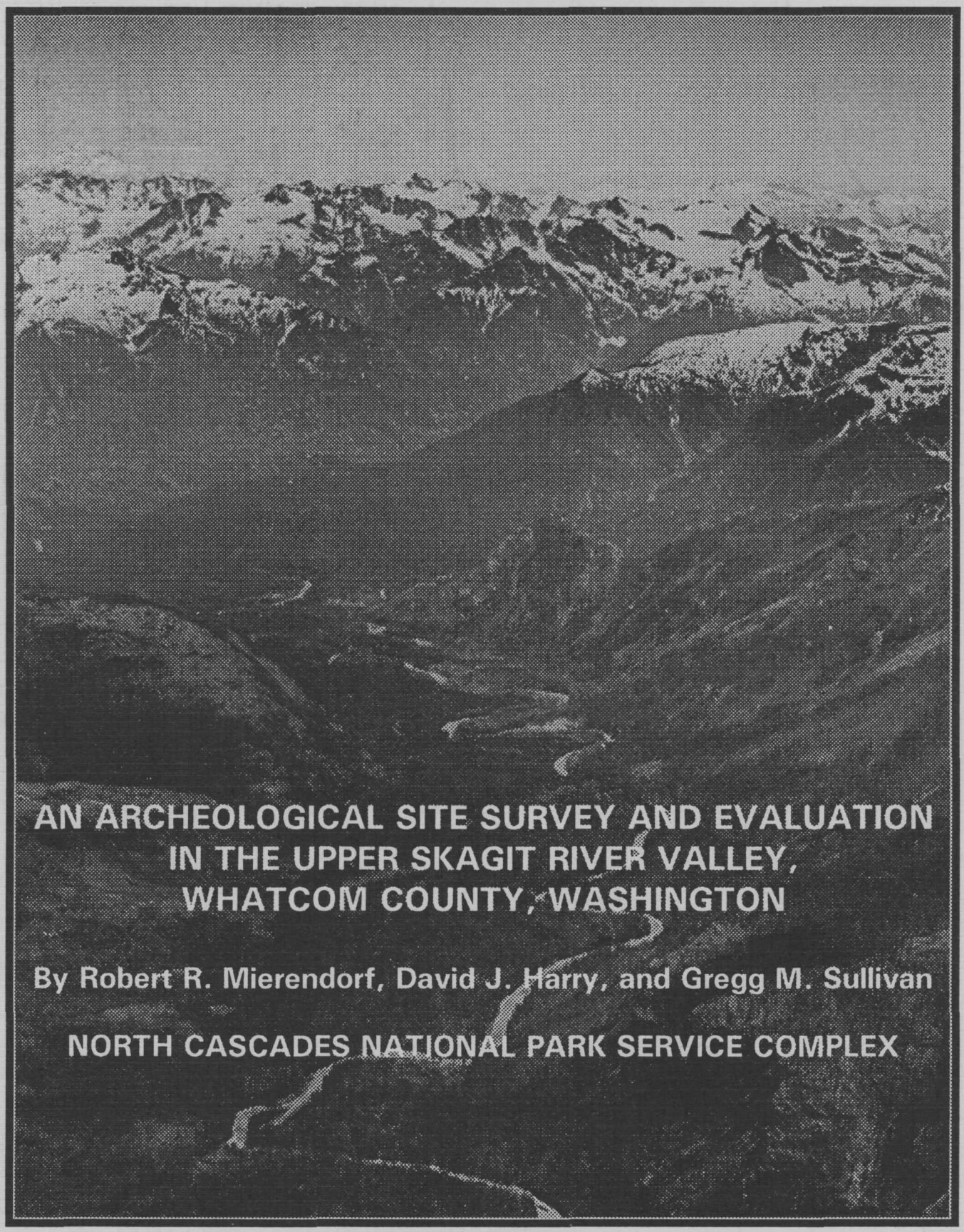


AN ARCHEOLOGICAL SITE SURVEY AND EVALUATION IN THE UPPER SKAGIT RIVER VALLEY, WHATCOM COUNTY, WASHINGTON

By Robert R. Mierendorf, David J. Harry, and Gregg M. Sullivan

NORTH CASCADES NATIONAL PARK SERVICE COMPLEX

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1. ABSTRACT

The Ross Lake Archeological Project consisted of a site survey and testing program in and around Ross lake, a reservoir located in the upper Skagit River Valley, Whatcom County, Washington. The archeological project area includes both the Ross Lake portion of Seattle City Light's Skagit Hydroelectric Project (Federal Energy Regulatory Commission [FERC] No. 553) and additional land that would have been inundated by the High Ross Project, which is no longer contemplated by Seattle City Light. The archeological project boundaries are inside the larger area licensed by FERC, on land administered by the U. S. Department of Interior, North Cascades National Park Service Complex, as the Ross Lake National Recreation Area.

The majority of the Ross Lake Archeological Project lands was surveyed during the 1988 and 1989 field seasons. Prior to 1988, 15 archeological sites had been recorded in the project area. Between 1988 and 1990, two archeological surveys of the project area were conducted. The first was an intensive, inventory-level survey to locate cultural resources on land exposed in the drawdown during the annual spring lowering of the reservoir. The second consisted of a reconnaissance-level survey of forested lands above the reservoir's maximum pool level of 1,602.5 ft. The total area surveyed covers 46.92 km^2 (11,591 acres). The drawdown tract covered 27.76 km^2 (6,858 acres) and the forested tract covered 19.16 km^2 (4,733 acres). One hundred fifty cultural resource sites have been recorded in the project area: 144 are prehistoric and 6 are historic sites.

Test excavations were conducted during the spring drawdowns between 1989 and 1993 to assess the sites' eligibility for the National Register of Historic Places. Thirty-six of 41 archeological sites recommended for testing were test excavated (the remaining five sites were inundated by reservoir waters and were not available for study). Of the 36 tested sites, 16 are assessed as eligible for inclusion in the National Register of Historic Places.

A radiocarbon chronology of tested sites in the project area revealed two major, late-prehistoric occupations of the project area. One was between about 1,900 and 1,100 radiocarbon-years ago, and the other between about 500 and 200 years ago. Other evidence, based on time-sensitive projectile points and geologic strata, indicates much earlier occupation of the valley, beginning roughly 10,000 years ago. Earlier test excavations of a large chert quarry and the frequency of time-sensitive projectile points suggests another major period of occupation between 5,000 and 3,500 BP. Prehistoric groups inhabiting the valley made extensive use of locally available resources, including lithic raw materials and mammals such as mountain goat, deer, and beaver. In addition, they brought with them tools made of obsidian from Oregon and California, probably acquired through exchange. They also brought tools made of lithic materials from southern British Columbia and, possibly, eastern Washington. The sites represent seasonal base camps that were occupied repeatedly by small groups the size of a band or smaller.

2. ACKNOWLEDGEMENTS

This report came about through the cooperation and effort of many individuals and agencies. There is not room to recognize all of their contributions.

The survey was made possible through the concern of the City Light Department, City of Seattle, for cultural resources affected by its Skagit Hydroelectric Project. Since 1987 the City Light Department has provided financial and administrative support to make possible an intensive study of archeological resources within its (Federal Energy Regulatory Commission, Project No. 553) licensed project boundaries. Through agreements reached between City Light staff and the National Park Service, a cooperative effort to study cultural resources was initiated. All phases of the study were coordinated with staff of the Environmental Affairs Division, now the Environment and Safety Division, including Ms. Beth Blattenberger, Mr. Keith Kurko, Ms. Michele Lynn, and Dr. Richard Rutz. Mr. Bill Newby, former manager of the Skagit Hydroelectric Project, provided unending assistance and logistic support throughout the project.

The project was administered by staff of the National Park Service, including members of the Pacific Northwest Regional Office, Cultural Resources Division, in Seattle. All phases of the project were developed with the considerable administrative expertise, technical assistance, and funding offered by Mr. Jim Thomson, Regional Archaeologist, and Dr. Stephanie Toothman, Chief of the Cultural Resources Division.

At North Cascades National Park, Superintendents William Paleck, John Earnst and John Reynolds gave the on-going project their support and encouragement. Mr. Bruce Freet, Chief of Resource Management, and Mr. Jon Jarvis before him, provided crucial support in planning and implementation. Personnel and procurement staff at the park headquarters, including Ms. Margie Allen, Ms. Barbara Ashley, Ms. Jerry Andrews, Ms. Pat Blunt, Ms. Karen Brown, Ms. Joan Huxhold, Ms. Vicki Tisdel, Ms. Pat Laitner, Mr. Dan Peregoy, Ms. Judy Richmyer, and Ms. Sarah Welch kept the project going.

Equipment and logistics problems were solved by Skagit District personnel from maintenance, trails, wilderness, and ranger divisions. District personnel, including Ms. Merlene Buller, Mr. Gerry Cook, Mr. Jeff Harsha, Mr. Tim Oliverius, Mr. Gary Richmyer, and Ms. Pat Young helped with planning and implementation, and provided facilities.

Help in planning and field supervision was rendered by Mr. James Forrest, Mr. Alfred Reid, and Mr. Paul Rushmore. Other archeological team members included Mr. Kevin Anderson, Ms. Cindy Brown, Ms. Jeannie Ott Harsha, Mr. Brent Hicks, Mr. Austin Ivers, Mr. James Kangas, Ms. Joanie Lawrence, Ms. Valerie Normand, Mr. Jon Riedel, Mr. Nick Smith, Mr. Douglas Stephens, Mr. James Sterling, Mr. Gregg

Sullivan, Ms. Linda Switzer, and Ms. Shelly Wilson. Dr. Jesse G. Kennedy III successfully and efficiently managed the project records during the field and data compilation phases of the project, kept the computers running and printing, and offered his considerable expertise in numerous other matters. Mr. Chris White and Ms. Linda Switzer cataloged the archeological collection acquired by the project. The project's accomplishments were realized only through this group's united efforts.

During four project tours, the tribal representatives shared their beliefs, thoughts, and feelings regarding the upper Skagit River Valley and selected sites. These people participated on behalf of the Colville Confederated Tribes, the Lummi Indian Business Council, the Nlakápamux Nation (Lower Thompson People of British Columbia), the Sauk-Suiattle Tribal Council, the Swinomish Indian Tribal Community, and the Upper Skagit Tribal Council. These organizations today embody the tribal and ancestral knowledge handed down for more than two hundred generations.

Mr. Jon Riedel generously shared his geologic knowledge of the North Cascades, assisted in recording site stratigraphy, and mapped landforms throughout the project area.

Artifact drawings were provided by Ms. Sarah Moore Illustration Services, Ms. Sidney Cossleman, and Mr. Douglas Stephens. Ms. Anne Braaten, Geographic Information System specialist for the park, provided some of the report maps. Mr. Ron Holmes also assisted in preparation of maps.

The Mt. Baker District Office of the Mt. Baker-Snoqualmie National Forest, U.S. Forest Service, helped in the preparation of field survey base maps by making available planimetric equipment for the measurement of survey tract areas.

The Washington State Office of Archeology and Historic Preservation provided necessary consultation and review of the project and its results. Over the years, the office of the British Columbia Provincial Archaeologist promptly honored requests for site information from north of the project area.

Finally, the authors would like to thank archeologists Dr. David Rice, Dr. Gail Thompson, Dr. Robert Whitlam, and Ms. Christian Miss for their review of an earlier draft of the report. Ms. Beth Blattenberger also provided helpful review comments.

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6. INTRODUCTION

6.1 Project Scope of Work and Administrative Background

This report documents the results of the Ross Lake Archeological Project, a program of archeological surveys and test excavations of prehistoric sites in and around Ross Lake, a reservoir located in Whatcom County, Washington. The archeological project area includes both the Ross Lake portion of Seattle City Light's Skagit Hydroelectric Project (FERC No. 553) and additional land that would have been inundated by the High Ross Project, which is no longer contemplated by Seattle City Light. Ross Lake, the largest of three reservoirs in the Upper Skagit River Valley, inundates the flood plain and lower slopes of immediately adjacent mountains. Archeological surveys, excavations, and related studies were not done within the Skagit River Valley prior to construction in the 1920s of the first of three hydroelectric dams that comprise the Skagit Project. This survey constitutes the first systematic effort to inventory archeological resources in and above Ross Lake. The test excavations that immediately followed were conducted in order to assess the significance of sites according to the National Register of Historic Places and to acquire the information needed to develop a management plan for cultural resources in the project area.

The Ross Lake Archeological Project was implemented by the National Park Service (NPS), U.S. Department of Interior, through two Memoranda Of Agreement signed by the City of Seattle, City Light Department (SCL) and the NPS. The memoranda and their amendments are identified administratively as NPS No. MA-9000-8-0001 and No. 1443-MA9000-92-003. The project was planned and designed by NPS staff of the Resources Management Division at the Pacific Northwest Regional Office in Seattle and resource management staff at North Cascades National Park Service Complex (NOCA), and by staff members of the Environment and Safety Division at SCL. The project was implemented by NPS archeologists at NOCA, Skagit Ranger Station, Marblemount. All phases of the project were directed by Robert R. Mierendorf, NPS archaeologist, Pacific Northwest Regional Office, Seattle, WA.

This document constitutes the final report of the survey and site evaluation phase of the Ross Lake Archeological Project. It provides descriptive data and substantive technical results of fieldwork and analysis. This document supersedes earlier interim and progress reports that have been submitted to SCL by NPS during the course of the project (Mierendorf 1987a, 1991, 1992; Mierendorf et al. 1988, 1989; Mierendorf and Switzer 1991).

For survey purposes, the project area was divided into two zones. The first zone consists of land exposed in the reservoir bottom during each spring's lowering of the pool level. This "drawdown" survey was an intensive inventory designed to locate all readily-visible archeological resources. The second zone consists of forested lands above

the reservoir's maximum pool level of 1,602.5 ft (488 m), and extended to the approximate upper elevation of the project boundary, ca. 1,800 ft (549 m). The reconnaissance-level survey in this zone was designed to assess the potential for occurrence of archeological resources. Although not directly affected by the reservoir pool, the forested zone was included because it would have been affected by the High Ross Dam project, which would have raised the maximum level of Ross Lake an additional 125 ft (38 m) (Federal Energy Regulatory Commission 1995). In 1984, the U.S. and Canadian governments approved a treaty which provides for SCL to purchase energy from British Columbia in lieu of the energy that would have been generated by High Ross, at equivalent cost, through A.D. 2066. While the treaty allows SCL to build the dam if British Columbia fails to supply the energy, such an outcome is unlikely and SCL is no longer considering the High Ross project.

Of the project total of 150 archeological sites, only the 128 located in the drawdown zone are directly affected by the reservoir pool and were evaluated for significance according to National Register criteria. Of the 128, 41 were recommended for evaluation through limited test excavation, but only 36 were exposed long enough to be tested. Since their discovery and recording between 1988-89, the five sites remaining to be tested have yet to be exposed above the reservoir. Of the 36 sites that were tested, 16 are assessed as eligible for inclusion in the National Register of Historic Places.

6.2 Report Organization

The main body of the report consists of background information followed by detailed results of the survey and testing phases of the project. A series of appendices contain technical data referenced in the main body. The remainder of this section of the report (6) provides background information about the project setting, including climate, vegetation, geography, and geology. Section 7 provides an overview of ethnography, archeology, and history of the project area within the context of the Pacific Northwest region. Section 8 describes the project's research design and methodology. Section 9 is a description and analysis of the survey results. Section 10 provides the site-by-site results of test excavation of sites considered eligible for the National Register of Historic Places, while section 11 provides the excavation results for sites considered to not be eligible according to National Register criteria. Section 12 is a discussion highlighting the scientific results of the study. Section 13 presents the historic contexts within which the National Register significance of the sites is to be understood. Section 14 is a listing of all references cited in the text. Appendix J at the back of the report provides a glossary of the most frequently used technical terms.

6.3 Description of Project Area

The project area occupies a portion of the interior of the northern Cascade Range of Washington State. As used in this report, the northern Cascade Range (or North Cascades) refers to the area bounded on the north by the Fraser River near Hope; on the

south by Snoqualmie Pass; on the east by the Okanogan River; and on the west by the western foothills of the mountains (Figure 6.1).

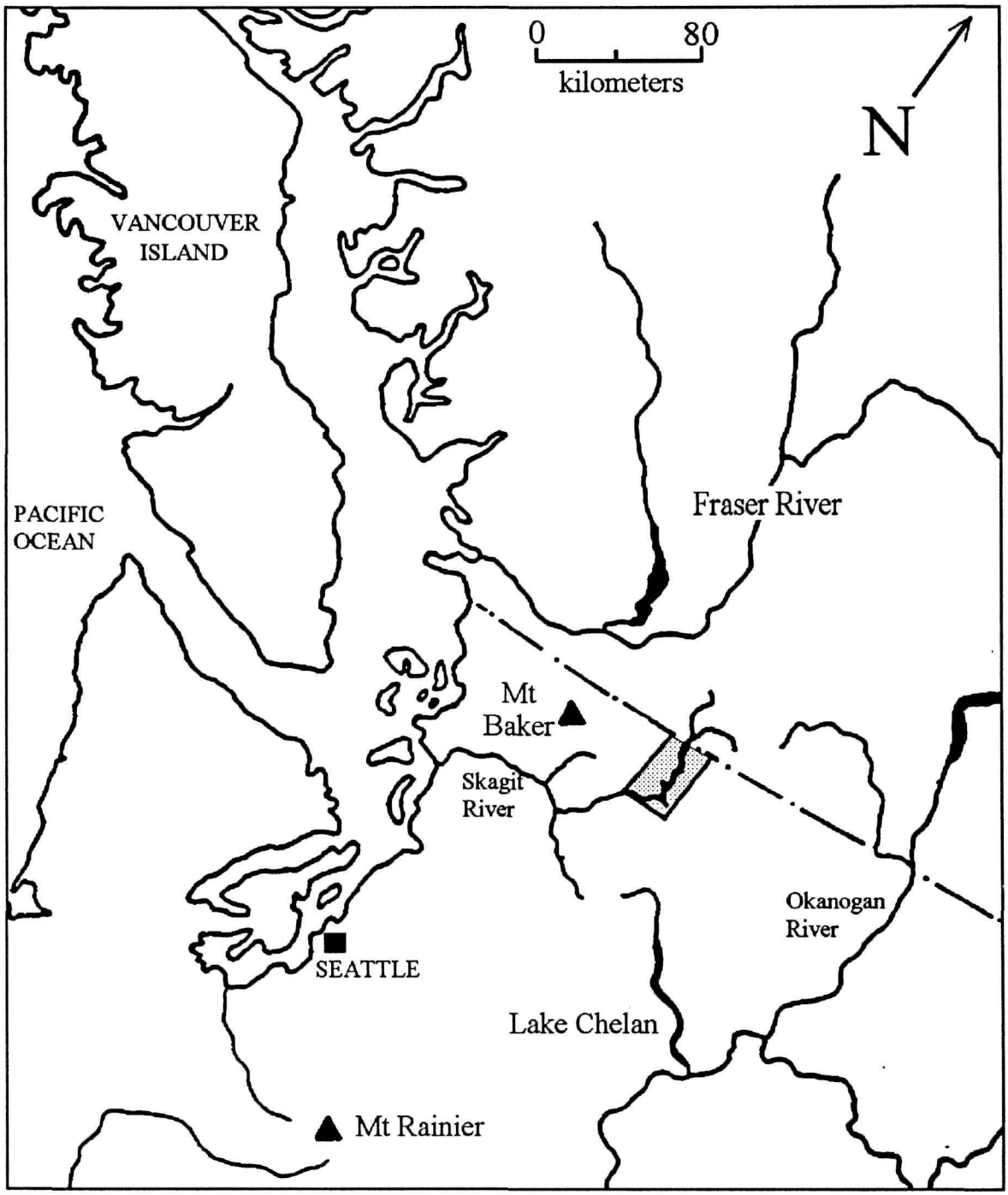


Figure 6.1 Planview map of northwest Washington and southwestern British Columbia showing the project area.

The project lands are located in the vicinity of Ross Lake, a reservoir in the northeastern corner of Whatcom County, Washington. Ross Lake extends about 38 km (24 mi) along the valley of the Skagit River from Ross Dam (located in a deep gorge northeast of Newhalem, Washington) to just north of the Canada-USA border (Figure 6.2). Ross Dam was constructed in several stages, beginning in 1937. Construction was interrupted by World War II, and resumed after the war ended. The reservoir reached its present maximum elevation in 1953. Archeological sites within the reservoir that are discussed in this report were first inundated between 1946 and 1953.

At full pool (elevation 488.6 m [1,602.5 ft]) the reservoir inundates about 46.7 km^2 (11,557 acres) of land in the Ross Lake National Recreation Area, which is administered by the North Cascades National Park Service Complex. As defined in this report, the "project area" is bounded by the concrete structure of Ross Dam on the south, by the Canada-USA border on the north, and by the 549 m (1,800 ft) elevation contour line to the east and west. The drawdown portion of the project area lies between elevation 454 m (1,490 ft), the lowest drawdown level during implementation of the survey, and 488.6 m (1,602.5 ft), the maximum high pool allowed by FERC (the portion of the reservoir bottom not exposed during the survey will be inventoried for archeological resources as future reservoir levels permit). To date, 59% of the lands inundated by the reservoir have been surveyed at an inventory level. The forested tract is between 488.6 m and 549 m (1,800 ft), the latter elevation marking the approximate upper boundary of the once-proposed High Ross Dam project (Figure 6.3).

Except for a gravel road providing access from Hope, B.C. to Hozomeen Campground, the valley surrounding the reservoir is a roadless wilderness. There are no settlements along the reservoir, which is used for power generation and recreational water sports and fishing. The adjacent shores are used for hiking, camping, and hunting.

6.4 Environmental Setting

6.4.1 Climate and Vegetation

Northwestern Washington's climate is classified as marine with wet, mild winters and cool, dry summers (NOAA 1979a). Primary factors influencing the climate of the North Cascades are latitude, proximity to the Pacific Ocean, height of the range, and semi-permanent high and low pressure cells located over the North Pacific Ocean (NOAA 1979b). Prevailing westerly winds continually carry wave cyclones and moisture-laden air from the Pacific into contact with the North Cascades. The orographic effect causes increased precipitation with altitude as Pacific air cools while rising over the range. The presence of semi-permanent pressure regions over the North Pacific imparts a strong seasonal component to precipitation in the Cascades. Less precipitation falls during the summers because a vast region of high-pressure dominates the Pacific. Circulation around the high-pressure cell causes a northwesterly flow of relatively cooler, drier air onto the continent. In late fall and winter, the Aleutian low-

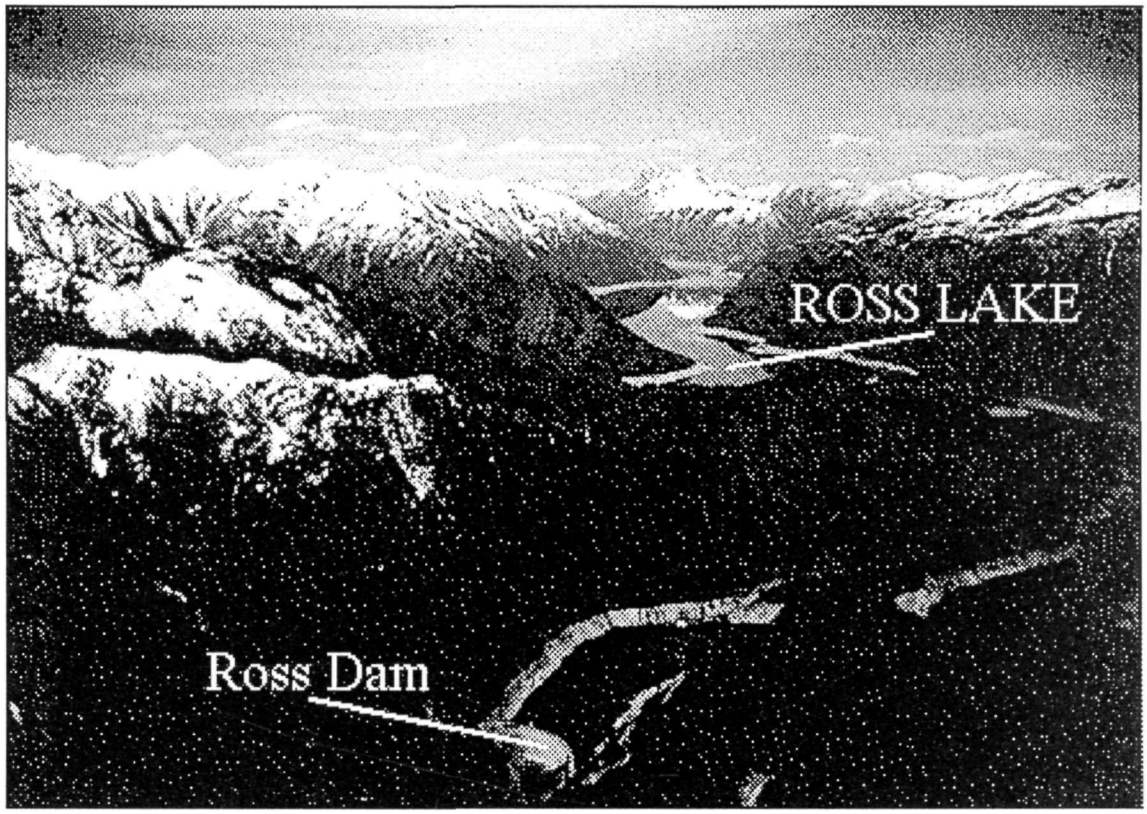


Figure 6.2 Oblique aerial photograph showing Ross Dam (bottom) and reservoir pool at a lowered level.

pressure dominates the Pacific, bringing a predominantly southwesterly flow of warmer, moister air into the North Cascades. Cooling and condensation, as a result of the orographic effect, is enhanced by the relatively cool landmass.

Weather stations in the project vicinity are located at the north end of Ross Lake at Hozomeen campground, and at the Ross, Diablo, and Gorge powerhouses. An additional weather station is located at the NPS Marblemount Ranger Station. The Marblemount and Hozomeen stations collect fire weather data during the fire weather season (late spring to early fall). Annual precipitation decreases up valley: 198 cm (78 in) at Newhalem, 180 cm (71 in) at Diablo, 142 cm (56 in) at Ross powerhouse and 79 cm (31 in) at the international boundary (International Joint Commission 1971). Mean annual temperature is 9.5°C (49°F) at Newhalem, and 8.9°C (48°F) at Diablo and Ross powerhouses (Phillips 1966). Temperature extremes increase in response to increasingly continental conditions along a south-to-north transect.

Wind data from the Hozomeen and Marblemount stations indicate strong up-valley flow from the south and southwest. The strongest winds in the valley are sea breezes that develop during summer afternoons when high inland temperatures draw air from the

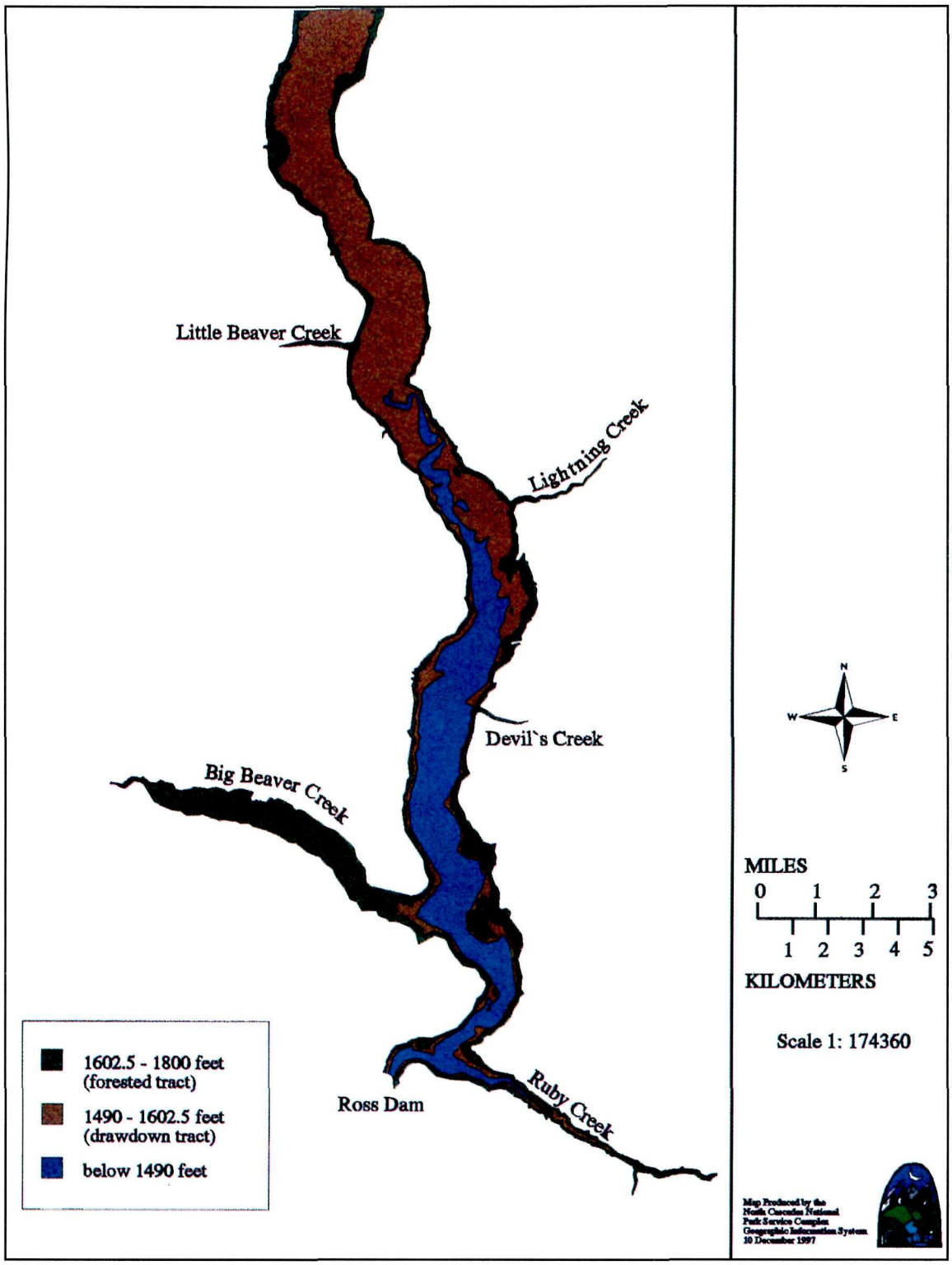


Figure 6.3 Planview of the project area showing the forested and drawdown survey tracts.

relatively cooler Pacific Ocean. Wind speed increases in the narrow river-canyon sections of the valley between Newhalem and Ross Dam. A strong northeast component to summer winds at the Hozomeen station probably reflects storm-wind patterns.

Four broadly defined vegetation zones are found in the North Cascades based on altitude and the strong west-to-east precipitation gradient. The lowland forest, the montane forest, the subalpine forest, and the alpine tundra extend from west to east across the Cascade crest (Heusser 1983). The project area is within the lowland forest zone. This zone extends from sea level to 899 m (2,950 ft) and is dominated by western hemlock (*Tsuga heterophylla*), western red-cedar (*Thuja plicata*), and Douglas-fir (*Pseudotsuga menziesii*). Dominant trees adjacent to the Skagit River and in wetland areas include big-leaf maple (*Acer macrophyllum*) and cottonwood (*Populus trichocarpa*).

Within the Ross Lake basin, the lowland forest exists as a complex mosaic of shrub and forest communities. One component is a more xeric plant community than usually exists west of the Cascade crest reflecting the drier conditions within the rainshadow caused by the Picket Range and Chilliwack subranges. Precipitation falling in these mountains (356 cm [140 in] annually) reduces the amount received by mountain slopes to the east (203 cm [80 in] annually). Several plant species found in the much drier interior plateaus of the Fraser and Columbia Rivers grow in this rainshadow, out of their accustomed range (International Joint Commission 1971; Franklin and Dyrness 1988; Ralph and Dorothy Naas 1988: personal communication; Vanbianchi and Wagstaff 1988). The driest microenvironments in the project area (rock outcrops and lithosols) support small patches of ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), Rocky Mountain juniper (*Juniperus scopulorum*), bluebunch wheatgrass (*Agropyron spicatum*), balsamroot (*Balsamorhiza*), biscuitroot (*Lomatium ambiguum*), creeping Oregon grape (*Berberis repens*), and other taxa characteristic of steppe-grassland communities. Additional complexity in vegetation communities is found in avalanche chutes, rocky canyons, and talus that support dense shrub communities of vine maple (*Acer circinatum*) and thin-leaved alder (*Alnus sinuata*) (Vanbianchi and Wagstaff 1988).

Although not high relative to some mountain ranges in North America, the 2,440-2,744 m (8,000-9,000 ft) summits of the Chilliwack and Picket subranges catch the brunt of Pacific storm systems. Excessive snow accumulation, which sustains today's glaciers, and past glacial activity have created a deeply eroded terrain of sculpted summits and ridges, forming spires, aretes, and horns. Some of these ridgelines descend to the Skagit Valley and impart a strong alpine character to the valley's cultural ecology. Some plants characteristic of subalpine and alpine habitats include Alaska yellow-cedar (*Chamaecyparis nootkatensis*), Mountain hemlock (*Tsuga mertensiana*), Pacific silver fir (*Abies amabilis*), heather (*Cassiope* and *Phyllodoce* spp.), mountain ash (*Sorbus*), and huckleberry (*Vaccinium*). Species that inhabit disturbed sites in the study area include red alder (*Alnus rubra*), willow (*Salix*), and fireweed (*Epilobium angustifolium*).

6.4.2 Physiography

The valley is densely forested, as was the flood plain prior to inundation by the reservoir (Figures 6.4 and 6.5). Lowland forests of the flood plain and lower slopes were composed of mixed, deciduous and coniferous species (Envirosphere Company 1988). Large trees within old growth stands can range from 3-5 m (10-16 ft) dbh. With increasing elevation along the valley walls, the lower montane forests give way to upper montane and subalpine forest tracts separated by meadows and brushy avalanche chutes. At the highest elevations, there are treeless alpine tundras, permanent snowfields, bare rocks, and glaciers.

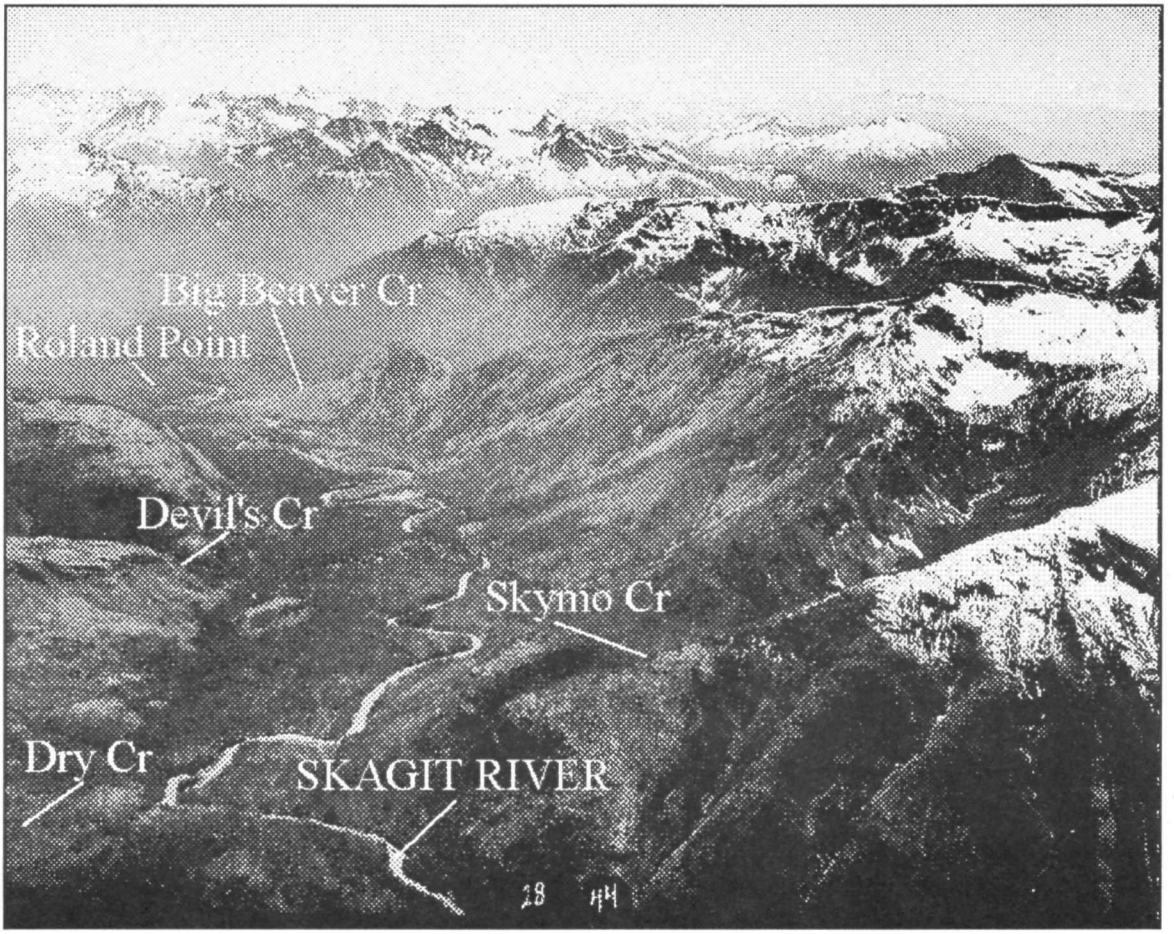


Figure 6.4 Oblique aerial photo of the upper Skagit River valley prior to hydroelectric development, from Dry Creek vicinity to Roland Point, facing south (circa 1931).

Beginning in the 1930s, logging operations partially cleared the forests in the reservoir bottom. Fortunately, few of the stumps were removed, or the disturbance to buried archeological sites would have been more extensive. Today, during each season's

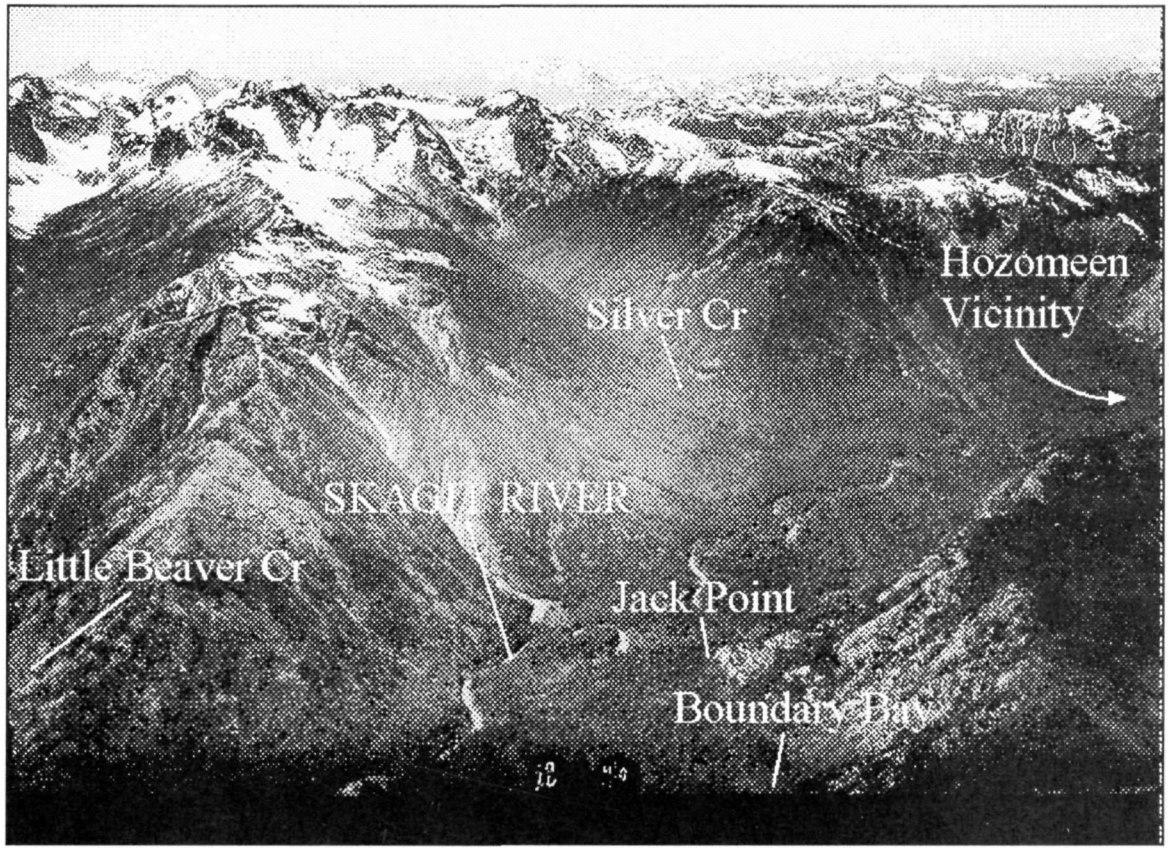


Figure 6.5 Oblique aerial photo of the upper Skagit River valley prior to hydroelectric development, from today's Boundary Bay vicinity to Hozomeen vicinity, facing northwest (circa 1931).

annual drawdown, the exposed bottom and sides of the reservoir show a stark, devegetated landscape of eroded rocky soils, reservoir sand and mud deposits, rock walls and cliffs, and glacially scoured bedrock outcrops. These are dotted with the sawn stumps of the pre-reservoir forest.

As the largest and most interior, the upper Skagit Valley is a prominent and geographically distinctive feature of the northern Cascade Range (Figures 6.6 and 6.7). The valley is the only one to drain the wet west slope of the North Cascades by cutting through the crystalline core of the range. Several characteristics of the region including width of the range, the accumulation of snow sufficient to support active glaciers, the bedrock geology, and the extreme topographic relief profoundly affected prehistoric and historic land uses:

1. **Range Width:** The Cascade Range of southern Washington and Oregon averages about 105 km (65 mi) in width and is defined by a single prominent crest. In contrast, at the latitude of the project area, the Cascade Range is 220 km (138 mi) wide with two

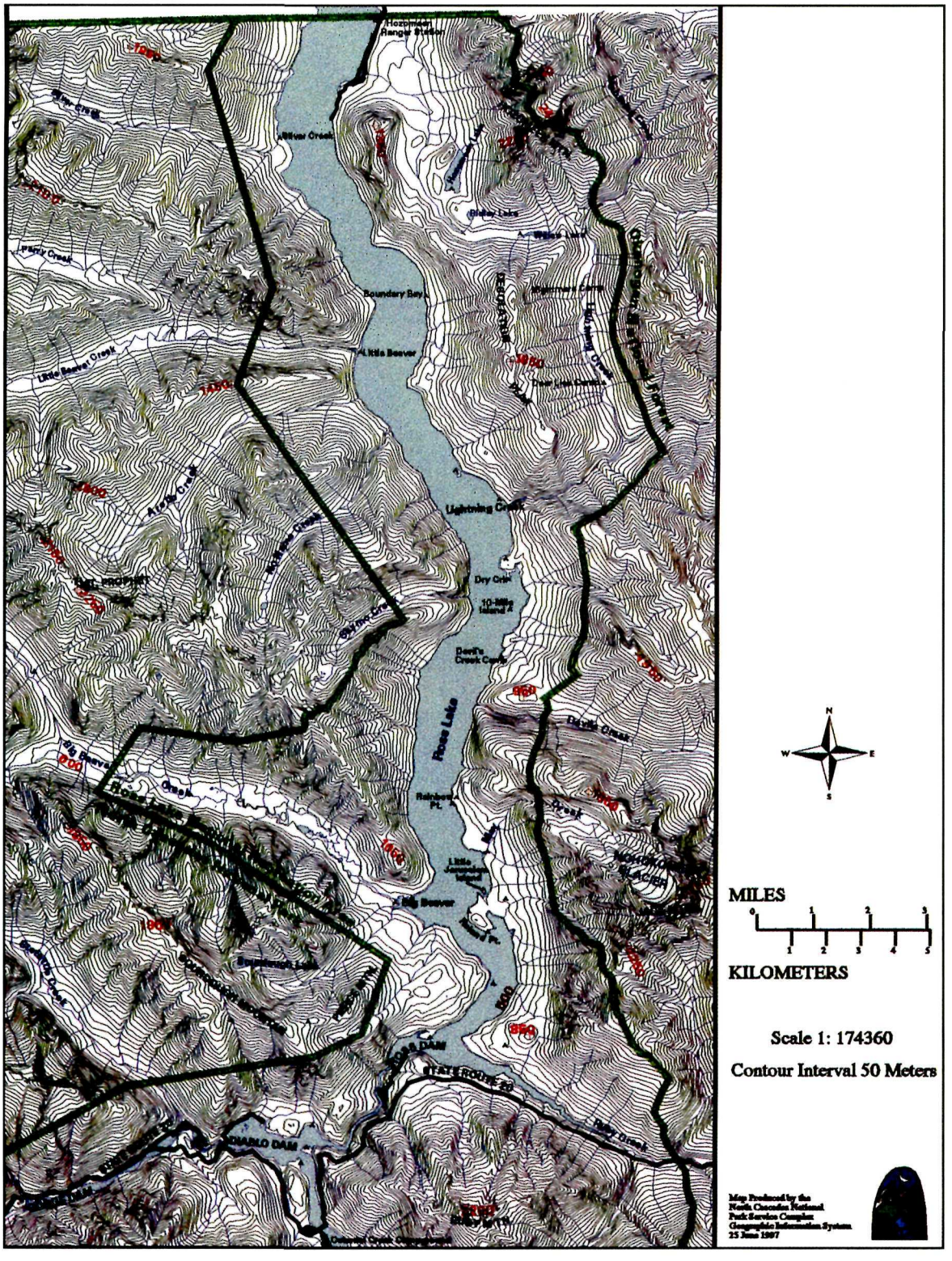


Figure 6.6 Topographic map of the Ross Lake vicinity.

parallel, north-south oriented crests separated by the upper Skagit Valley. The eastern crest, 22 km (14 mi) east of the project area, forms the hydrologic divide between the Skagit and Columbia River basins. The heavily glaciated western crest separates the Skagit from the Baker-Nooksack-Chilliwack River drainages, 29 km (18 mi) west of the project area. This divide is composed of the massifs of the Chilliwack Group and the Picket Range.

2. **Snow Accumulation:** The northern Cascade Range supports the largest number of active glaciers in the lower forty-eight states. Many of the major and minor drainage divides consist of rock walls towering thousands of feet above crevassed glaciers. As a result, pedestrian travel in and out of valleys is channeled through a few low passes. The easiest prehistoric route into the upper Skagit River Valley is from the north, via a low (549 m [1,800 ft] elevation), glacially-scoured flat at the head of Silverhope and Klesilkwa Creeks. It separates the Fraser and Skagit River Basins. Most of today's active glaciers are concentrated south and west of the project area.

3. **Bedrock Geology:** Whereas the Cascade Range to the south is composed predominately of intrusive and extrusive igneous rocks, the North Cascades are dominated by a complex suite of metamorphic, sedimentary, and igneous rock types. These rocks were an important source of stone materials used prehistorically. Examples include obsidian, argillite, nephrite, talc, and chert. One rock type in particular, Hozomeen chert, which outcrops in the valley, is the dominant tool material found in archeological sites in the project area.

4. **Extreme Topographic Relief:** Few mountain ranges are as steep as the North Cascades, where gravity exerts a strong influence on biological and physical processes. Vegetation zonation according to elevation creates strong contrasts in biological communities, compressing faunal and floral diversity between the flood plain and nearby summits. This means that a wide variety of subsistence resources are available within a relatively small foraging radius. The extreme relief also contributes to a geologically active landscape where snow avalanches and earth slides are common. In the past, large landslides have thundered down mountainsides and spilled onto the Skagit River flood plain. Such processes rendered some segments of the valley unsuitable for winter settlement. The dominant summits bordering the east side of the project area are Hozomeen Mtn. (2,460 m [8,066 ft] elevation) and Jack Mtn. (2,763 m [9,063 ft]). Along the crests of the Chilliwack massif and Picket Range are Mts. Spickard (2,737 m [8,977 ft]), Redoubt (2,730 m [8,954 ft]), Challenger (2,510 m [8,233 ft]), Prophet (2,329 m [7,639 ft]), and Sourdough Mtn. (1,861 m [6,104 ft]). Currently, all but the last of these peaks support alpine glaciers.

The Skagit River Valley has been deeply cut by fluvial and glacial erosion. The most recent glacial period occurred 10,000 to 20,000 years ago. The evidence of glacial sculpting is recorded in prominent U-shaped cross-valley profiles and a flat, drift-filled alluvial bottom in the northern and middle portions of the project area. The river

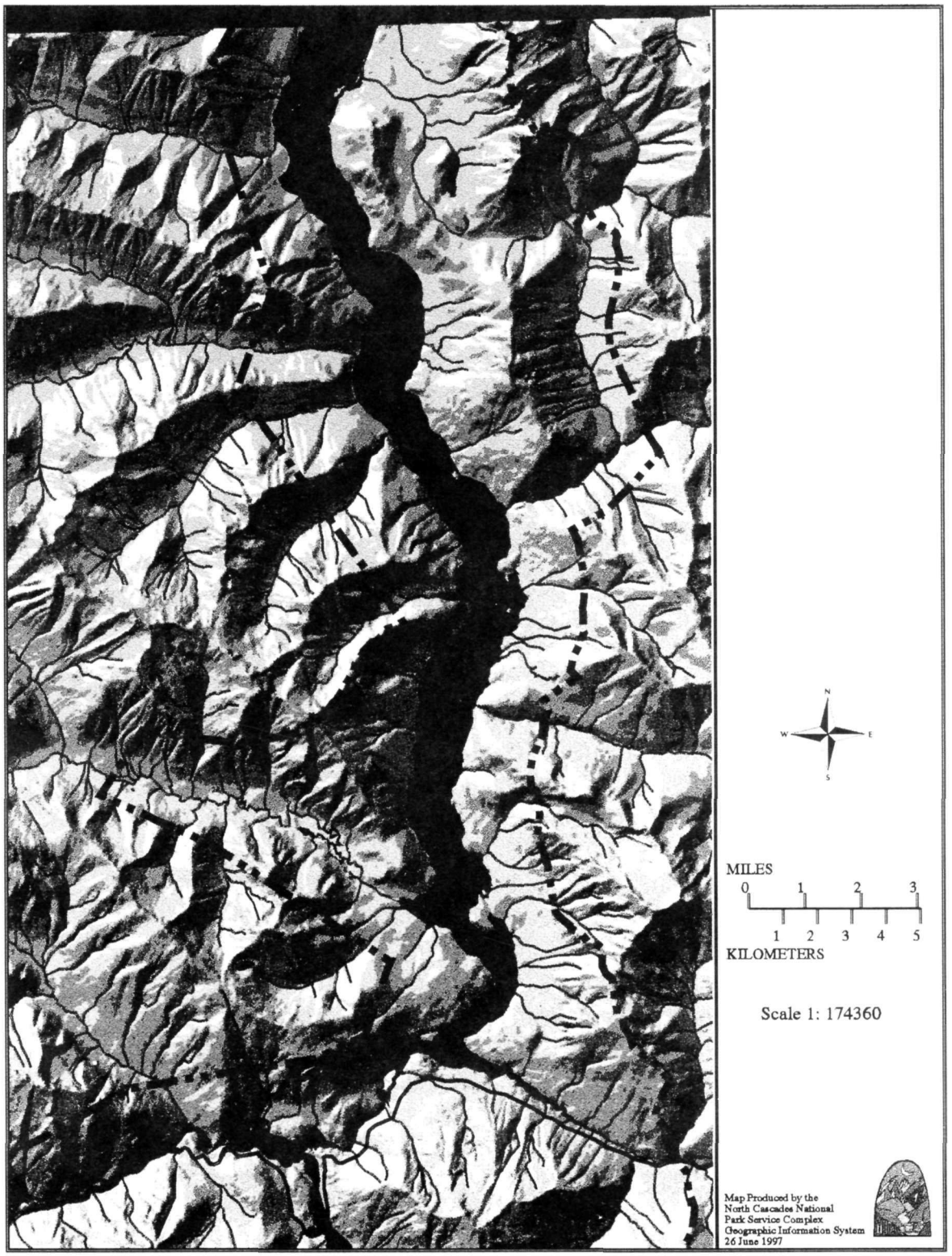


Figure 6.7 Computer generated relief map of the project area.

gradient here drops an average of about 2.8 m/km (15 ft/mi). In the southern part of the project area the river has cut a deep, V-shaped canyon into bedrock; here the river drops at a rate of about 6.3 m/km (33 ft/mi). The width of the valley ranges from 2.1 km (1.3 mi) to less than 0.9 km (0.5 mi). Mountain valleys of equivalent width do not occur for many miles to the east, west, and south. To the east, these valleys are the Methow and Similkameen, and to the west, the Baker and Nooksack. The widest valley to the south is the segment of the Skagit downstream of the canyon at the town of Newhalem. The broad valley of the Fraser River to the northwest is the largest and one of the closest to the project area. At 488 m (1,600 ft) above mean sea level, the project area is elevated 396 m (1,300 ft) or so above the Puget and Fraser lowlands.

In the upper Skagit River Basin, large tributaries from the east are Lightning, Devil's, and Ruby Creeks. Those joining from the wetter west side are Little Beaver, Big Beaver, and Silver Creeks. Most segments of these valleys are wide, glacially-scoured troughs, indicating that the glaciers that once filled them merged with the ice lobe that filled the Skagit River valley. Exceptions to this pattern are the narrow and V-shaped lower reaches of tributaries entering from the east where glacial effects are minimal. Some segments of these valleys and the intervening ridge lines form natural travel corridors into the high country surrounding the project area.

The surface morphology of the flood plain (when it is visible in the drawdown) displays abandoned stream channels, flood channels, and near the Skagit River main channel, multiple channel-and-bar complexes. The sinuous course of the river across the valley floor is controlled by the location of bedrock features, earth movement deposits, and alluvial fans. The latter two types of landforms have forced the river to the opposite side of the valley from their point of deposition.

6.4.3 Bedrock Geology

The North Cascades are relatively young mountains; however, the exposed bedrock types have a long and complex geologic history. The following section of the report describes in some detail the major rock units found in the region, their approximate age, and their distribution in the project area. Contained within these rock units are specific rock types and minerals that were used by prehistoric people for a variety of adaptive purposes such as making tools and cooking food. The presence of some of these rocks and minerals in archeological assemblages provides important clues about the movements and land-use patterns of prehistoric peoples.

The uplift and subsequent erosion of the North Cascades over the last 20 million years has exposed ancient, severely folded and faulted metamorphic rocks. Two major suites of metamorphic Paleozoic and Mesozoic bedrock are separated in the center of the North Cascades by a large granitic intrusion of Tertiary age (Misch 1977). On the west side of the project area the Skagit Metamorphic Suite and the Chilliwack Composite

Batholith are the most widely distributed formations; to the east, the Hozomeen Group of Cairnes (1944) and the Ross Lake Group are the most extensive.

Rocks of the Skagit Metamorphic Suite (SMS) were formed during the Cretaceous Period, 140 to 70 million years before present (Staatz et al. 1972). The most geographically extensive rock of the SMS in the project area is Skagit Gneiss (Misch 1966). Skagit Gneiss varies from amphibole rich to both light and dark banded gneiss locally bedded with white marble (Staatz et al. 1972). It is exposed along the shores of the reservoir south of Pumpkin Mountain on the west and from Roland Point to Ross Dam on the east.

Northeast of the Skagit Gneiss, on the west side of the Skagit River Valley, is a narrow, northwest-trending band of meta-gabbro, phyllite and schist of the Ross Lake Group (Staatz et al. 1972). These units are exposed on the west shore of the reservoir north of Pumpkin Mountain and date to the Cretaceous Period.

On the east shore the Ross Lake Group outcrops from Roland Point north to Devil's Creek. Phyllite, schist and massive conglomerates of the Ross Lake Group are also exposed in a 13 km wide (8.06 mi), northwest-oriented belt 10 to 15 km (6.2 to 9.3 mi) to the east of Ross Lake, at the heads of Lightning, Three Fools, Devil's and Canyon (Ruby) Creeks (Staatz et al. 1972).

The Ross Lake Fault separates rocks of the Ross Lake Group from the Hozomeen Group of Cairnes (1944) on the west side of the valley. The Hozomeen Group consists of a thick suite of greenstones with less common occurrences of chert, argillite and mafic intrusions (Staatz et al. 1972). These metamorphosed, deep-ocean sedimentary rocks of Cretaceous age extend over 40 km (25 mi) in a northwest trending belt, approximately 5 km (3.1 mi) wide, from north of Ruby Creek into Canada (Staatz et al. 1971; Staatz et al. 1972).

One rock type within the Hozomeen Group is of particular significance to the valley's prehistoric inhabitants. This rock, a variety of quartz, has been named "Hozomeen chert" and is found in archeological sites throughout the North Cascades National Park Service Complex (Mierendorf 1993a). It is the dominant chipped stone raw material found in archeological sites in the project area. The chert formed in a deep ocean basin and subsequently became metamorphosed under varying amounts of heat and pressure.

The Chilliwack Composite Batholith crystallized during four or five intrusive phases between 50 and 20 million years before present (Misch 1977). It is composed primarily of granodiorite and quartz diorite (Staatz et al. 1972). Rocks of the Batholith are found at the surface west of the reservoir in the upper portions of Luna, Little Beaver, Redoubt and Perry Creeks (Staatz et al. 1972). Granodiorite is exposed along

the reservoir from south of Silver Creek, north, to the international border, and just south of Hozomeen campground.

During later stages of the intrusion of the Chilliwack Batholith, the Skagit and Hannegan Volcanic Formations were deposited (Misch 1977). Most of the floor of the Silver Creek Valley is composed of the tuffs, breccias and flows that characterize the Skagit Volcanic Formation (Staatz et al. 1972). Flaked stone tools of vitrophyre (a type of obsidian) from either of these two rock formations have been found in archeological sites recorded in the project area (Mierendorf 1991, 1993) and in subalpine zones to the west (Mierendorf 1987b). The Skagit Volcanic Formation also may be the local source of andesite, which was the preferred material used for hammerstones at the Desolation Chert Quarry (45WH224) (Mierendorf 1993a).

6.4.4 Overview of Glacial and Post-Glacial History

The resistant crystalline rocks of the North Cascades were deeply dissected during the Pleistocene epoch (3 million to 10,000 years BP) by the action of rivers and glaciers. Large-scale, repeated glaciation of the range also has modified most fluvial landscapes in the basin. Only the portion of the Skagit River Valley from the mouth of Ruby Cr. to the town of Newhalem, and tributaries entering from the drier east side, retain narrow, V-shaped canyons resultant from stream erosion of bedrock (Waitt 1977).

Armstrong et al. (1965) divided the late Wisconsin period of glaciation into four geologic-climatic periods based on radiocarbon chronology, tephrochronology, palynology and stratigraphic studies throughout the Pacific Northwest (Figure 6.8). During the Evans Creek Stade of the Fraser Glaciation, alpine glaciers filled most valleys in the North Cascades. Alpine glaciers headed at major divides in cirque basins. Erosion by glaciers sculpted high-altitude rocks of the crystalline core of the range into spires, horns, and precipitous aretes. Alpine glaciers straightened, broadened and deepened the river valleys, leaving them with U-shaped cross-section and also lowered and truncated valley spurs, often reducing them to a series of scoured bedrock benches.

While alpine glaciers in the North Cascades were reaching their maximum extent around 18,000 years ago, alpine glaciers in the coast and interior mountains of British Columbia had coalesced to form a piedmont glacier and, eventually, the Cordilleran ice sheet (Clague 1980). The ice sheet moved down the Georgia Depression and reached the international border around 18,000 years ago (Lowden and Blake 1968; Armstrong 1977). By 14,000 years ago, it had moved down the Puget Lowland to a terminal position south of Olympia (Thorson 1980; Waitt and Thorson 1983). Distributary lobes of the ice sheet descended the upper Skagit River Valley via Klesilkwa Pass, at the headwaters of Silverhope Cr. and Klesilkwa Cr. (Waitt 1977) and ascended valleys flowing to the north such as the Pasayten (Waitt 1979). The Fraser Plateau was the source for ice flowing south into the upper Skagit Valley. By 12,900 years ago, the ice sheet had retreated north and east of the Fraser River (Clague 1980). During the Sumas

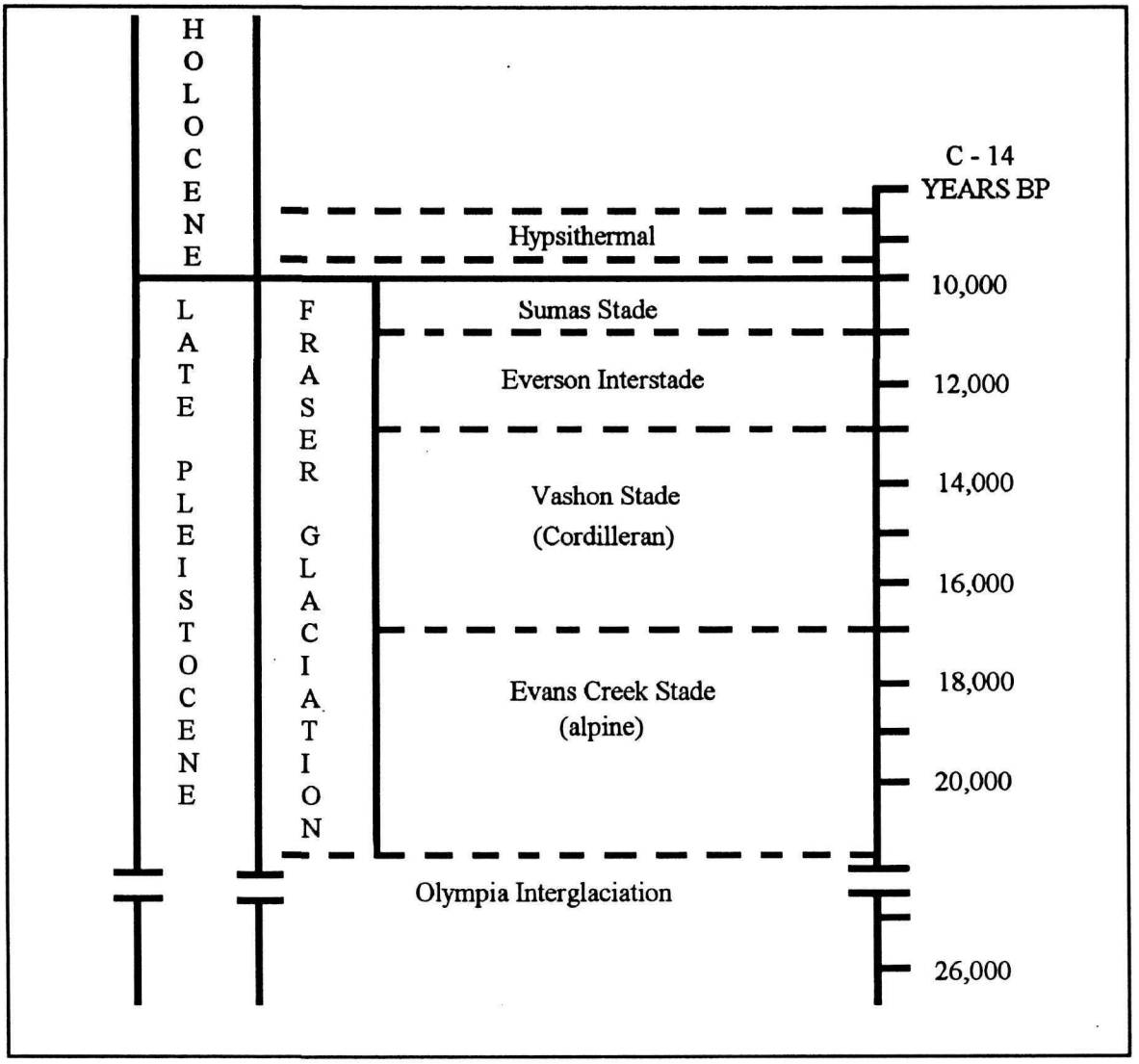


Figure 6.8 Late Pleistocene Glacial Sequence in the Central Puget Lowland. Dashed lines indicate approximate ages (after Hiller 1980 and Deevey and Flint 1957).

Stade of the Fraser Glaciation (10,000-11,000 years ago), the ice sheet readvanced to the international border, and possibly up valleys whose rivers flow north, across today's border (Waitt 1979). Presently, there is no data regarding the extent of Sumas glaciation in the project area or a date for the onset of ice-free conditions.

Although it filled the Skagit Valley with thick ice and topped all but the highest summits, the Cordilleran ice sheet's influence on the topography of the North Cascades during the Vashon Stade was minor in comparison to that of the longer-lived alpine glaciers (Waitt 1977). Passes at the headwaters of the Chilliwack, Methow, and

Stehekin Rivers, however, were lowered. It also enlarged cross-valley profiles and subdued alpine glacial topography below 2,250 m (7,380 ft) because of its great thickness (Waitt and Thorson 1983). In the upper Skagit Valley are landforms deposited by the glacier and its meltwater streams. Most common are moraines, glacial outwash terraces, alluvial fans, and glacially-smoothed bedrock formations.

Following the Fraser Glaciation, the early Holocene Skagit River cut into these glacial deposits. As its base level lowered, the river left remnants of the older glacial landforms and flood plains, while building newer and successively lower flood plains until it reached modern levels or below. The early Holocene (ca. 7,000-10,000 years ago) also was the period of greatest postglacial warming in the Pacific Northwest and there is abundant evidence of drought. At this time forests in the region contained more Douglas-fir, red alder, and bracken fern than today (Whitlock 1992:17), but old-growth Douglas-fir forests apparently were absent (Brubaker 1992). In the late Holocene, after 5,000-6,000 years ago, summer droughts were less intense due to lower temperatures and higher precipitation than in the early Holocene. Cedar and hemlock spread to northern Puget Sound at this time, and prairies shrank in size (Whitlock 1992:18). Old-growth Douglas-fir forests, so typical of the recent, became established (Brubaker 1992). A series of alpine glacier advances and retreats occurred, but at a much smaller scale than during the Pleistocene. The most recent glacial episode, called the "Little Ice Age," may have had important effects on the North Cascades landscape during the last half of this millennium. During this interval, some alpine glaciers in the North Cascades expanded and descended thousands of feet from cirques into the valleys below (Riedel 1987). They may have been larger than at any time in the previous 4,000-5,000 years (Porter et al. 1983). The activity of these glaciers may have influenced sediment yield and hydrology of the streams that drained them (Mierendorf 1986:69). The Little Ice Age ended sometime during the middle of the last century (ca. A.D. 1850). Today, alpine glaciers of the North Cascades are much smaller than they were during the latest prehistoric period of Native American occupation, 200-700 years ago. The effects of the Little Ice Age and earlier climatic events on the subsistence resources and land-use practices of Native American populations are some of the intriguing puzzles of northern Cascades prehistory.

7. ETHNOGRAPHY, ARCHEOLOGY, AND HISTORY OF THE UPPER SKAGIT VALLEY

7.1 Native People of the Upper Skagit Valley

The upper Skagit Valley has been traditionally thought of as being in the Northwest Coast culture area (Kroeber 1939), which is noted for its development of a series of culturally complex hunting-and-gathering societies based on marine-oriented economies. Lands just east and north of the upper Skagit Valley have been placed within the Plateau Culture Area, which differs substantially from the Northwest Coast by its reliance on riverine and terrestrial resources and by its less complex social organization. There are two geographic characteristics, however, that make this easy division implausible. The first is that the northern termination of the Cascade Range is a short distance north of the project area, and the second is that the Coast Range of British Columbia, which continues the line of western cordillera beyond the Cascades, trends decidedly to the northwest, with the location of the dry interior Fraser Plateau east of the Coast Range, but directly north of the Cascades. As a consequence, the upper Skagit Valley serves as a meeting place of coastal and interior environments and cultures, which may have combined here in ways peculiar only to a place so strategically located between culturally diverse regions. Just as important in contributing to the unique character of culture in the upper valley is the locality itself, which is centered in this dominant mountain mass that forms the headwaters to portions of the Columbia and Fraser Rivers.

The valley is within the historic home range of bands of the Nlakápamux (also referred to as the "Lower Thompson"). Portions of the valley also were visited by Upper Skagit people from below the Skagit River gorge near today's town of Newhalem (Smith 1987:150). Considering that it has been visited by Native populations for thousands of years, it is likely that bands from both sides of the Cascade Range passed through the valley to hunt, and perhaps, procure other resources. Embedded in ethnohistoric accounts of Native American groups are references of visitations to the northern Cascades and the upper Skagit River Valley by various bands. For example, Collins (1974:80) noted that Upper Skagits expected to meet Nooksack, Stillaguamish, Thompson, Methow, or Okanogan people who were relatives in the divides between drainages. Land and Lane (1977:163) quote Wilson Duff's Tait Indian informant that they would meet both Thompson and Skagit hunting parties east of the Fraser River. Hudson (1994) reports frequent use of the area by Similkameen people to hunt, trade, trap, and travel. Any listing of Native American groups likely to have visited the project area would include all the tribes adjacent to the northern Cascades on both sides of the mountains. A generalized map of historic Native American linguistic groups for the northern Cascade Range region is shown in Figure 7.1 (data for this map is compiled from Spier 1936; Swanton 1952; and Suttles and Lane 1990).

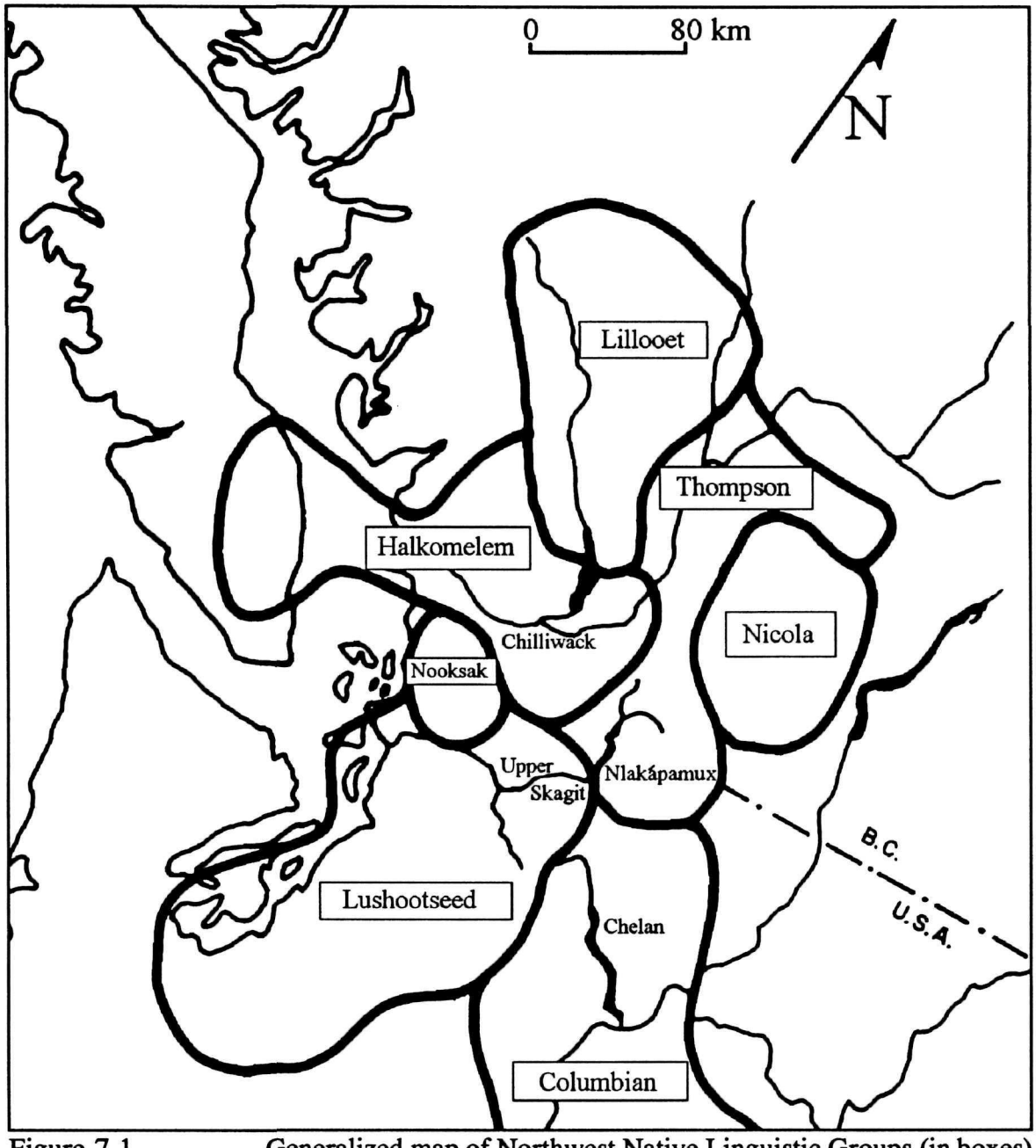


Figure 7.1 Generalized map of Northwest Native Linguistic Groups (in boxes) and Band Names; Ross lake is Shown Between the Upper Skagit and Nlakapamux.

The name "Lower Thompson" is one assigned by Euroamericans to the Uta'mqtamux (also spelled Nlakápamux), "the people below Lytton". Their language is most similar to, but mutually unintelligible with, that spoken by the other two members of the northern group of Interior Salish, the Shuswap and the Lillooet (Smith 1987). The Nku'kumamux, the "people above Lytton" (the Upper Thompsons), speak

the same language as the Lower Thompson with only minor dialectic differences. Although their languages share some distant similarities, the language communities of Interior Salish are only remotely related to those of Coast Salish, which is spoken by numerous groups living in western Washington and southwestern British Columbia (Elmendorf 1963:74). Lushootseed, one of the southern-coast Salish languages, was spoken by the various Upper Skagit bands (Suttles and Lane 1990).

An interesting phenomenon regarding Native use of the project area is the apparent disappearance of Indian people from the upper Skagit Valley in the last century. Few Native people were encountered in the North Cascades, and none in the project area, at the time of the first explorations by non-natives. At the time of his 1859 travels through the valley to survey the international boundary, Henry Custer observed limited evidence of Native people's presence, noting that "We found an Indian trail leading through the Klesilkwa valley, faint though as all these trails are, & observed subsequently its continuance through the entire length of the Skagit valley explored by us." (Custer 1866:22). In valleys adjacent to the Skagit he also observed two abandoned brush structures built by Native people. Custer's observations here agree with those of George Gibbs, who noted that many Native American trails throughout the northern Cascades appeared to have "fallen into disuse". He attributed this to "the diminution of the tribes and the diversion of trade to the posts" (Gibbs 1877:169). It is likely that introduced diseases, such as smallpox in ca. 1770, played a major role in reducing Upper Skagit populations, as happened in widespread areas of the Northwest Coast (Boyd 1990). Whatever the reasons, the accumulating archeological evidence suggests that Native populations, at times in the prehistoric past, made much more use of the valley than the historic record suggests.

7.2 Subsistence Ecology

The upper Skagit River Valley expresses strong seasonal differences in temperature, precipitation, and growing season. In this regard, it is transitional between the mild maritime conditions to the west and the more extreme continental conditions that prevail to the north and east. Compared with the milder climate along Puget Sound and the coast, the valley might seem a marginal environment for human occupation. The purpose of this section is to suggest some of the ways in which prehistoric bands are expected to have adapted to the valley environment. The emphasis here is on the structure of food resources, although a host of other factors may influence a foraging group's total subsistence base and range of settlement alternatives. For example, the constraints of mountain physiography on travel has much to do with the energy expended in transporting subsistence resources from their location of procurement to the camps and settlements where they are consumed. Similarly, winter exploitation of the valley implies knowledge of winter-adapted technologies and strategies, including the ability to establish and maintain bivouac camps during protracted storms and snowshoe construction and use. This overview uses information drawn largely from records of the last hundred years, although this period is not probably representative of the last ca. 10,000 years with

respect to either environment or cultural adaptation. Rather, there is evidence that the climate and the resource base of the project area has shifted significantly over the last ca. 10,000 years.

The set of environmental factors that characterize the project area offers a unique landscape in western Washington for prehistoric people with a hunting, gathering, and fishing economy. Few places can be found with this diversity of plants and animals within a day's foraging radius. Environmental factors of extremely steep slopes and strong rainshadow result in "a set of biotic zones compactly arranged within small territories" (Watanabe 1968:73). Such habitat variations had an important effect on Native American subsistence and can result in distinctive settlement patterns for separate bands within the same cultural group (Watanabe 1968). It is possible, therefore, that environmental conditions of the upper Skagit River Valley have influenced aspects of Native American settlement and subsistence in ways that are unique by comparison with other "culturally similar" groups and bands of the western Cascades.

From studies conducted to assess the effects of Ross Dam and its reservoir on the upper Skagit Valley, it is reported that the area sustained an abundance of native fauna prior to impoundment of the river. The large animals included black and grizzly bear, black-tailed and mule deer, mountain goat, Roosevelt elk, and cougar. Small mammals included beaver, marmot, snowshoe hare, bobcat, lynx, ermine, river otter, marten, mink, and red and Douglas squirrel (International Joint Commission 1971; Taber 1971). Over 170 bird species have been recorded in the valley. The most common are blue grouse, ruffed grouse, mallard, American widgeon, shoveller, and bufflehead (International Joint Commission 1971).

Prior to impoundment, large trout were plentiful in the Skagit River. Four species were known to occur above Ross Dam. In order of abundance they are rainbow trout, dolly varden char, eastern brook trout, and cutthroat trout (International Joint Commission 1971). Lane and Lane (1977:155) mention a trout processing site up Ruby Cr. used by Upper Skagit people.

The valley also supports a range of plant resources that were traditionally used by the Nlakápamux and other Native groups throughout the Northwest for food, medicine, and utensils (Turner et al. 1990). Among these are wild lilies (chocolate, glacier, and tiger lily), spring beauty, wild onion, berries (serviceberry, gooseberry, wild cherry, huckleberry, salmonberry, thimbleberry, raspberry, and blackberry), dogbane, hazelnut, biscuitroot, cow parsnip, bleeding heart, cascara, hawthorn, kinnikinnick, western red-cedar, paper birch, and many others.

Of the many food resources in the valley, deer are likely to have been most abundant and important for subsistence (although the cumulative abundance of other animals, such as bear, elk, and goat may have exceeded that of deer). Although deer populations were low in the early 1900s, their numbers increased rapidly with opening

of the forest canopy following the great fire of 1926, which burned a large portion of the project area. The main factors controlling deer population are the availability of winter shrubs and winter snow depth (Taber 1971). In prehistoric times, Native American subsistence practices affected deer populations in two ways. First, periods of intensive predation probably reduced deer populations. Second, intentional forest burning, a practice reported in other mountainous areas, is likely to have increased deer populations (Barrett and Arno 1982; Schalk 1984). Native use of fire was mentioned as a possible explanation for the observed fire frequencies recorded in studies of wild fires on Desolation Peak and near Hozomeen (Agee et al. 1986). The only direct historical reference to this practice near the project area is from Henry Custer who noted that "Fires are very frequent during sum[m]er season in these Mountain forests and are often ignited purposely by some of the Indian[s] hunting in these Mountain regions, to clear the woods from under brush & make travel easier." (Custer 1866:20).

During winter a migratory mule deer herd that summered in the mountains east of the valley joined the resident population of black-tailed deer in the valley bottom (Taber 1971). The aggregate population's main wintering ground was the driest portion of the valley: a three-mile long flat of well-drained glacial deposits and alluvial fans between Devil's Cr. and Lightning Cr. This area was informally called "Little Sahara." Here, brushy expanses and open-canopied, xeric forests covered the valley bottom and the adjacent slopes of the east valley wall (such areas correspond to the Douglas fir/Ponderosa pine community described by Agee et al. 1986). This portion of the valley may have been the focus, prehistorically, of winter hunting activities. It would be in this area that deer herds would be concentrated or "yarded" in their winter range (Schalk and Mierendorf 1984), and where we might expect prehistoric hunters to focus their hunting activities.

Unfortunately, equivalent information from historic records regarding other ungulates and subsistence mammals is unavailable. From analysis of animal bones associated with prehistoric cooking hearths in the project area we have identified bones of mountain goat, elk, deer, and beaver. Although presently we can make no statements regarding the abundance of these mammals prior to the historic period, it is clear that they were available to prehistoric hunters in the valley.

Historically, most Nlakápamux people congregated in winter to live in pithouse villages along the Fraser River some distance north of the valley. Present day Nlakápamux people recount that their ancestors traveled into the North Cascades in the summer and fall to hunt and pick berries. There is little doubt that subsistence activities during these seasons account for much of the prehistoric use of the upper Skagit River Valley by these and other bands residing near the North Cascades. Teit (1900) recorded that Lower Thompson hunting parties wintered on the western slopes of the Cascades with some individuals specializing in hunting. He further noted that "Hunting-parties who visited the most southern part of their hunting-grounds were sometimes absent for seven months, returning only when the snow began to melt in the mountains." (Teit

1900:239). Based on the mapped boundaries of Nlakápamux territory and other references to the Skagit Valley, Smith (1987:156, 230) considers these hunting grounds to include the northern portion of today's Ross Lake National Recreation Area which encompasses the project area. A historic Nlakápamux pattern of winter hunting in the valley suggests that sizeable ungulate populations provided a predictable winter subsistence base.

7.3 Previous Archeological Studies

No archeological studies were conducted in the Skagit River Valley prior to construction of the hydroelectric dams of the Skagit Project. The first archeological fieldwork in the North Cascades National Park Service Complex was an archeological survey conducted in the early 1970s to locate sites on lands that would have been inundated by the then-proposed High Ross Dam reservoir. These lands extend from the present reservoir full-pool elevation of 488 m (1602 ft) to an elevation of 526 m (1725 ft) (Rice n.d.a.). The survey strategy included examination from a boat or on-foot of nearly the entire reservoir margin. No archeological sites were found. Steepness of slopes and the absence of salmon and other food resources were factors cited to explain the absence of sites and a lack of prehistoric use of the upper Skagit River Valley. Rice also noted a small likelihood that archeological sites could be found because the river banks, preferred locations of Native American habitations, had been inundated by the reservoir. A second survey was conducted in an area proposed for road and recreational developments at Roland Point. Again, no archeological sites were found (Rice n.d.b.).

A survey also was conducted in 1971 of the Skagit River Valley in British Columbia for the High Ross Dam project. The nine day survey extended for ca. 17.6 km (11 mi) along the Skagit Valley and included the lower portion of the Klesilkwa Valley (Percy 1972). No archeological sites were reported. Too little time and dense vegetation were noted as factors affecting the survey results. Citing Duff (1956:62) as the source of information, a soapstone bowl at the Provincial museum (No. 7906) is reported to have been collected about one mile north of the international boundary (Percy 1972:160). However, this portion of the Skagit River Valley was considered archaeologically or culturally not significant and no further work was recommended (International Joint Commission 1971:93).

In 1977 limited archeological surveys were conducted by a team from Western Washington University including 16 selected locations along the margin of Ross Lake. Two sites were recorded, one near the mouth of Big Beaver Cr. and the other in the vicinity of Hozomeen campground (Grabert and Pint 1978). The first of these (45WH80) was reported to contain possible housepit depressions, but subsequent test excavations could not confirm this. The second (45WH79), a large lithic scatter, was believed to be an early prehistoric site with the potential to contribute new and significant information about Native American occupation of mountains. During a reexamination of 45WH79 by NPS archaeologists, additional artifact classes were identified. Many of these are

chronologically and culturally diagnostic and indicate periods of use and possible cultural affiliations later than those originally suggested (Mierendorf and Thomson 1986).

Archeological surveys between 1984 and 1986 in the project area have consisted of a series of reconnaissance-level surveys of land tracts near and adjacent to Ross Lake as part of NOCA's cultural resources management program. Thirteen new archeological sites were found both above and below the high pool line. This brought the upper river basin's known site total at that time to 15 (Mierendorf 1987a). The results of these surveys offered the first evidence demonstrating the presence of numerous archeological sites in the mountainous interior of the North Cascades and the sites' potential eligibility to the National Register of Historic Places criteria.

A brief reconnaissance-level survey for cultural resources was conducted by NPS for the City of Seattle in October of 1987. The survey took advantage of a rare four-day drawdown of Diablo Lake, one of the two reservoirs in the Skagit River gorge. No cultural resources were recorded (Mierendorf and Luxenberg 1987).

Two prehistoric sites (DgRg2 and -3) were recorded during a March 1988 survey conducted on the British Columbia side of the reservoir. Based on information from surface collection and test excavation the sites were estimated to date between 6,000 and 2,400 BP. The artifact material types reflect use of Hozomeen chert and other local rocks, as well as lithic materials that do not occur naturally in the upper Skagit River Valley (Rousseau 1988). The author recommended that a cultural resources survey and impact assessment be conducted in the Canadian portion of the reservoir.

Between 1987 and 1989, the Desolation Chert Quarry (45WH224) was test excavated by NPS in order to determine its eligibility for the National Register of Historic Places. The site covers part of the steep valley wall both above and below the 488 m maximum high pool elevation (1602.5 ft) of Ross Lake. The quality of the chert found here varies from poor to very good, and it was used in prehistoric stone tool-making technologies for at least 7,600 years (Mierendorf 1993a). In addition to testing 45WH224, limited reconnaissance-level surveys were conducted on mid-elevation mountain slopes above Ross Lake. Three prehistoric sites were recorded: two Hozomeen chert quarries (45WH446 and -447) and a lithic scatter (45WH449).

During the winter of 1988-1989, a systematic subsurface archeological survey was conducted on NPS land in the Newhalem vicinity. The purpose of the survey was to assess the effects to cultural resources of proposed construction of a park visitor center and attendant facilities. Of the 181 total shovel test pits excavated, 24 (13%) encountered lithic artifacts. Four prehistoric lithic scatters (45WH400, -401, -476, and -476) were recorded as a result of the survey (Mierendorf and Harry 1993).

In spring of 1989 Larson Anthropological/Archaeological Services performed a test excavation of 45SK200, a prehistoric site near the mouth of Bacon Creek on SCL

land (Larson and Lewarch 1989). An intact fire hearth made of river cobbles, which was radiocarbon dated at 6,000 BP, constitutes the oldest dated hearth in the interior of the North Cascades. The remaining portions of the site were recommended as not eligible to the National Register of Historic Places.

Larson Anthropological/Archeological Services made a detailed site survey along the margins of Diablo and Gorge Reservoirs during the spring of 1990 (Lewarch and Larson 1990). The survey strategy included use of numerous shovel probes in areas with poor ground visibility. The study constituted the first intensive archeological examination of landforms along reservoirs in the gorge of the Skagit River. Some of these landforms had been heavily modified by reservoir-related construction earlier in this century. One prehistoric archeological site (45WH454) was recorded, but the overall results of the project confirmed other studies also reporting a very low archeological site density in the narrow canyon of the Skagit River as compared to wider valley segments beyond either end of the canyon (Mierendorf and Luxenberg 1987; Mierendorf et al. 1989).

In 1991 Larson Anthropological/Archeological Services conducted a systematic subsurface archeological survey on Seattle City Light land adjacent to Newhalem Cr. as part of SCL's efforts to relicense the Newhalem Creek Hydroelectric Project. The subsurface sample consisted of 113 shovel pits. No archeological sites were found during the survey (Ebasco Environmental n.d.).

In addition to these studies, NPS has conducted annual surveys for archeological sites throughout the park complex. As a result, additional archeological sites adjacent to the project area are recorded in unpublished NPS documents. One site is a subalpine lithic scatter (45WH498) that overlooks the upper Skagit River Valley. Three others are in the Newhalem vicinity (45WH490, -491, and -495).

7.4 Overview of Northwest Mountain Prehistory

This section gives a brief review of Pacific Northwest prehistory from the perspective of the North Cascades. The purpose is to review existing knowledge about prehistoric use of high-relief montane areas so as to place the project results into a regional context. Of particular relevance to the archeology of the upper Skagit River Valley are several research problems addressed by anthropologists and archeologists. These include the perceived relationship of northern Cascades environments and cultures to those of adjacent coastal and interior regions, the dating of prehistoric settlement and subsistence in the Cascades, and the models that have been proposed to explain patterning in the archeological record derived from Cascades archeological sites.

7.4.1 Initial Views of Montane Settings

It is not surprising that the Cascades have been viewed as peripheral to professionals interested in the development of Northwest Coast and Plateau peoples.

Beginning in the late 1800s, anthropological interest centered on marine-oriented groups and was devoted to describing and explaining linguistic and cultural phenomena, including the potlatch, mythology, social inequality, descent, and distinctive northern Coast art styles (Suttles and Jonaitis 1990). Archeologists of the time were interested in the origin of Northwest Coast peoples, and their approach to the problem reflected the dominant Boasian school, which sought to reconstruct the "actual history of mankind" (Carlson 1990:107). Some of the anthropologists working in the first half of the 1900s, before the highly-developed specialties of today, combined archeology with historic, linguistic, and ethnographic research in order to understand the Northwest Coast pattern (Suttles and Jonaitis 1990). All of these early efforts were focused on the large coastal populations, and to a lesser degree on the immediately adjacent river people of the interior, because it was apparent that these are where most of the Native population lived.

Although Native use of the mountainous hinterlands, such as the North Cascades, has never been a research theme in studies of Coast Salish peoples, information about Skagit Indian culture was recorded by anthropologist June Collins. Though Collin's (1974) interests centered on Skagit Indian religious life, she indicated that the interior Upper Skagit bands were strongly oriented to terrestrial resources and shared a number of characteristics with Interior Salish peoples to the east (Collins 1974:7). In a map outlining Upper Skagit habitat (reprinted in A. Smith 1987:25), Collins indicates their use extended into the most rugged portions of the North Cascades, including the Ross Lake area. Subsistence uses depicted on the map in the high-elevation areas include hunting of mountain goat, deer, bear, and elk. The only other references to these higher lands relates to travel over the main passes through the Cascades.

A contemporary of Collins, Marian Smith, offered a perspective on Northwest Coast settlement and subsistence that is of interest to understanding Native uses of the mountainous interior (M. Smith 1941, 1950, and 1956). Although Smith's perspective has been criticized for various weaknesses (see Suttles 1957), her concept of a "foothill" adaptation may in fact recognize an important pattern in Native use of the interior of the North Cascades. In this model, she divided village groupings (the rough equivalent of bands) according to four environmental settings (the word she uses is "topography"). The four and their definitions are (Smith 1941:205):

1. salt water, along Puget Sound and its various arms, utilizing clams, seals, and other salt water products as staples;

2. river, above tides on the lower reaches of large rivers, relying heavily on canoe mobility;

3. prairie, adjacent to large, unforested prairies, the most root-oriented Coast Salish groups, and later the most horse-oriented;

4. inland, in the headwaters areas of rivers, in the Cascade foothills, the cultural traits of these groups reflected strong environmental influences.

Regarding the last group, she goes on to note that hunting was nearly as important as freshwater fishing and "cross-country travel by land was prominent" (p. 205). Although not explicit, she offers a strong argument for a terrestrial economic orientation to the inland or foothill adaptation and suggests that the Skagit villages define the northern Puget Sound inland orientation (the Skagit, Snoqualmie, and Muckleshoot are identified as the "Inland Puget Sound" groups that fit this adaptation [p. 204]). In a later paper, Smith further elaborated on a "Foothill or Interior province" and published a map of it (Smith 1956:Fig. 1, p. 288) that includes the Cascade Range of Washington, from just south of the Columbia River into Oregon, and extending into the southern Coast Range of B.C. an unspecified distance (Fig. 1, p. 288). In developing this notion, Smith acknowledges a limitation of the culture-area concept:

> One of the strange effects of the wide acceptance of the culture-area concept in American anthropology has been a kind of permanent fixation on timeless areas defined by ethnographic data. Thus, because Yale on the Fraser River marked a satisfactorily definite line between Interior and Coast Salish on the historic level, this boundary was carried back into the past. Because of this, discussions of the interior or coastal origins of Pacific Coast culture have functioned with rigid concepts of "interior" and "coastal." An obvious way out of the contretemps, and one which has the more important advantage of evolving from the data, is to redefine areas in depth. (Smith 1956:287).

The rigid adherence to the culture-area concept that Smith identified continues today and it may, indeed, be one reason why definition of the interior resource base of the western interior of the northern Cascades is lacking. Given our present low-level of knowledge of the interior, whether or not a "foothills" concept has utility is probably less important than the recognition that cultural adaptations to the interior of the northern Cascades are best understood on their own terms rather than through adherence to characterizations borrowed from the culture-area core.

Prior to about 1950, little archeological research had been done and not much was known about the prehistory of Northwest Coast peoples; it was generally believed that Native people had occupied the region for hundreds, but not thousands of years (Carlson 1990:109). By the early 1960s, however, the advent and use of radiocarbon dating had demonstrated human occupation of noncoastal areas, between the Fraser and Columbia Rivers, for at least 8,000-9,000 years (Borden 1960; Cressman 1960; Daugherty 1956). This led to formulations of some of the first inter-regional models of cultural development. One of the foremost problems addressed in these models was the origin of the first occupants of each region and the relative "influence" or "relationship" among distinct regional populations, acting through the mechanisms of population migration or

cultural diffusion of traits and ideas (Carlson 1990). Because the earliest dated sites were in the interior, it was suggested that the coast was settled by people from the interior (see Osborne et al. 1956). These regional models tended to view the Cascade Range as a barrier to cultural developments. The Columbia River, as the main passage through the Cascades, was assigned primary importance in connecting the interior to the coast (Osborne et al. 1956).

In the 1960s it was generally recognized that the earliest Northwest populations participated in a generalized and diversified hunting and gathering economy that covered a large geographic area of western North America. Recurring patterns in associated material culture, particularly chipped stone tool types found at archeological sites, provided the evidence for these cultures. Swanson (1962:1) suggested development in the Cascades in the early period of a land-mammal subsistence base for a Mesolithic, forest-hunting culture (Swanson 1962:152); however, this view was never fully developed or explored. Nevertheless, the Cascade Range continued to play a central role in archaeologists' attempts to explain the appearance and spread of post-glacial cultures. Ironically, in spite of their "barrier" status, the Cascades assumed great importance for understanding coastal and plateau interactions, yet no archeological sites in the mountains proper had been excavated.

Butler was among the first to recognize that early Northwest archeological sites were characterized by leaf-shaped, bi-pointed "Cascade" points and associated chipped stone flake and cobble tools used for chopping, cutting, and scraping tasks. He called this tradition the "Old Cordilleran Culture" which he believed extended along the lower slopes of the Pacific mountain ranges, from southern British Columbia to South America (Butler 1961). He considered this tradition to have appeared near the end of the Pleistocene sometime between 12,000 and 13,000 years ago, when large unforested expanses covered the Pacific Northwest.

Interest in the problem of early cultures in the Cascade Range focused on sites on the post-glacial terraces of the South Fork of the Stillaguamish River, a large river system draining the west slopes of the Cascade Range about 37 km (60 mi) south of the project area. A result of this focus was the widespread belief that the western slopes of the Cascade Range formed the core area for the early development of Pacific Northwest cultures. A key archeological site on the terrace system, the Olcott site, was the type site for Olcott assemblages and it formed a basis for Butler's Old Cordilleran Culture. Although lacking radiocarbon dates, the site was considered to be early postglacial in age based on its location on a Pleistocene terrace and on artifact weathering (Butler 1961; Kidd 1964). The Olcott site has come to assume great importance in Northwest prehistory as reflecting an early generalized hunting and gathering culture. As such, it has been used as a standard for comparison with other archeological assemblages and as ***the*** representative of a large class of nonsystematically documented early sites, with many presumably located in the Cascade "foothills" (in fact, the Olcott site is located only 22 km (13 mi) east of Puget Sound on a large remnant glacial terrace at 61 m [200

ft] elevation above sea level, some distance west of the lower slopes of the Cascade Range). Through subsequent usage, the label "foothill", and later "upland", came to be applied to any unspecified land area (or archeological site) located even a short distance from a major waterway. As a result, references to the "foothills" in archeological literature most often foster inaccurate representations of local site environments and the subsistence resources that the Cascade Range offered to foraging economies. The Olcott site, and others referred to by Butler (1961), are found on near-sea-level Pleistocene and early Holocene glacial terraces within the Puget Lowlands.

Butler's tradition was criticized as too inclusive to represent a culture. Daugherty redefined the concept as the Northwest Cordilleran Area tradition and geographically placed it between southern British Columbia and Oregon, especially in the "foothills" of the western Cascade Range (Daugherty 1962:149). Borden hypothesized that the Pacific Northwest was initially populated by "Protowestern" bands that had lived south of the late Pleistocene ice sheets. His "Protowestern" construct was clearly intended to include Butler's "Old Cordilleran" culture. As the ice retreated into today's British Columbia, Protowestern bands expanded northward along the Puget Lowland or across passes of the Cascade Range (Borden 1979:965). Like Butler and others at the time, he considered the archeological sites on post-glacial terraces to suggest great age (Borden 1975). Age-related field criteria consisted of weathered artifact surfaces and the inclusion of the artifact assemblages in well-developed A and B horizons of the terrace soils. Kidd (1964) postulated a close association between early artifact assemblages and soil mapping units, but Dancey (1968:65) considered these associations questionable for estimating site age. Swanson (1961) critiqued the environmental implications of the geomorphic and soil associations at the Olcott site and recommended further analytic studies, but these have not been implemented.

Although the early post-glacial time period in the region is poorly understood, earlier ideas have been challenged by more recent studies. It is now generally accepted that local equivalents of Old Cordilleran components occur in environmental settings far more diverse than originally postulated, and include marine shorelines, plateaus, mountain lakes, deltas, and flood plains (Matson 1976; Rice and Stilson 1986; Samuels 1993; Schalk and Taylor n.d.). Whereas Butler (1961) and Kidd (1964) considered Old Cordilleran sites to reflect relatively diverse subsistence activities (while recognizing the possibility of lithic reduction and quarrying), others (Dancey 1968; Rice and Stilson 1986; Stilson and Chatters 1981) considered them representative of more task specific quarrying and raw material reduction activities. Concerned with prehistoric use of the interior of the Olympic Mountains, Schalk (1988) has suggested an Old Cordilleran forager land-use system characterized by high mobility and a dependence on ungulates. He also hypothesized early (10,000-6,000 BP) and late (6,000-3,000 BP) stages of the Old Cordilleran, the latter reflecting a lower carrying capacity due to increasing closure of the forest canopy typical of the late Holocene in western Washington.

For all of the interest generated in these early cultural manifestations, few Old Cordilleran-related assemblages have been found in geologic contexts that preserve datable materials or artifact associations; most of these sites are found near the surface in disturbed contexts. Presently, the oldest reported archeological remains in the Washington Cascades from this time period is from Chester Morse Lake, dated about 8,500 BP (Samuels 1993) and the next oldest is from Desolation Chert Quarry at Ross Lake, dated at 7,600 BP (Mierendorf 1993a). What seems to be clear, however, is the presence in the early and mid-Holocene of a generalized foraging adaptation practiced by many bands utilizing a great variety of coastal and interior environments, including the most rugged mountain ranges.

7.4.2 Archeological Studies in Montane Settings

Archaeologists first examined high-relief montane settings in the mid-1960s in national parks along the crest of the Cascade-Sierra cordillera. In Crater Lake National Park, only three pieces of chipped stone were found, although scattered projectile points and flaked lithics had been found sporadically on the surface for some years before (Davis 1964). The few time- diagnostic tools in this collection suggested early, middle, and late prehistoric use. In discussing the results, Davis (1964:31) suggested that little use was made of the Crater Lake area prehistorically because the environment produced only marginal quantities and varieties of food plants, which he thought represented the most important subsistence resource in the park and therefore the determining resource in the location of archeological sites. Davis considered lithic resources of some importance but found no evidence of their availability at Crater Lake.

Davis' interpretation may have been influenced partly by the results of archeological surveys further to the south in Lassen Volcanic National Park and Yosemite National Parks. There, abundant archeological evidence of plant processing and hunting at high elevations was found. It is likely that these data provided the basis for his conclusion that with increasing latitude, more "climatic limitations" are imposed "on high-altitude occupation in the Sierra-Cascade Mountain Province" (Davis 1964:31).

In 1963 and 1964 the National Park Service conducted ethnographic and archeological studies in Mt. Rainier National Park. One prehistoric site, Fryingpan Rockshelter, was identified in the survey (Daugherty 1965). From test excavations conducted at the site, D. Rice (1965) suggested that it was occupied in the last 1,000 or so years and that the projectile point styles were related to those of the Columbia Plateau. Although lacking additional archeological evidence, Daugherty offered a scheme of montane prehistory based largely on the climatic model being applied to widespread arid regions of the western United States. According to his scheme, from the early postglacial until about 8,000 years ago, the mountains had little economic significance for Northwest inhabitants. The heaviest use of montane settings was during the warm, dry, mid-postglacial interval between 4,500 and 8,000 years ago. Daugherty suggested that in eastern Washington during this time period "true deserts prevailed", causing some

human populations to move into the mountains as they followed an uphill shift in vegetation zones and, presumably, game animals (Daugherty 1965:4). After 4,500 years ago, the climate shifted to cooler and moister conditions, eventually developing a pattern of summer-season hunting and berry-picking during the last few thousand years.

After Daugherty's work at Mt. Rainier, D. Rice conducted a reconnaissance-level archeological survey of about 10,360 km^2 (4,000 mi^2) in the southern Cascades of Washington in order to determine the nature of archeological assemblages in the mountains and their relationships to sites in the river basins (Rice 1969:v). Thirty-two archeological sites were recorded, most in valleys or adjacent "foothills" and dating to about the last 2,000 years. No sites were found in the highest portions of the project area, along 1,219 to 1,829 m (4,000 to 6,000 ft) elevation ridge lines or along the crest of the range (Rice 1969:3). Rice noted that obscuring vegetation made site discovery on the west slope of the range more difficult than on the drier east side and that site discovery was limited to areas where vegetation had been cleared. Based on historic and ethnographic sources for the south-central Cascades, D. Rice (1964) noted that alpine resources played an important role in the annual subsistence round of native peoples. Included in this study are references to "basket trees", Indian trails, and obsidian and soapstone (talc) sources in the mountains.

After the first North Cascades surveys along Ross Lake, H. Rice (n.d.a. and n.d.b.) also noted the obscuring effects of vegetation, and thought it "impossible" to locate sites not having surface features. He concluded that it was unlikely that Native people had used this area to any extent due to the absence of anadromous fish in this segment of the Skagit River and because there were not many places where archeological sites logically would be expected. During a brief survey for the Washington State Department of Transportation along the Stehekin Valley road in the Lake Chelan National Recreation Area, evidence for prehistoric use of this remote interior valley consisting of reports of archeological sites and features encountered by local valley residents, was recorded (Rice n.d.c.). The first archeological sites recorded on the west side of the park complex were found in the Newhalem vicinity. Grabert (1975) recorded three distinct concentrations of prehistoric cultural materials in the vicinity of the proposed Newhalem Campground and recommended further investigation of these sites.

The results of the Rice (n.d.c.) and Grabert (1975) surveys were an important milestone in the prehistory of the northern Cascade Range. The reported sites constituted the first archeological evidence of Native American use of the interior of one of the steepest and most rugged mountain ranges in the lower forty-eight states. The first subalpine archeological site was recorded at Cascade Pass in 1977 as part of a reconnaissance survey and testing project conducted at selected locations in the park (Grabert and Pint 1978). The study provided the first evidence of prehistoric Native American use of subalpine terrain in the northern Cascade Range and it suggested a span of approximately eight millennia of Native American use of the North Cascades.

In the Pacific Northwest recognition of prehistoric human use and the archeological potential of interior montane settings has lagged behind other western mountain ranges. Early investigations in the 1940s and 1950s of high elevation archeological sites were carried out in the Rocky Mountains (Ives 1941 and 1942, cited in Husted [1974]; Wendorf and Miller 1959) and the Sierras (Bennyhoff 1956 and Treganza 1963, cited in Davis [1964]) and had demonstrated prehistoric Native American use of such areas. It was shown that some mountain ranges were rich in archeological sites spanning the last 12,000 or so years and that montane areas supported indigenous populations during some prehistoric time periods (Husted 1974). A recurring research interest has developed regarding the use of high mountain regions during different climatic intervals of the Holocene, especially during an inferred Altithermal abandonment of the Great Plains (Husted 1974; Benedict and Olson 1978). Based on their work along the Colorado Front Range and subsequent regional comparisons, Benedict and Olson postulated widespread human population fluctuations throughout the arid west during the severest Altithermal droughts, which occurred about 6,750 and 5,700 radiocarbon years ago (Benedict and Olson 1978:176). They postulated that the Cascade Range during these droughts served as a refuge for eastern Washington populations that migrated to the moister (west) slopes of the range (Benedict and Olson 1978:150-153).

By the late 1970s, the overall intensity and scope of archeological investigations in the Cascades had increased noticeably, compared to the previous decade. The impetus for this work was provided by new laws and regulations guiding the management of federal lands and projects regulated or permitted by federal agencies; all of the mountainous interior is managed by the U.S. Forest Service and the National Park Service. The archeological surveys of Grabert (1975), Grabert and Pint (1978), and others provided impetus for further investigation.

In the 1980s there developed a more focused interest in upper montane and subalpine settings. This work proceeded by the preparation of explicit research designs and the implementation of problem-oriented archeological surveys. A first effort in this direction was made in the subalpine zone of Olympic National Park. As a result of a reconnaissance survey, 23 archeological sites were recorded, supporting the claim for widespread use of the interior of the Olympic Mountains by prehistoric populations (Bergland 1984). In addition, a radiocarbon date was obtained in association with lithic flaking debris and a bone fragment from a hearth site in the subalpine (Bergland 1984). The date of 4,990$\pm$60 BP constitutes the first radiocarbon age estimate of a prehistoric site or feature in a subalpine zone of the Pacific Northwest. Bergland's work was followed by preparation of a research design and reconnaissance surveys in the North Cascades that documented widespread use of subalpine zones (Mierendorf 1986 and 1987b).

Subsequent archeological surveys and excavations in the Cascade Range have documented even more widespread evidence of prehistoric activity in the high interior. The great majority of sites recorded are lithic scatters (Fulkerson 1988; Mierendorf 1986;

Vivian 1989; Zweifel and Reid 1991). Quarrying and procurement of lithic resources for the manufacture of tools appears to be widespread (Mierendorf 1987b and 1993a; McClure 1989; Mack 1989; Vivian 1989; Zweifel and Reid 1991). Lithic resources include vitrophyre (a variety of obsidian), chert, and metamorphic rock types. From an alpine setting in the southern Cascades of Washington, McClure (1989) has documented over 6,000 years of exploitation a locally-occurring variety of obsidian. Also in the southern Cascades of Washington, archeological features related to huckleberry processing have been recorded and test excavated (Mack 1989, 1992). Such features are often associated with bark-stripped trees (Mack 1992). The bark may have been used to make huckleberry baskets (Davis and Caulk 1992). Most recently, archeological excavations in the North Cascades National Park Service Complex have obtained the first well-dated archeological sequence from a high elevation site, demonstrating intensive and continuous use of alpine and subalpine resources for the last 4,500 radiocarbon years (Mierendorf and Skinner 1997). As such investigations continue, it is likely that evidence will be acquired to document the use of many more montane resources. This effort will substantially foster an increased understanding of Native American subsistence and settlement activities in the interior of the Cascade Range.

In concluding this brief overview, there are several general trends that can be identified to help place the archeological resources in the project area into a regional and even national context. First, it is now clear to most archeologists working in mountainous lands that there has been more extensive and intensive use of such areas by prehistoric people than, until now, had seemed likely based on the available data. Given the new evidence, and the fact that only a small proportion of the mountainous terrain has been investigated, it is likely that there exist thousands of as yet unidentified archeological sites representing many millennia of Native American use of the most rugged mountainous terrain in the continental USA. Secondly, there exists little understanding of, or appreciation for, the complexity of local environmental variability and subsistence resources that characterize the North Cascades and other mountain ranges. Instead, the mountains have been treated theoretically and methodologically as a simple monolithic entity, for the most part devoid of any meaningful internal variability, and peripheral to events taking place in the surrounding lowlands. As a result, traditional anthropological and archeological models have failed to advance our understanding where they have been applied to the study of people in mountainous landscapes. Finally, evidence and knowledge derived from study of human prehistory in the North Cascades contributes importantly to the investigation of the complexity of human foragers practicing a hunting-gathering-fishing economy. Rather than viewing all foraging societies as a single, undifferentiated lifestyle displaying little if any significant variation between groups, regardless of geographic or temporal separation, the notion of "complexity" recognizes a surprisingly wide range of adaptations and variations in the way that foraging groups organize themselves in local environmental settings. This approach recognizes and seeks to elucidate the human-environment interactions that differentiate the land-use patterns of foragers across the range of tropical, temperate, and arctic environments. In like manner, investigation of the land-use patterns of groups

adapted to the interior of rugged mountains, such as the North Cascades, has the potential to contribute significant new information to the understanding of the complexity of foraging societies.

7.5 A Chronological Sequence of Mountain Prehistory

In this section, a general chronology of North Cascades cultural evolution is presented. Reference is occasionally made to selected sites and localities beyond the Cascades that enhance the chronology. The chronology reflects trends in land use beginning with the earliest evidence for human occupation at the end of the Pleistocene and proceeding through the Holocene up to the historic period.

7.5.1 Late Pleistocene Adaptations (10,000-12,000 years ago)

Only a few sites exhibit evidence for human occupation of the Pacific Northwest during this time. Even so, the ability to document this presence sets an important baseline because it establishes the time scale over which prehistoric cultures evolved. Archeological sites dating to this time, on each side of the North Cascades, have produced tools associated with the bones of now-extinct large animals. The Manis Mastodon Site, located some distance west of the North Cascades on the Olympic Peninsula, has provided a series of radiocarbon age estimates dating to 12,000 year ago and derived from clearly defined late- and post-glacial geologic deposits (Gustafson et al. 1979). The artifacts consist of a handful of bone tools found in direct association with fractured mastodon and bison bones and some possible stone tools. However, the assertion of the site's excavators that the mastodon was killed by a bone-pointed spear and then butchered on the spot is questioned (Fladmark 1982:106). The site is not considered indisputable evidence of human activity at this early date.

The East Wenatchee Clovis Site, located at the eastern margin of the North Cascades, is in many ways opposite to the Manis Mastodon Site in the strength of its evidence. Here, a cache of the largest known Clovis points was found with bone tools in undisturbed deposits. Site sediments lacked clearly-defined geologic strata and datable organic remains (Mehringer and Foit 1990). The term "Clovis" refers to distinctive spear points and tools that were used by people who hunted now extinct mammoths and other mammals at the end of the Pleistocene. Across North America, it appears that this specialized adaptation was confined to a relatively brief span of time between about 10,800 and 11,500 years ago (Haynes 1982). Through the identification of volcanic glass fragments adhering to some of the Clovis points, the site was estimated to date to the approximate time of a well-known eruption of Glacier Pk. (a North Cascades volcano) about 11,200 years ago. More than a dozen large bone tools "foreshafts" recovered from the cache were manufactured from the bones of mammoth. Much of the site was excavated in 1990 (Gramly 1993) but the effort was poorly implemented and documented. An attempt to radiocarbon date one of the bone tools yielded a mid-Holocene age (Gramly 1993). This is incompatible with other dated Clovis assemblages

in North America. The extent of any remaining *in situ* artifacts and the site function remain uncertain.

The evidence from these two sites, along with the handful of isolated Clovis points found around the State of Washington (Meltzer and Dunnell 1987; Avey 1992) suggests early occupation of the Northwest landscape by nomadic people who subsisted by hunting large, late-Pleistocene herbivores. One isolated Clovis point, found near Lake Cle Elum (Hollenbeck and Carter 1986), is the most direct evidence suggesting that Clovis people used or traveled through the Cascade Range.

7.5.2 Early and Middle Holocene Adaptations (4,000-10,000 years ago)

The archeological assemblages of this time period are characterized by many regional and local names, such as "Windust," "Olcott," "Cascade," "Old Cordilleran," and Vantage, among others. They are believed to reflect cultures practicing a less specialized foraging economy based on utilization of a variety of plants and animals. Such groups did not rely on food storage or establish semipermanent settlements (Schalk and Cleveland 1983). Once thought to have originated in the late Pleistocene as early as 13,000 years ago (Butler 1961), present evidence supports a more recent date.

A number of early, well-documented sites located along the outer margins of the northern Cascade Range date from 8,000 to 9,000 years ago. The earliest of these, the Milliken Site, is located in the Fraser River canyon near South Yale, British Columbia. It is radiocarbon dated to 9,000 years ago (Borden 1975). Other sites radiocarbon dated to this period have been excavated along the Columbia River between the mouths of the Okanogan and Wenatchee Rivers (Mierendorf and Bobalik 1983; Galm and Masten 1985; and Chatters 1986). The artifact assemblages associated with all of these sites are relatively simple, consisting of stone tools of various sorts, cores, and leaf-shaped knife and spear points.

Only recently has evidence been acquired to suggest utilization of the interior of the North Cascades during this time period. From archeological surveys in the lower Similkameen River valley, Salo (1987) has reported sites estimated to be of early to middle Holocene age, based on comparison of distinctive artifact types from dated assemblages in eastern Washington. At Chester Morse Lake (located in the Cedar River drainage of the central Washington Cascades), a radiocarbon age of 8,540 BP was obtained on charcoal excavated from a buried, intact rock feature associated with lithic flaking debris (Samuels 1993). Preliminary results of the Ross Lake project (this report) revealed extensive utilization of the interior by prehistoric populations. Based on the frequency of time-sensitive artifacts, the North Cascades appears to have been used more intensively during the middle Holocene than at any time before or after (Mierendorf 1991a). Presently only the Desolation Chert Quarry (45WH224) provides more precise dating based on 13 radiocarbon age estimates. The site is a large chert quarry that appears to have been used more or less continuously for the last 7,600 years, with the

most intensive use occurring between 3,500 and 5,000 years ago (Mierendorf 1993a). Other quarries have been recorded in the valley, some of these at outcrops on steep mountain slopes. Based on these and other studies, the interior of the northern Cascades was extensively exploited by human populations during the middle Holocene.

7.5.3 Late Holocene Adaptations (200-4,000 years ago)

Between 3,500 and 4,000 years ago, changes in prehistoric adaptations began to occur in some regions of the Pacific Northwest (Schalk and Cleveland 1983; Kuijt 1989). Late Holocene populations aggregated at large, semipermanent or permanent villages. Earlier, small mobile bands had subsisted by moving small encampments frequently to different locations within a home territory. The new adaptation relied on small task groups to collect and bring food resources to the village. Food preservation and storage permitted the accumulation of surplus food for consumption through the winter. Increasingly, new and more efficient techniques were developed for the intensive exploitation of food plants, animals, and fishes. Populations exceeded earlier levels, resulting in more complex cultural and social institutions, such as hereditary-based social strata in the highest density population areas west of the mountains (Matson 1983). Egalitarian societies, lacking social strata, remained east of the Cascade Mountains into the historic period.

These changes are manifested in the archeological record through the appearance of constructed features and artifact types that were rare or nonexistent in sites from earlier time periods. Foremost among these are the remains of houses and storage features and a greatly increased variety of artifacts reflecting elaborate fishing and hunting technologies, wood working, and plant use. The remains of semisubterranean pit houses have been reported from the lowlands along the edges of the North Cascades, especially to the north and east. House remains are common in river valleys of the Okanogan (Grabert 1968), Methow (Swanson 1959), Columbia (Nelson 1973), and Fraser and Thompson (Sanger 1970; Stryd 1973, Richards and Rousseau 1987). Few have been reported in the mountainous interior of Washington, these being near the outlet of Lake Wenatchee (Taylor 1974; Kennedy and Blukis Onat 1988). To the west, prehistoric house remains of any type are rare. Two somewhat anomalous pit houses have been reported, one from the lower Fraser River valley (LeClair 1976) and one near Bellingham Bay (Grabert 1983). Typical of Native groups living west of the mountains was the above-ground plank house. The remnants of some of these have been investigated by archeologists working along Puget Sound (Snyder 1956; Chatters 1981).

More common than the large villages and communities of this period are the many satellite camps and resource use areas that were temporarily occupied for specialized subsistence and ceremonial pursuits. Common examples of such sites include fishing camps along rivers; marine and freshwater mussel shell middens along coasts, sounds, and rivers; hunting camps containing cooking hearths and scatters of butchered animal bones; hunting blinds; earth ovens consisting of abundant charcoal and burned

rocks left after the cooking of roots and the drying of berries; rock quarrying and gathering locations; pictographs and petroglyphs; and vision quest sites. Most archeological sites found in the interior of the Cascades reflect these more specialized activities, especially in high-elevation, remote areas.

The final chapter in the story of the prehistory of the North Cascades began little more than a hundred years before Euroamericans arrived in the Pacific Northwest. Even before their first direct encounters with non-natives, the ancient traditions of Native American people were severely and irreversibly disrupted by diseases introduced on this continent from Europe (Dobyns 1983; Campbell 1989). With no natural immunity to diseases such as smallpox and measles, most Native American populations were entirely or largely decimated. Also about this time, another European import triggered rapid changes in some Native American lifestyles. Along the east slopes of the Cascade Range and the expansive grasslands beyond, horses spread rapidly after their introduction from the American Southwest. Some Native American groups, especially those living in extensive grasslands, developed an economic dependency on the horse and became the nomadic equestrian foragers (Schalk and Cleveland 1983) that are most often depicted in movies.

The prehistoric period ends with the written accounts of the earliest non-Indian explorers to enter the North Cascades. These include Simon Fraser who traveled down the river in 1888 that today bears his name. Alexander Ross, in 1814, experienced difficulties in crossing the crest of the North Cascades. Though his exact route is uncertain and is debated, he probably crossed through Cascade Pass. Although these and other subsequent accounts of the early historic period contain vivid details about selected aspects of Native American people and their traditional habits, they reflect a way of life that already had been disrupted by diseases and confrontations with invading populations of foreigners.

7.6 Historic Overview

This section emphasizes historic themes of significance in development and use of lands in the project area. These themes were first developed in a historic resource study prepared for the park complex in 1986 (Luxenberg 1986). Themes relevant to the project area include: exploration, early settlement, commercial development, and United States Forest Service management. Themes are discussed in a park-wide context and referenced to specific localities within the project area. Cultural resources and historic sites found in the project area are noted throughout; resources which are still extant or have the potential to be intact beneath the waters of the reservoir are also discussed.

7.6.1 Exploration

Fur traders were among the first to enter the area in the early Nineteenth Century. Fur trapping in the project area probably began after the establishment by the Hudson's

Bay Company of Ft. Langley on the lower Fraser River. Beginning in the 1850s, the United States government assigned military personnel to conduct general reconnaissances through the mountains. Between 1857 and 1860 the first survey was conducted of the international boundary between Canada and the United States. Several decades later, in the 1880s, government expeditions and private surveyors continued to explore what was still an unfamiliar region. Nearly all of these expeditions had a similar goal--to improve transportation and communication networks in an expanding territory. Each party sought to find the most feasible route through the North Cascades. Of the known (documented) historic surveys and exploration efforts in and around the vicinity of the North Cascades, only two parties physically entered the project area, one in the mid-19th century and the other in 1895. The former was a team of surveyors sent in 1857 to map and delineate a boundary between the U.S. and Great Britain (now Canada). Members of the survey team followed the channel of the upper Skagit River from the international boundary to ten miles to the north and south of it. When the work was completed a boundary had been marked with rock cairns. The boundary was resurveyed twice (once in 1901 and again in 1908), and a swath of forest was cut and the original rock cairns were replaced.

In 1895 a survey team appointed by the Washington Board of State Road Commissioners (WBSRC) set out to explore four different potential road routes through the North Cascades. One of these routes took the party up the Skagit River as far as present day Diablo. From there the party traversed around Sourdough Mtn., returning to the Skagit River at its confluence with Ruby Cr., within the current project area.

Because these explorations and surveys were transitory in nature, no permanent structures are believed to have been built. The monuments remaining from the survey of the international boundary are outside of the project area.

7.6.2 Settlement

A combination of natural and cultural factors hindered widespread settlement in the North Cascades. Difficulties of access and the limited amount of suitable agricultural land were the primary deterrents. The lack of surveyed land and the creation of the Washington Forest Reserve in 1897 also discouraged settlers from moving into the remote region. Despite these difficulties, a handful of individuals established homesteads in the North Cascades, primarily along the park's three major river corridors: the Cascade, Stehekin, and Skagit Rivers. Much of the settlement was spurred by mining. The greatest settlement activity occurred along the Skagit River where individuals claimed legally and as squatters along both banks.

In the upper Skagit River region, most of the settlement was centered around Marblemount. Upriver from there, homesteads were more sporadic as the topography became increasingly rugged. In the vicinity of the project area, only two individuals established homesteads: John McMillan and Tommy Rowland. Both were squatters who settled in the 1880s and 1890s respectively and were actively involved in mining,

trapping, and horsepacking for other miners. They were self-sufficient for the most part, raising vegetables and keeping animal stock on their land. McMillan chose a site west of the Skagit, a mile or two from the river's edge along Big Beaver Cr., within the project area. Rowland had two homesteads on the east side of the Skagit. The lower place was located near the bank of the river where he had a small cabin and outbuilding and some cleared land for growing hay. The upper homestead was sited on a knoll above the river. There, Rowland built a log cabin, barn and root cellar. The level of the reservoir never dropped low enough between 1988 and 1990 to expose the flat on which this lower homestead was sited. While it is unlikely that any above-ground structures of this site exist beneath the reservoir, the potential exists for other kinds of historic remains. Remains of the upper homestead are located above the reservoir.

7.6.3 Commercial Development

The North Cascades have been used for decades for commercial purposes including trapping, logging, agriculture, mining, and hydroelectric production. Many of these operations were successful for a time. Most suffered from the unpredictable mountain weather, a lack of easy access, and distance from major supply centers. Trapping was the earliest use, undertaken by settlers and other individuals well into the 20th century. Agricultural use--the growing of crops and ranching--was also done by settlers. Both McMillan and Rowland grazed animals and raised vegetables and hay, often selling their surplus to other settlers and miners.

Perhaps the uses that most altered the physical character of the land in the project area were mining, logging and the building of a dam for hydroelectric power production. The only mining activity known to have occurred in the project area was along Ruby Cr., now submerged beneath the waters of Ruby Arm. The first party of prospectors arrived in 1872. Later, in 1878 and 1879, rumors persisted that gold was present in Ruby Cr. and there was a short-lived "rush." Although it was brief, upwards of 600 claims were located in the Ruby Cr. Mining District. A second rush was underway in the 1890s when gold was found on a creek to the east of Ruby Cr. The Ruby Cr. District became the Slate Cr. Mining District, but miners continued to locate claims along Ruby. A small hydroelectric plant was built near the mouth of the creek by a company attempting to develop the placer potential of the drainage. A sawmill, flume, cookhouse, bunkhouse, office, tool, and blacksmith shop were built to service the mining operation which lasted until 1906. After the mining company left, the site was used as a roadhouse known as the Ruby Inn. For a number of years, settler John McMillan ran this hostelry for miners and other backcountry travelers. Seattle City Light (SCL) purchased the inn in 1929, eventually removing the buildings before reservoir impoundment. This site is not exposed in reservoir drawdowns, but it is possible that tangible evidence of this development remains submerged.

Timber was recognized as a valuable resource in the North Cascades, but one that was difficult to exploit due to the ruggedness of the terrain. The largest amount of

timber removed from today's park complex was from the project area prior to impoundment behind Ross Dam (formerly Ruby Dam). This dam was the third and final installation of SCL's "Skagit Project," a hydroelectric development of enormous undertaking which began in 1919 with the building of Gorge Dam. The rugged terrain made it a difficult project to complete. The dam site had little room for buildings or equipment; a compressor house was perched on a rock island in the gorge and a concrete plant was hung on the side of a mountain along with other small structures. Haul roads were carved into the steep slopes and shored up by rock and timber cribbing or carried on trestles. A suspension bridge provided access from one side of the gorge to the other.

Removal of the estimated 340 million board feet of timber was hindered by the lack of access. Since Gorge and Diablo Dams blocked access at the south the only feasible way to remove the timber was north, through Canada. Floating camps were built in 1937 on Diablo Lake and transported up to the dam site. The plan was to cut the timber and wait until the reservoir level rose high enough to float the logs. The logs were be boomed together, hauled onto specially made trucks 18 m (60 ft) long and 5 m (16 ft) wide, and hauled north to Hope, British Columbia. There, the logs were dumped into the Fraser River, boomed together and floated downriver to the coast, and thence to Anacortes, where they were processed into lumber. A floating camp facilitated the logging operation by allowing the workers to move easily as the reservoir level changed. The clearing was begun in 1936 and completed in 1954. It was undertaken by two contractors who eventually joined forces to become the Decco-Walton Company.

For over three decades Ross Dam has impounded a reservoir (Ross Lake) in the upper Skagit River Valley. The size of the reservoir has varied over time from 770 ha (1902 acres) in 1939 to the current 4536 ha (11,200 acres) at full pool. 4379 ha (10,816 acres) is in the United States, the remainder is in Canada. The partial remains of historic structures and artifacts associated with the building of Ross Dam or the logging of the basin exist in the project area, but they are disturbed and lack integrity.

7.6.4 United States Government Management

The federal government has had jurisdiction over the North Cascades region since the national forest reserves were created in 1897. In 1905, the United States Forest Service (USFS) was established to manage those lands that were designated as national forests. The area comprising today's park complex was within the Mount Baker National Forest until 1968 when NPS assumed management responsibility.

The USFS had the greatest influence in altering the North Cascades' landscape, both directly and indirectly. The Forest Service's mission to satisfy a variety of interests such as timber, mining, and recreation was reflected in the construction of numerous roads, shelters, trails, lookouts, ranger or guard stations, bridges and campgrounds. Special-use permits issued by the USFS resulted in construction of dams, reservoirs, and mines, structures that are prominent features of the present landscape.

Historically, the project area had several guard stations, shelters, lookouts, and a limited number of trails. There were ranger stations at Ruby Cr. and at Boundary Bay. Ruby Cr. ranger station was a 5.2 ha (12.8 acres) site at the confluence of Ruby and the Skagit River. Completed by 1913, the station had a one-room log cabin and 1 ha (2.5 acres) of cleared pasture land. It was used primarily as a packer's headquarters. When rising reservoir waters threatened this station, the USFS dismantled and removed all improvements. The Boundary ranger station was located 13 km (8 mi) south of the international boundary and 4.8 km (3 mi) north of Lightning Cr., on the east side of the Skagit River. The site was selected in 1910 and construction of a 4.3 m x 4.9 m log house (14 ft x 16 ft), a 4.3 m x 6.1 m tool house (14 ft x 20 ft), and a three-stall barn began the same year. The USFS also fenced-in a 1.2 hectare (3 acre) clearing at the site. All improvements were removed from the area prior to its flooding.

The North Cascades National Park Service Complex was created by an act of Congress in 1968 (Public Law 90-544). Immediately following this action, NPS assumed management responsibility for the new park unit, which includes the lands under and surrounding Ross Lake. All of the Skagit Hydroelectric Project is within the Ross Lake National Recreation Area. With the passage of the Washington Wilderness Act of 1988, 63% of Ross Lake NRA was designated as within the Stephen Mather Wilderness. Although surrounded by it, the project area is outside of the wilderness boundaries. Throughout these administrative changes the City of Seattle has continued to operate the three reservoirs of the Skagit Project as licensed by the Federal Energy Regulatory Commission.

8. RESEARCH PLAN AND METHODOLOGY

8.1 Problem Statement For Archeological Investigations in The Upper Skagit River Valley

The investigations described in this report comprise the first two phases of a long-range plan to manage archeological resources in a reservoir. Information acquired by these early studies provides the basis for later phases of management, which include excavation and preservation of some sites. The sites and the methods used to examine them are strongly influenced by the reservoir. The methods and techniques used to test the sites reflect reservoir operations as these control the artifact visibility and site condition. This section describes the research context, the survey and testing methodologies, and field implementation of the project.

The overall research context of the studies is directed at understanding prehistoric hunting-gathering-fishing economies in a mountainous landscape. The northern Cascade Range and other similar mountainous regions of Washington are some of the few remaining frontiers of prehistoric archeology in the state. The few ethnohistoric and ethnographic accounts of Native American activity in the North Cascades are sketchy at best, and though use of the interior is generally implied and occasionally referenced, most of the area is archeologically unknown. Following historic contact and during Euroamerican exploration of the land, for reasons that are not clearly understood, Native American bands had no strong presence in the North Cascades. This fact has, in part, contributed to claims by some archaeologists, ethnographers, and historians that Native peoples avoided the mountains for all of the prehistoric past. As the statements below demonstrate, these claims deny that the mountainous interior has any significant role in understanding Northwest Native cultures. To the extent that they are in error, they deny a part of the ancestral traditions of Native Americans and the significance of mountainous landscapes in understanding Northwest Indian prehistory.

> The zones of the higher mountain areas of the Olympics and Cascades have minimum potential for archeological sites, but these areas may yield important finds on occasion. (H. Rice 1975:55).

> The scarcity of archeological findings high in the mountains makes it evident the Indians of Eastern and Central Washington were lowland dwellers who shunned the highlands. (Relander 1965:21).

> Given the nature of the rough terrain and dense vegitation [sic] in this portion of the forest it is not at all surprising that these areas probably saw little aboriginal habitation. (Jermann and Mason 1976:125).

> It should be noted that Indians had little practical reason to spend much time in the far reaches of the Cascades, unless such areas were accessible by waterways. The plentiful game in lowland and foothill forests, and fish in rivers and salt water made the non-mountainous areas more attractive... (Beckey 1977:342).

These statements exemplify how the archeological potential of the interior of the mountains is disregarded. In considering these claims, however, it is acknowledged that, until recently, little archeological evidence existed to suggest otherwise. As a result, archeologists have sought to develop regional subsistence and settlement models, and to view cultural developments in general, using data from only that portion of the landscape where it was presumed Indian people spent their time (i.e., along the courses of the largest inland rivers and along the marine coasts and sounds). Yet such areas comprise only a part of the entire ancestral home ranges of Native Americans. Montane portions of the landscape have remained undifferentiated in settlement and subsistence models and has been ambiguously lumped through ubiquitous use of the term "upland". This term is never explicitly defined or mapped in terms of the region's subsistence and settlement models, but through conventional usage it has become a catchall. The label "upland" is attached to any land area, regardless of elevation, vegetation type, slope, or human subsistence potential, so long as it is higher in elevation (and apparently, less interesting) than adjacent lowlands. The difficulties inherent in such usage of "upland" is apparent when one considers that lands in the state so designated by archeologists include high ground in riparian valleys, semi-arid shrub-steppe below the region's low timberline, mountain foothills, subalpine meadows, and the alpine tundra above upper timberline. These are all exceedingly different environments to the foraging cultures of the past, and indeed, to present-day land uses.

The research perspective of this study conforms in its main points to the one developed in the park's overview and research design (Mierendorf 1986). The research is directed at changes in the land-use strategies utilized by inhabitants of the project area during the span of human use. As used here, land use refers to the cultural patterns established by human groups for the utilization of resources within a geographically defined landscape or ecosystem. There exists great variety in current ideas of land-use evolution during the span of human occupation of the Pacific Northwest. However, there is general agreement for a shift from less complex, broad-spectrum foraging in the early Holocene to more complex, semisedentary foraging by the late Holocene. This model employs the collector-forager dichotomy (more realistically seen as a continuum) proposed by Binford (1980) as a means of understanding changes in hunter-gatherer settlement systems. The disparities between specific models of land-use change pertain to the timing, causes, and empirical recognition of more complex and intensive land-use systems. The onset of greater complexity in forager land use in the Pacific Northwest occurred sometime between 5,000 and 3,000 years ago. The contribution of human populations versus environmental changes in influencing or triggering shifts to more complex land uses is debated. The use of storage technologies to amass a surplus of

food reserves and the use of semipermanent or permanent dwellings are considered key indicators of such a shift. The following references, and others cited therein, discuss these issues in detail (Ames and Marshall 1981, Matson 1983, Schalk and Cleveland 1983, Salo 1985, Price and Brown 1985, Schalk 1988, Chatters 1989, Thoms 1989).

The kinds of information that can be used to address the use of mountains by prehistoric human foragers are embodied in archeological remains within the project area. Several general classes of archeological remains that were expected to be present have been identified in the park overview. These include trails, fire-modified rock features, rock structures, lithic scatters, quarry sites, rock art, caves and rockshelters, burials, storage pits, datable organic materials, associated faunal and floral remains, and culturally-modified trees (Mierendorf 1986:106-114). A much larger number of more specific data categories or requirements are recognized and were routinely recorded during implementation of both fieldwork and the data analysis. The range of data categories, both realized and potential, addressed in this report can be found in the remainder of this section, and in sections 12 and 13.

8.2 Survey Methodology

The survey portion of the project stratifies and differentiates the project area into landform units and geographic areas, and looks for temporal patterns in site distributions and artifact assemblages. Landform units are broadly enough defined that they are applicable to other montane settings in the region. The testing phase describes the overall nature of the cultural materials in the project area, including age, content, condition, and degree of preservation, and the potential to contribute new information to the prehistory of the Cascade Range interior. The data acquired from testing will subsequently used to develop plans to manage and conserve the information embodied in those sites that are determined eligible to the National Register of Historic Places.

8.2.1 Problems and Questions Addressed by the Survey

Field survey was the first step in the documentation of sites. The inventory of sites provided baseline information that will be used in subsequent planning and management. Baseline information documented from the sites addressed the following questions (the location in the report where this information can be accessed is noted in parentheses):

1. What is the nature and distribution of archeological sites in the drawdown and the forest zones? This includes site locations by landform type, by side of the valley, by elevation, and other environmental associations (section 9).

2. What is the range of site types present in the project area? This includes descriptive and functional types (sections 9-12).

3. What are the types of artifacts and cultural materials present in sites? This includes the kinds of plant, animal, and mineral remains at each site, and features such as living floors or artifact concentrations that are present (sections 10-12).

4. What are the time periods of prehistoric and historic use of the site? (sections 9-12).

5. What is the comparative visibility of cultural resources between the drawdown and the forest? (section 9).

6. What is the potential significance (according to the National Register criteria) of the inventoried cultural resources? (sections 10, 11, and 13).

7. What is the physical condition of and what factors or processes have affected the site condition? (sections 10-11).

8.2.2 Survey Objectives

The survey methods were designed to locate prehistoric and historic archeological resources in two different settings. The first consisted of a landscape barren of vegetation and offering a high to low probability of site discovery. The second tract consisted of a closed-canopy forest surrounding the first tract and offering a low probability of site discovery. The survey was designed to achieve these goals:

1. to conduct an intensive-level survey in the drawdown zone of Ross Lake (implemented in spring of 1988 and 1989) and a reconnaissance-level survey of the forested tract above it (implemented summer of 1990),

2. to map, photograph, and describe the archeological resources found with sufficient descriptive detail to complete a Washington State Site Inventory form for assignment of a Smithsonian trinomial number to each site,

3. to determine site integrity, condition, and to identify agents of site disturbance,

4. and to make preliminary assessments of eligibility to the National Register of Historic Places, to the extent possible based on survey data, by identifying sites requiring test excavations for thorough eligibility assessment.

8.2.3 Survey Strategies and Techniques

Different search strategies were employed in the two tracts. The drawdown survey was designed to be intensive, systematic, and to cover all of the tract. Crew members examined the tract by walking more or less parallel transects. The distance between surveyors was ca. 20 m (66 ft), and each surveyor walked a more or less

sinuous route within each transect. On large survey parcels, a crew consisted of three or four archaeologists. On small survey parcels, a two-person crew was sufficient. No ground clearing was done in order to increase artifact visibility.

This strategy worked well on flat or gently-sloping landforms, which comprise over 85% of the project area (Figure 8.1). However, some deviations from the systematic survey pattern were required. This occurred where walking was precarious and unsafe: on steeply sloping bedrock outcrops, talus, and steep valley walls having vertical to steeply dipping bedrock strata or loose, eroded rocky debris. Such areas were examined from a boat next to the shore; wherever such areas were interrupted by safe slopes, the boat landed and on-foot survey was completed. Another deviation occurred in the northern-most flood plain portion of the drawdown where more than a meter of reservoir-deposited mud obscured nearly all of the original (pre-reservoir) ground surface. Through trial and error, a survey strategy was devised wherein surveyors sought out those places, however small, where the underlying flood plain soils were exposed. Such places were restricted to the base of large tree stumps where breaking waves washed away the mud cap and to the tops and edges of terraces elevated slightly above adjacent flood plain segments. Within the northern portion of the drawdown tract, such exposures were separated by large expanses of obscuring mud flats.

The survey in the forested tract was nonintensive and nonsystematic. Although all parts of the tract were accessed by the survey crew, the intensity of examination was low. Mostly, the orientation of survey transects was controlled by natural features of the terrain, especially frequent large-diameter blown-down trees and extremely steep, exposed slopes, including numerous cliff faces. For these reasons, most survey transects followed the easiest line of passage for a pedestrian and thus, selected for low-gradient landforms. At locations selected on a judgmental basis, small patches of forest duff were cleared away with trowels to provide exposure of mineral soil and increased artifact visibility. In some portions of this tract, human-caused disturbances provided greater surface visibility than could practically be exposed by trowel clearing, particularly in devegetated campgrounds and trail treads (Figure 8.2).

A technique employed in both survey tracts was the use of the presence of the soil B-horizon as an indicator of high site potential. The technique was suggested by recognition of a correlation between buried chipped stone archeological assemblages and soil B-horizons as observed in archeological excavations scattered widely across coniferous forests of the Pacific Northwest. "Soil B-horizon" refers to a weathering zone that forms under natural conditions in the upper subsoil. Such horizons are recognized by a few pedological properties, the most obvious being a distinctly "reddish" color as compared with soil horizons above and below. This is due largely to the accumulation of oxides of iron and other metals (Soil Conservation Service 1975). In the drawdown tract, large expanses of some landforms were covered by remnant parts of B-horizons, which outcrop at the surface because of wave-generated erosion. In the forested tract, trowels were used to clear away duff and relatively recent layers of volcanic ash in order

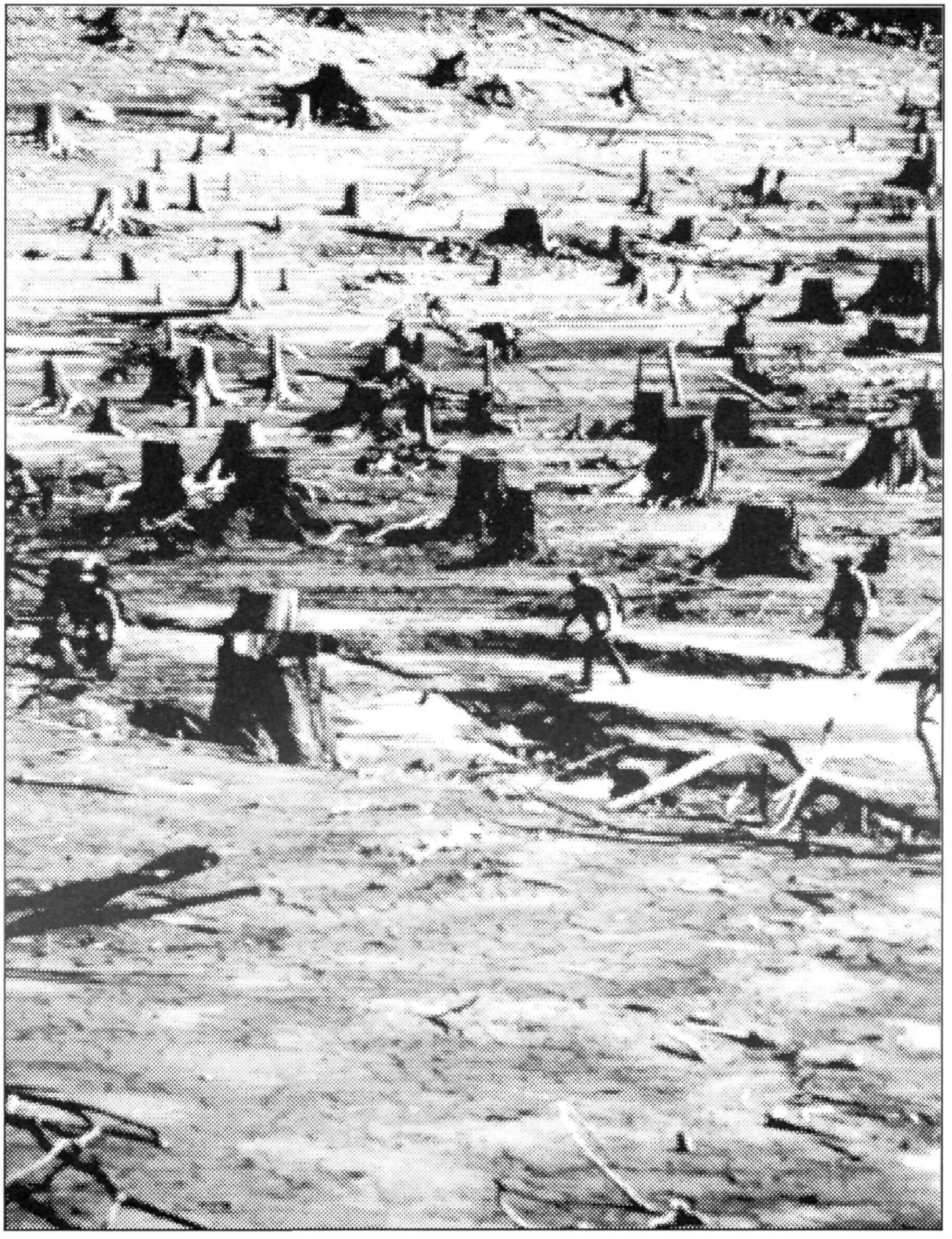


Figure 8.1 Photograph of the drawdown survey tract in the vicinity of sites 45WH250, -252, -254, and -256.

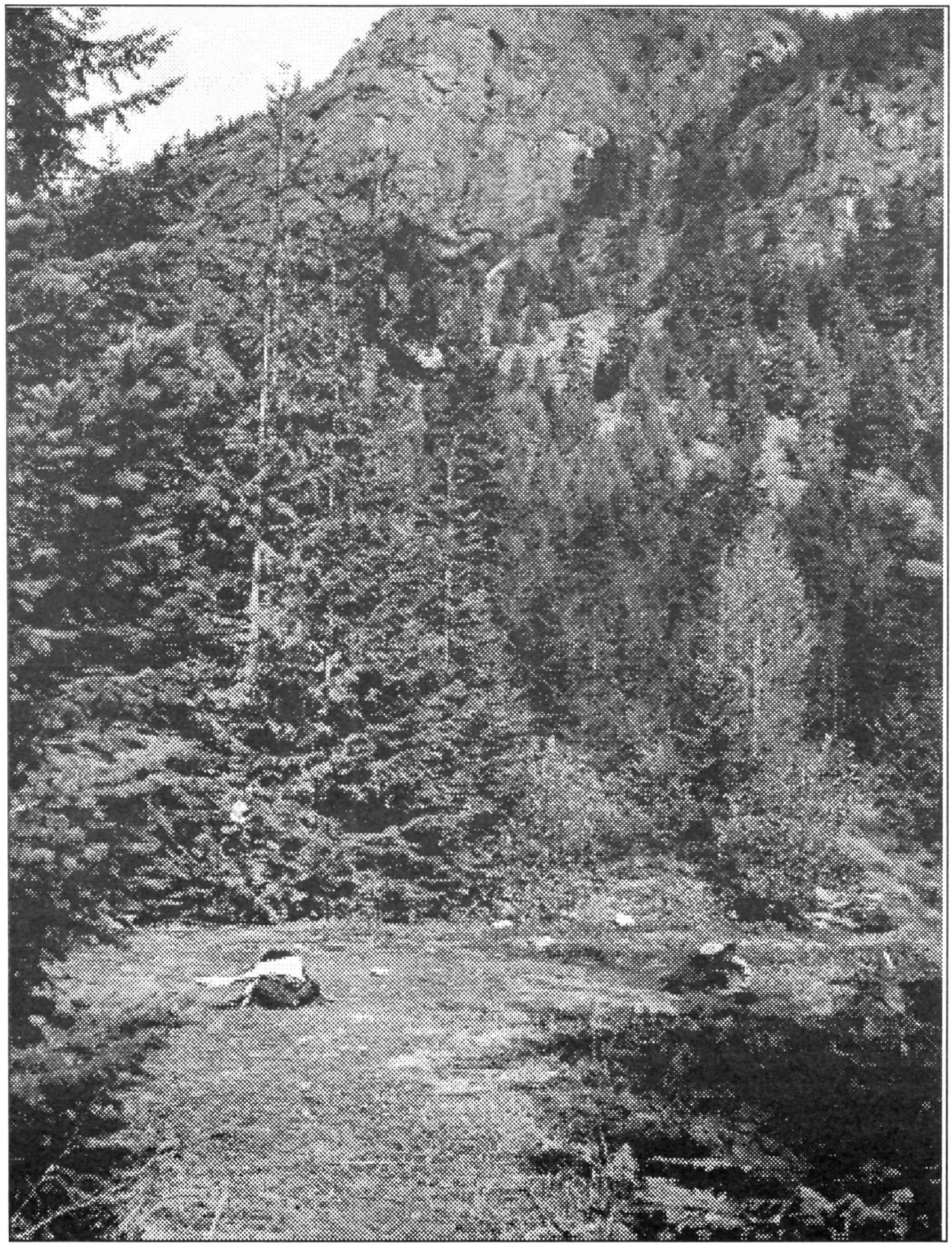


Figure 8.2 Photograph of the forested survey tract during recording of site 45WH472, Big Beaver Valley; view to the west.

to expose this soil horizon. In both survey tracts, the recognition and examination of the soil B-horizon by crew members aided in the discovery of numerous sites.

8.2.3.1 Recording Procedures

Cultural resources, whether prehistoric or historic, are all objects made or modified by people or placed by human activity. Cultural resources are physical manifestations of societies and cultures, regardless of ethnicity or time period. Specific examples of cultural resources commonly observed include stone tools or historic pieces of bottle glass, prehistoric cooking hearths, roads, prehistorically quarried rock outcrops, spring-board notches chopped with metal axes into the base of large trees, and charcoal and bone-rich layers marking the living floor at an ancient campsite.

Surveys require a means to systematically record the observed cultural resources. In our survey records, all cultural resources were considered either isolated finds or sites. Isolated finds were single occurrences of one artifact or one feature having no other evidence of associated cultural activity. Sites were defined by the presence of more than one artifact or feature (in any combination) on the same landform, in relatively close proximity to one another (within ca. 50 m), and confined predominately to the same landform. A separate form was used to record each of these cultural resource categories.

As each site was identified, it was assigned a North Cascades National Park field site number and it was recorded on a Site Inventory Form (SIF). Recording on SIFs adhered to these procedures. First, an intensive, close-interval (a few meters apart) survey was conducted by crew members. Each artifact was marked with a wire-stemmed flag (Figure 8.3) to retain visibility. Once flagged, crew members made a planview sketch map of artifact and feature distributions, and distinctive landscape attributes. An inventory was made of all artifacts and features observed, and other data required by the form. Information from the SIF's was later transferred to Washington Archeological Inventory Forms, which were then submitted to the State Office of Archaeology and Historic Preservation. The state office then assigned a Smithsonian trinomial number to the site, which was added to the site form and recorded on all catalog records and site documents.

Isolated finds (IFs) were assigned an IF number, described, photographed if necessary, and plotted by location on the survey parcel maps.

Map location and photographs were necessary components of site documentation. Sites were plotted on a variety of field maps at various scales, including 1:100,000, 1:24,000, 1:6000, and 1:1000. All site locations are plotted on black-and-white vertical aerial photographs. Nearly all sites were photographed with black-and-white prints, color transparencies, or both.

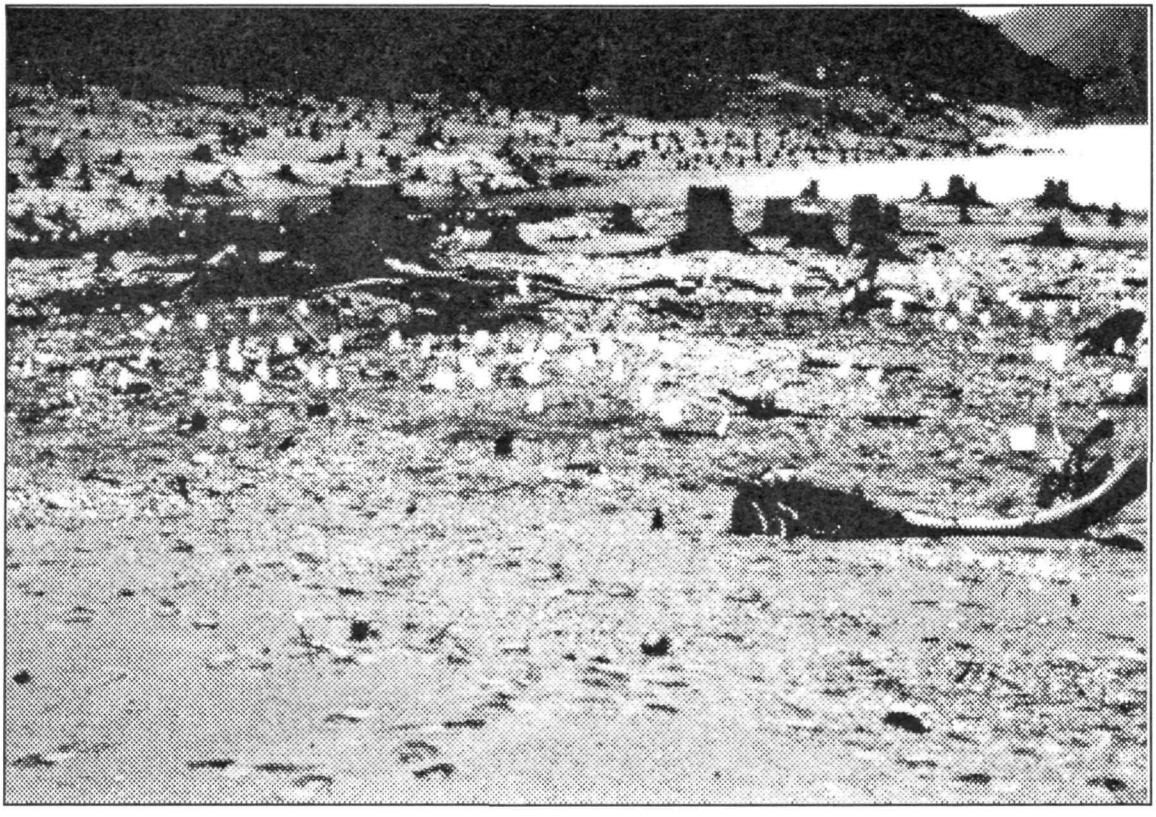


Figure 8.3 Photograph of drawdown tract during recording of Site 45WH247. Flags mark artifact locations.

As part of the survey design, artifacts considered diagnostic of time periods or cultural types were collected and their locations mapped. Of over eight thousand prehistoric artifacts observed and recorded during the survey, 259 were collected. These have been labeled and cataloged according to the NPS Automated National Catalog System and are stored in metal cabinets in the North Cascades National Park Service Complex Ranger Station's curation facility in Marblemount, Washington.

The proportion of various lithic material types found in archeological sites is an important data category within the project area. All stone artifacts itemized in the field on site inventory forms (SIFs) were categorized by raw material classes. The 10 lithic material types are listed next in Table 8.6.

Table 8.6 Local Lithic Raw Material Types Occurring in the Survey Area and Surrounding Mountains

Raw Material Name	Appearance	Rock Group	Source Locations and Abundance
Metasediment (Argillite) (Mudstone) (Siltstone) (Phyllite) (Greenstone)	Opaque, light gray to dark gray to black to greenish black	Ross Lake Group of Cairnes (1944), Hozomeen Group (Staatz et al., 1972)	Bedrock outcrops, river gravels, glacial deposits, alluvial fans; very abundant
Hozomeen Chert (Hozomeen White) (L. Beaver Gray) (L. Beaver Green)	Opaque to translucent, mottled lt. gray to black to blue with white quartz veins	Hozomeen Group of Cairnes (1944), Mierendorf (1993a)	Same location as above; abundant (except for green and gray subtypes)
Hozomeen Jasper	Opaque, reddish brown with white quartz veins	Hozomeen Group of Cairnes (1944), Mierendorf (1993a)	Bedrock outcrops, river gravels, glacial deposits, and alluvial fans at north end of survey area; rare
Hozomeen Chalcedony	Translucent, med. gray, waxy with quartz veins	Hozomeen Group of Cairnes (1944), Mierendorf 1993A)	Same as above; rare
Obsidian (Vitrophyre)	Translucent to opaque, light gray to black to green to metallic silver; abundant macroscopic phenocrysts	Skagit or Hannegan Volcanics (Mierendorf 1987b)	Bedrock outcrops and talus in alpine and subalpine west of the survey area; rare
Slate	Medium to dark gray, platy	Hozomeen Group of Cairnes (1944)	Same as above; abundant in survey area
Granodiorite	White groundmass with macroscopic black and gray crystals	Chilliwack Batholith (Misch 1966)	Same as above; abundant

Andesite	Gray groundmass with white and black phenocrysts	Skagit Volcanics (McTaggart and Thompson 1967)	At mouth of Silver Creek in glacial and fluvial deposits
Soapstone	Opaque to translucent, mottled dark to light green to yellow green, fibrous	Cascade River Schist Little Jack Terrane (Tabor et al. 1989)	Northwestern and Central Washington, British Columbia, middle Skagit River Valley
Quartz Crystal	Clear to milky white, euhedral crystal fragments	Various scattered locations	Ubiquitous in Bedrock formations throughout mountainous regions including North Cascades National Park Service Complex

Sorting of artifacts by lithic material was accomplished by visual examination of cleaned surfaces, under low magnification if necessary. For artifacts described in the field, sorting was accomplished by field crew members trained in the recognition of the raw material types. For artifacts studied in the laboratory, specimens were compared with rock samples collected from throughout the park and region and maintained for reference purposes by NPS archeologists. They were also compared with samples analyzed by petrography and major and minor element composition. Initially, lithic material classes in the project were recognized in earlier studies (Grabert and Chesmore 1979; Grabert and Pint 1978; Mierendorf and Bobalik 1983; Mierendorf 1986, 1987b, and 1991; Vivian 1989). The number of lithic material types recorded on SIFs increased as new types were identified in site assemblages.

Artifact classes described in this report are defined in Appendix A. Artifact classes are defined according to morphological, functional, and technological criteria. Some classes incorporate more than one criterion in the definition. Also, some classes are defined only by the range of morphological or technological characteristics represented in the project sample. However, most of the class definitions adhere to conventional usages employed in technical descriptions of archeological assemblages from the larger region.

8.2.3.2 Ross Lake Elevations

The area covered by the drawdown tract survey consists of all lands between 455 and 488 m (1,492.5-1,602.5 ft) above sea level (the maximum possible drawdown is 122.5 ft, to an elevation of 1,480 ft asl). Figure 8.4 shows the schedule of reservoir surface elevations for the 1988 and 1989 field seasons. Daily and weekly reservoir level

changes often became the controlling factor in the selection of survey parcels, with land lowest in the reservoir receiving the highest survey priority due to its infrequent and short duration of exposure. Land higher in the reservoir received a lower priority due to its longer period of exposure.

8.2.4 Landform Mapping of the Project Area

A component of the survey design was to examine the relationship between landforms and archeological site locations. This relationship is complex, and is influenced by climatic, biotic, and geologic processes that have been ongoing during the span of human use of the project area. All land surfaces and landforms are not of the same age; some were built by geologic processes and events before 10,000 years ago, and others were built in the last few hundred. Landforms of different age and origin may correlate with archeological sites in different functional and chronological classes. Landform mapping enables comparison between site types and landform categories.

At the inception of this project, the glacial and post-glacial history of landforms in the upper Skagit basin had not been studied. To acquire landform data, the project was designed to include a reconnaissance-level geomorphic survey of both survey tracts. Basic questions addressed in the survey design were:

1. What are the types and mapped distributions of landforms in the project area?

2. What are their ages and origins and what can be inferred about the glacial history of the project area?

3. Are there time-stratigraphic markers that can be used to date landforms and archeological sites?

4. What are the morphological and sedimentological characteristics of landform types?

5. What is the site density by landform type?

Landforms were identified on the basis of morphology, surficial geology, and topographic relationships to other landforms. These attributes were recorded in the field during both the 1988 and 1989 field seasons. Observations were made primarily on the ground. Aerial photographs taken in the 1940s (before the final pool raise) were used to initially identify and map landforms and, following field investigations, to check interpretations. The utility of the pre-inundation aerial photographs was reduced by trees felled during clearing operations; these covered and obscured most of the drawdown landscape. All landforms were checked against vertical and oblique aerial photographs taken of the drawdown in 1989.

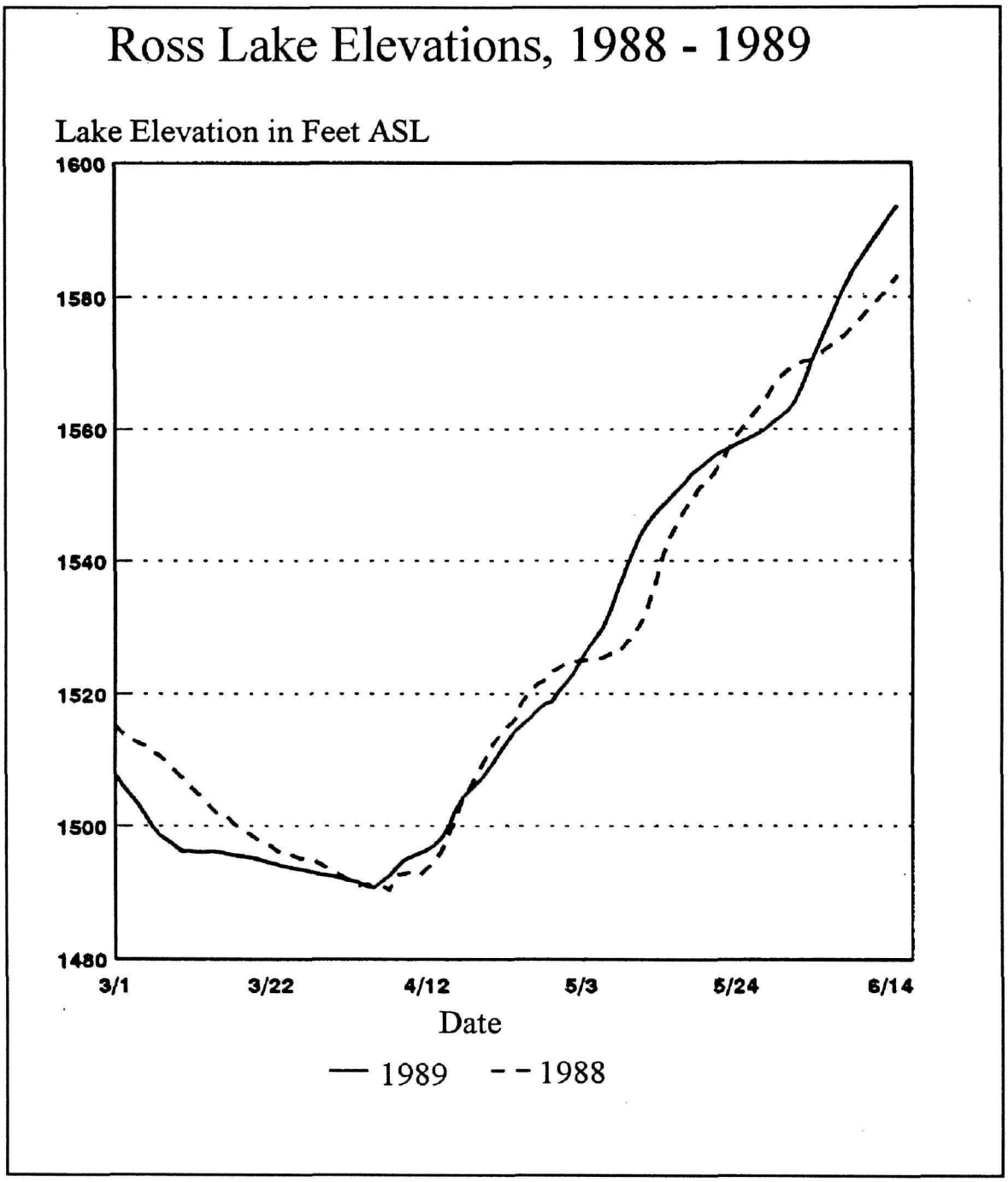


Figure 8.4 Graph of reservoir surface elevations during the 1988 and 1989 field seasons.

Overall, identification and interpretation of landforms was aided by the lack of obscuring vegetation in the reservoir drawdown. In some cases, identification was limited excessive erosion and deposition on the original landform surface, and by

difficulty of access. Generally, fine-grained sediments (clay, silt, and fine sand) were eroded from steep slopes and the stoss (up-wind) sides of landforms and deposited on low-angle slopes, terraces, and in gullies. Erosion of ca. 1 m of sand and silt generally left a surface layer of coarse-grained lag deposits on many landforms (at one location, >2 m of erosion was recorded). Erosion appears to be most severe on steep, south-facing shorelines composed of unconsolidated sediment.

Landforms described in the field were assigned to one of six landform-surficial geology units on the landform map of the Ross Lake Drawdown Zone at a scale of 1:15,600. An expanded version of this map and additional information concerning project surficial geology are documented in an erosion and existing conditions study (Riedel 1990). The six types are defined as follows:

1. **Steep Slopes**: This unit is defined as any surface with slope over 20 degrees. Surficial geology includes reservoir lag deposits of both exotic and local lithology which range in texture from sand to boulders and from angular to well-rounded. At the project mapping scale, this unit is comprised predominately of the outer valley walls, although it also includes bedrock cliffs, talus slopes, and river-cut canyons.

2. **Bedrock Benches**: This unit consists of glacially scoured bedrock typically having gradual, striated stoss slopes and more angular, steep lee (down-ice) slopes. It is often surrounded by gently-sloping, unconsolidated sediment and glacially scoured troughs. This unit includes all bedrock types.

3. **Terraces**: Defined primarily as a morphological feature, this unit includes both glacial drift (kame terraces and moraine deposits), outwash, and more recent fluvial deposits. It may be either erosional or depositional. Typically terraces have flat tops and dip down-valley at low angles although surface morphology is often complicated by the presence of old channel scars and depressions (kettles). Surficial geology includes a wide range of textures and lithologies. This unit includes slopes with angles of 5 to 20 degrees that may be terraces modified by reservoir controlled erosion and deposition.

4. **Alluvial Fans**: Alluvial fans are fan-shaped landforms associated with tributary drainage networks or avalanche gullies along the main valley walls. Surface slopes range from 5 to 15 degrees and have a convex-upward surface profile. This unit includes material deposited by fluvial activity, avalanches, and mass wasting processes. It also includes fan-shaped landforms that are more properly called debris cones. Sediments are locally derived, angular, poorly sorted, and exhibit wide variation in grain size.

5. **Flood Plain**: This unit is the active geomorphic surface of land adjacent to the Skagit River and some of its tributaries. Topography of this unit is characterized by a low-angle to flat surface dipping downstream with abandoned channel scars, flood channels, and oxbow lakes on its surface. Much of the surficial geology of this unit is obscured by reservoir muds.

6. **Mass Movement**: Morphology of this unit is characterized by a lobate form in plan view and an irregular, hummocky surface topography. It is sometimes associated with fan deposits. Surficial geology is characterized by very angular clasts that range in grain size from boulders 2 m (6.6 ft) in diameter to sand and silt. Lithology of clasts is local.

8.3 Site Testing Methodology

The research plan and testing methodology are tailored to the overall purpose of the project, which is to assess the effects of a hydroelectric project on archeological resources in accordance with Sections 106 and 110 of the National Historic Preservation Act, and other supporting legislative and regulatory mandates. The research plan is, therefore, geographically limited to the hydroelectric project boundaries, and fieldwork was limited to times when the project area (particularly the drawdown zone) was accessible. The drawdown schedule reflects the needs of water storage and the generation of hydroelectricity, which however, seriously limits the amount of time available in any one season for archeological investigations.

8.3.1 Site Testing Objectives

The purpose of the test excavations was to determine which sites are eligible for inclusion in the National Register of Historic Places. In some cases such a determination can be made rapidly through a brief examination of the site, but in others, it can be made only after exploratory excavations. In all instances, the determination was made using the least amount of effort and cost necessary and with the minimum alteration to each site's undisturbed deposits. The testing procedure was designed to be limited in scope, largely due to the practicalities and logistics of doing excavation in a predominately roadless environment under mostly adverse weather conditions. Only sites in the drawdown tract were evaluated. At least six factors served to constrain the amount of effort expended at each site. These included difficulty of access (transportation of staff and equipment to most sites was by some combination of automobile, boating, and hiking), weather (most often cold, windy conditions accompanied by rain and snow), limited time of exposure above the reservoir pool (for sites low in the drawdown, exposure may occur at cycles of five years or greater), water saturation of site soils (some low gradient landforms, even when exposed, have a high water table), a rapidly rising reservoir level (during maximum snowmelt on warm spring days, the pool level can rise more than 1 m/24 hours), and an unpredictable and erratic drawdown schedule (although variable from year to year, the most reliable period for testing is between about April 7 and May 31). Within these constraints, each site was tested with the minimum amount of effort needed to assess significance. Due to the massive scale of reservoir-induced erosion, the great majority of artifact-bearing deposits lacked integrity of association and location. As a result, the testing objective as implemented in the field sometimes evolved into an attempt to document intact, *in situ* features and artifact-bearing deposits having demonstrable thickness or depth.

For an evaluation, basic descriptive data and other information are required. These data include the following (these data are provided in the individual site descriptions in sections 10 and 11):

1. the site's horizontal dimensions and depth below surface of cultural remains;

2. the range of artifacts and features preserved at the site, and their inferred function;

3. age of the site and methods by which the site can be dated (radiocarbon, volcanic ashes, cross-dating of artifacts, etc.);

4. kinds of organic remains preserved at the site;

5. number of buried components or cultural layers at the site;

6. alterations of original conditions of the site and processes or events that continue to affect site integrity;

7. the potential embodied in the site for contributing new knowledge about prehistory and the kinds of analytic techniques used to acquire this knowledge;

8. any unique qualities of the site and any classes of sites it may represent; and its relationship to any other sites capable of contributing the same kinds of information;

9. any other qualities or characteristics that contribute to its eligibility for inclusion in the National Register.

8.3.2 Site Testing Strategy

The test excavations followed standard excavation procedures. All artifacts and other remains of cultural origin encountered in test pits were collected (fire-modified rocks excepted). The following standards and procedures were followed in testing the sites.

1. A permanent site datum (more than one in large sites) was established for spatial control over test pit, feature, and artifact locations. We used 9.5 mm (3/8 in.) steel rebar set in a circular concrete footing and topped with a yellow cap embossed with the site number. Regular monitoring over the last five years has shown that some of these "permanent" data have been eroded by wave action, some remain stable and in place, and some are buried by reservoir deposits.

2. All excavated site sediments and soils were screened through 6.4 mm (1/4 in.) or 3.2 mm (1/8 in.) mesh screen. The finer mesh was used to retrieve small artifacts, such as animal bone fragments and pressure flakes, or to excavate hearth features.

3. Three subsurface excavation techniques were used to investigate site deposits. Excavation units are either 1 x 1 m (39 x 39 in.) or 2 x 2 m (79 x 79 in.) squares. Test pits are 50 x 50 cm (20 x 20 in.) squares. These were dug using a combination of trowel and dust pan (most often) and shovel (infrequently). Level forms were prepared for all excavation units and test pits. Test units and test pits were usually excavated in 10 cm (3.9 in.) levels. On occasion, 5 cm (1.9 in.) thick levels were used, and in some units, excavation was by natural stratigraphy. Vertical control of levels was maintained by use of a line level connected by string to a temporary unit datum or subdatum.

4. The fewest number of test pits necessary to assure an adequate basis for site evaluation was excavated. Sites that were initially recommended as likely to be eligible for the National Register of Historic Places (Mierendorf 1991) were excavated by use of one or more test units or test pits. On large sites we made no attempt to, nor did we have the resources to, determine the full horizontal and vertical extent of intact deposits once it was determined conclusively that they were present. This strategy assumed that any subsequent data recovery or in-place protection may require two subphases: an initial subphase of excavation to determine the actual volume of artifact-bearing deposits which will serve as the basis for planning and implementation of the next subphase, either data recovery through excavation or protection. In some cases, however, the testing procedure that we used resulted in an accurate determination of the volume of intact deposits. This occurred in those cases where sites were restricted in horizontal and vertical extent, especially when they were located on small landforms having sharp boundaries.

5. Stratigraphy, including soil, sedimentary, and cultural layering was recorded for nearly all test units and test pits, and for selected geologic profiles exposed in eroding bank faces and a few test trenches (backhoe trenches) at four sites in the Hozomeen vicinity. The documentation consists of diagrams showing the drawn strata coded with numbers. These numbers are cross-referenced to profile descriptions. The descriptions conform to standard geological and pedological conventions for describing soil and sediments in the field. Occasionally, "shovel pits" were dug into the floor of a test unit or test pit after completion of regular excavation to expose deeper stratigraphy. Excavation by levels and screening did not accompany shovel pit excavation. Results of shovel pit excavation were recorded on the last level form for the unit or pit and on unit stratigraphic profiles.

6. A planview sketch map of each site was prepared showing the physical relationship among test units and pits, site boundaries, cultural features, physiography, and other pertinent environmental and physical characteristics of the sites. There is variability in

the precision of site maps, most of the mapping effort expended on eligible sites. Only maps of eligible sites have been included in this report.

7. Each tested site was photographically documented in color slide and black-and-white prints. Nearly all test units are so documented. In addition, key test units are photo documented either by level or to record the details of stratigraphy, volcanic ash layers, feature matrices and outlines, or other notable occurrences.

8. All excavation units and pits were backfilled once excavation was complete.

8.3.3 Laboratory and Curation Procedures

All collected artifacts, whether from surface or excavated contexts, were cataloged and labeled prior to analysis and storage. Initially, all artifacts were cleaned prior to cataloging; however, artifacts from the last few seasons have been left unwashed in order to retain any residues that could be analyzed at some future date. Artifacts are described according to raw material type, method of manufacture, artifact class, metric data, and chronological or cultural affiliation. All artifacts, whether individually or in lots, have been assigned accession and catalog numbers according to the National Park Service's collections software program, the Automated National Catalog System. For each assigned catalog number there is a completed Museum Catalog Record form on file. All artifacts, field notes, maps, diagrams, special samples, and other project related records and data are housed in the Marblemount Curation Facility at the Marblemount Ranger Station, North Cascades National Park Service Complex, Marblemount, Washington. The artifacts are stored in metal cabinets of a compact storage system located in a collection repository with a humidity- and temperature-controlled atmosphere.

9. SURVEY RESULTS

This section describes the cultural resources found during the inventory phase of the Ross Lake Archeological Project. Spatial and temporal patterns in the distribution of sites and isolated finds are identified and sampling and other sources of error are discussed. Data presented in this section were derived from surface reconnaissance only. This section updates and revises an earlier technical summary of the survey results provided in Mierendorf (1991).

9.1 Results of Archeological Inventory

9.1.1 Number and location of archeological sites

A total of 150 archeological sites was found in the project area. Table 9.1 presents a tally of all sites by chronological period (historic versus prehistoric) and location (above or below the high pool level of the reservoir, referred to as "forested" and "drawdown" zones respectively). Site locations are shown in Figures 9.1 through 9.8.

Although 144 prehistoric sites were recorded, site 45WH301 consists of a single projectile point and, therefore, does not meet our minimal operational definition of a site (see section 8 of this report). It is therefore excluded from the analysis presented in this section.

Table 9.1 Number and Percentage of Archeological Sites by Survey Area

Survey area	Archeological Site Type	Frequency	%
Drawdown zone (<1,602' elevation)	Prehistoric sites	127	85
	Historic sites	1	1
	Subtotal	128	86
Forested zone (>1,602' elevation)	Prehistoric sites	17	11
	Historic sites	5	3
	Subtotal	22	14
Entire project area	Total Prehistoric sites	144	96
	Total Historic sites	6	4
	GRAND TOTAL	150	100

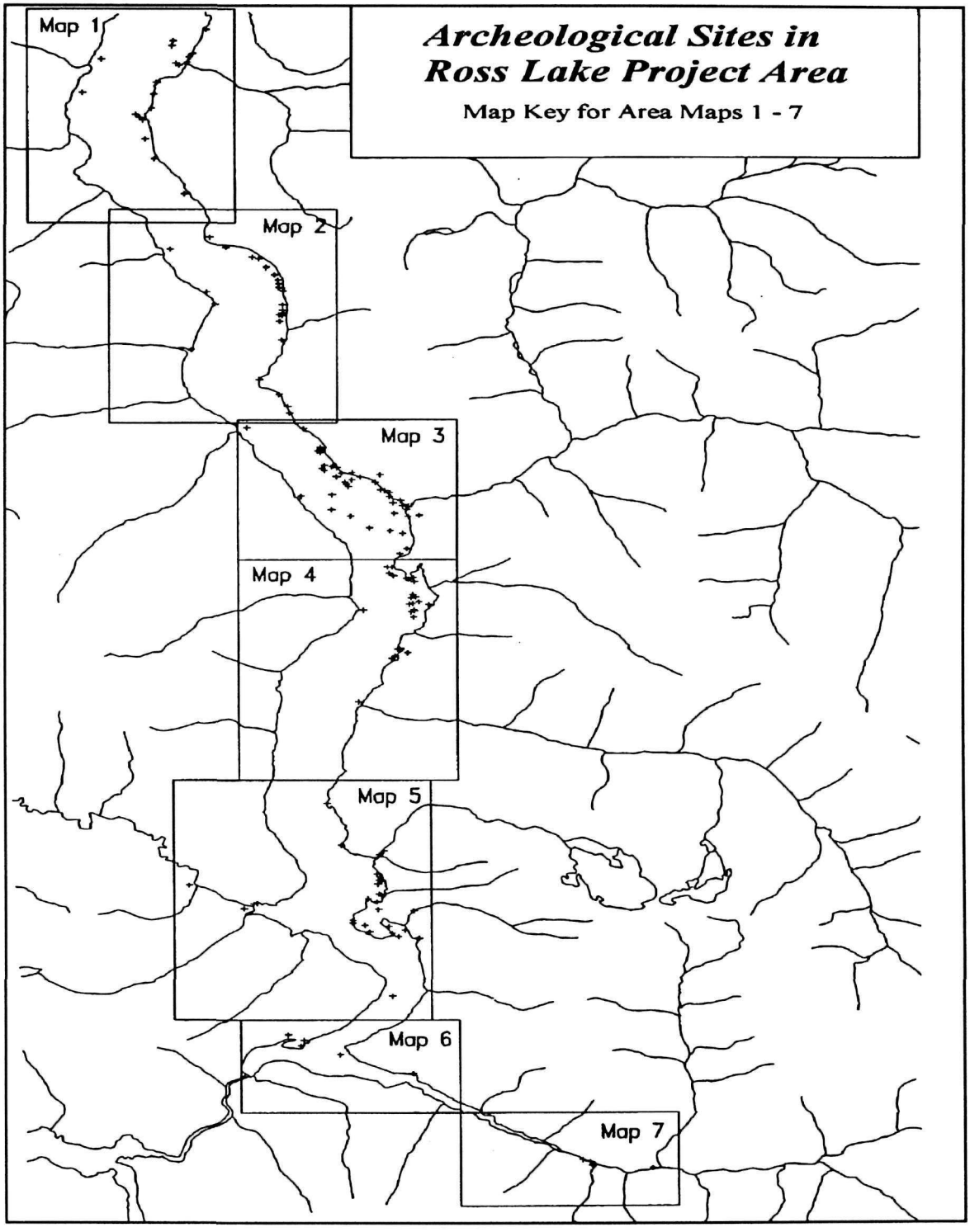


Figure 9.1 Map key for area maps of archeological sites in the Ross Lake Project Area

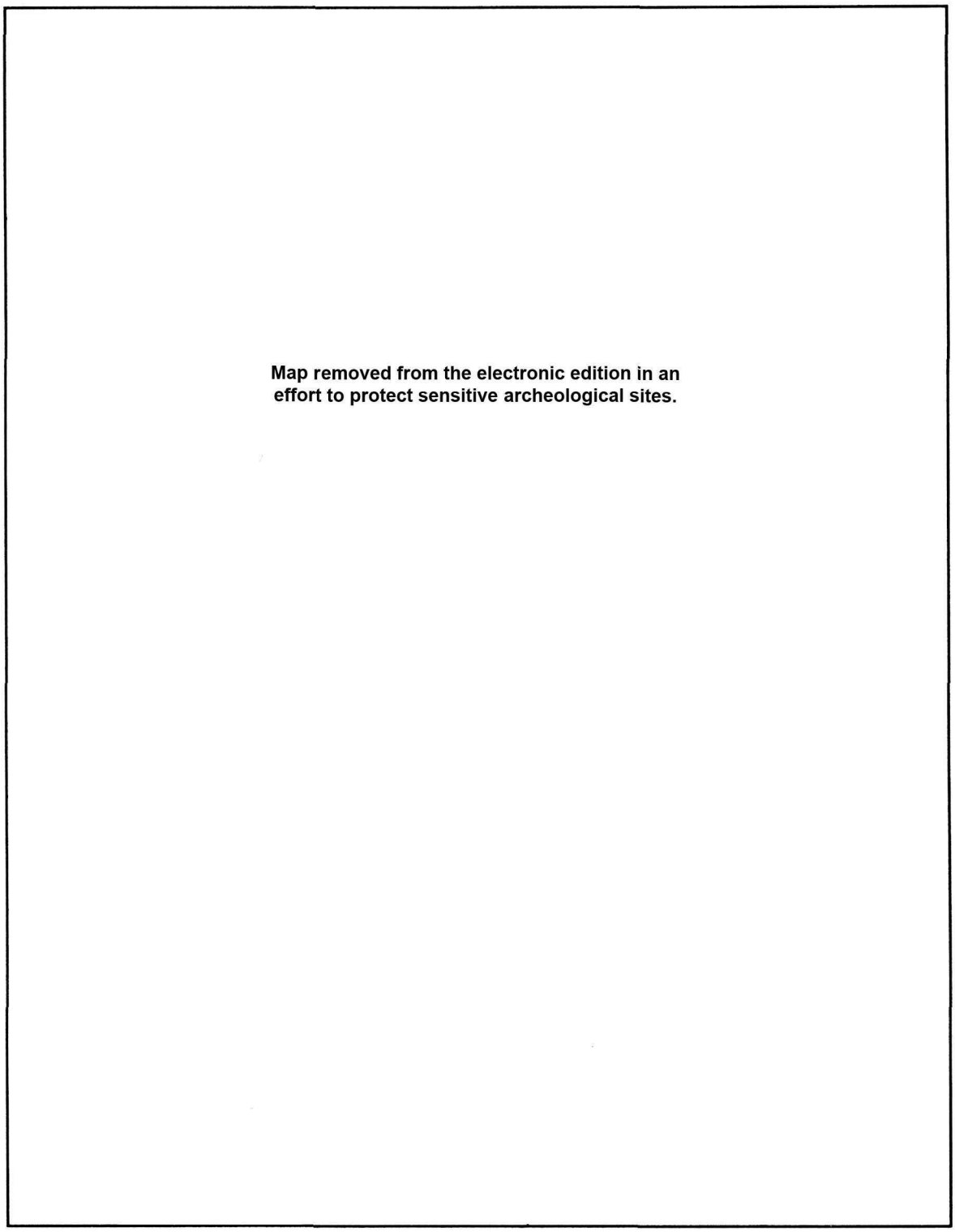


Figure 9.2 Map 1 of archeological sites in the Ross Lake Project Area designated by field site number.

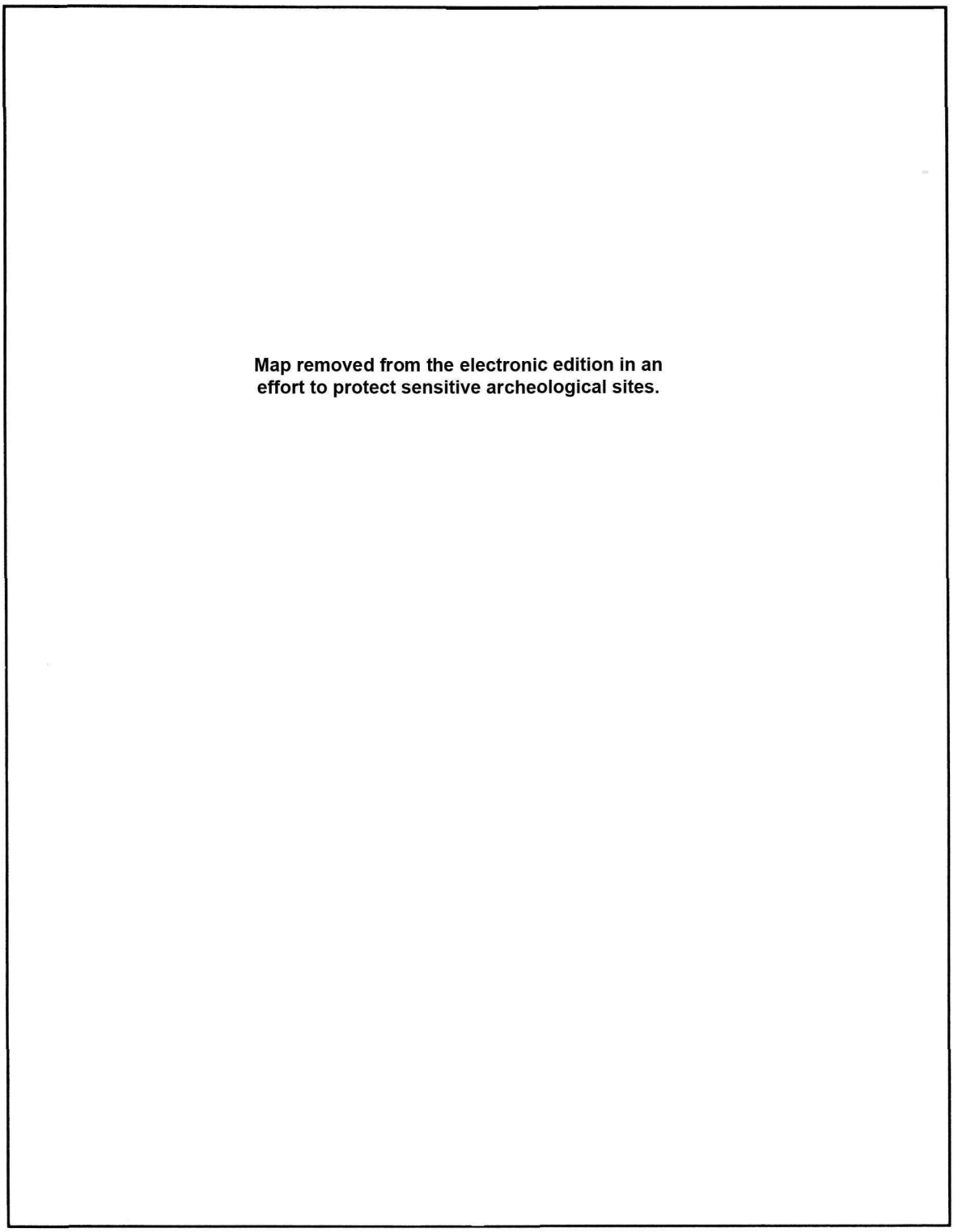


Figure 9.3 Map 2 of archeological sites in Ross Lake Project Area designated by field site number.

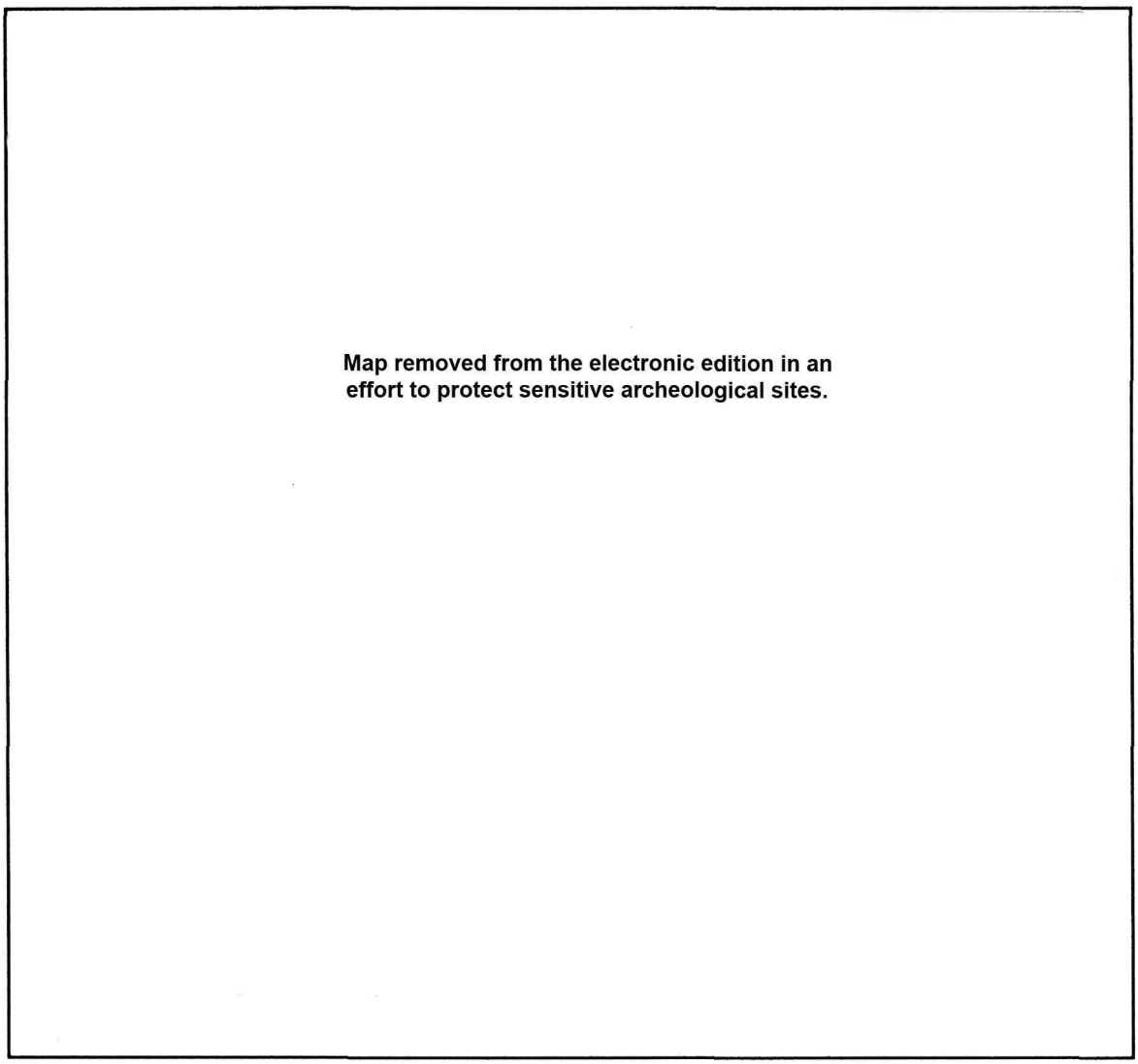


Figure 9.4 Map 3 of archeological sites in Ross Lake Project Area designated by field site number.

With the exception of Section 9.5, which concerns itself exclusively with the historic sites in the project area, all subsequent discussion of survey results concerns itself with the 144 prehistoric sites.

9.1.2 Number and location of isolated finds

A total of 66 isolated artifacts or features was recorded for the project area, nine of which were collected. A list of all isolated finds can be found in Appendix F itemized by type of object, year recorded, catalog number (if collected), and landform type. A map location for all isolated finds in the project area was presented in Mierendorf (1991).

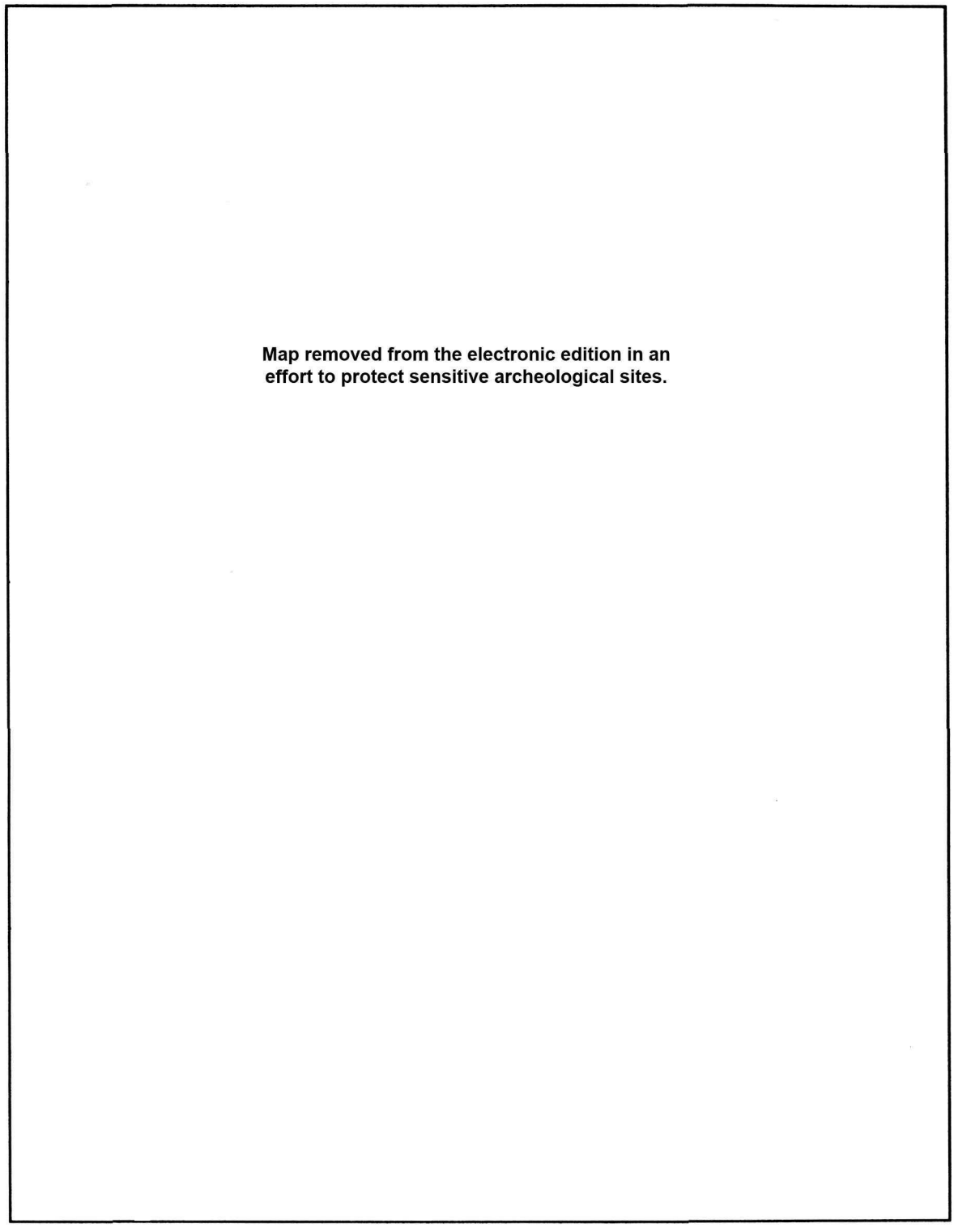


Figure 9.5 Map 4 of archeological sites in Ross Lake Project Area designated by field site number.

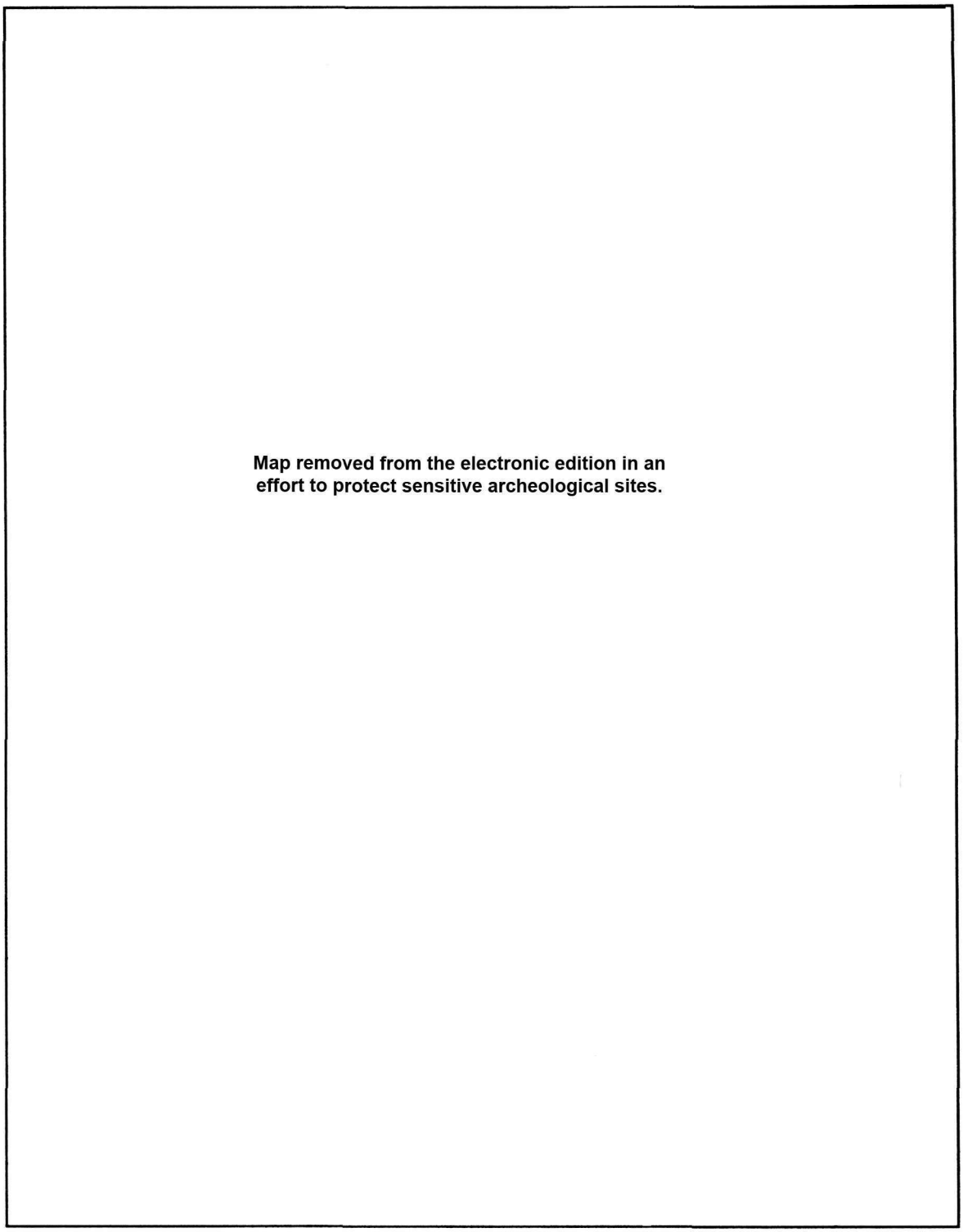


Figure 9.6 Map 5 of archeological sites in Ross Lake Project Area designated by field site number.

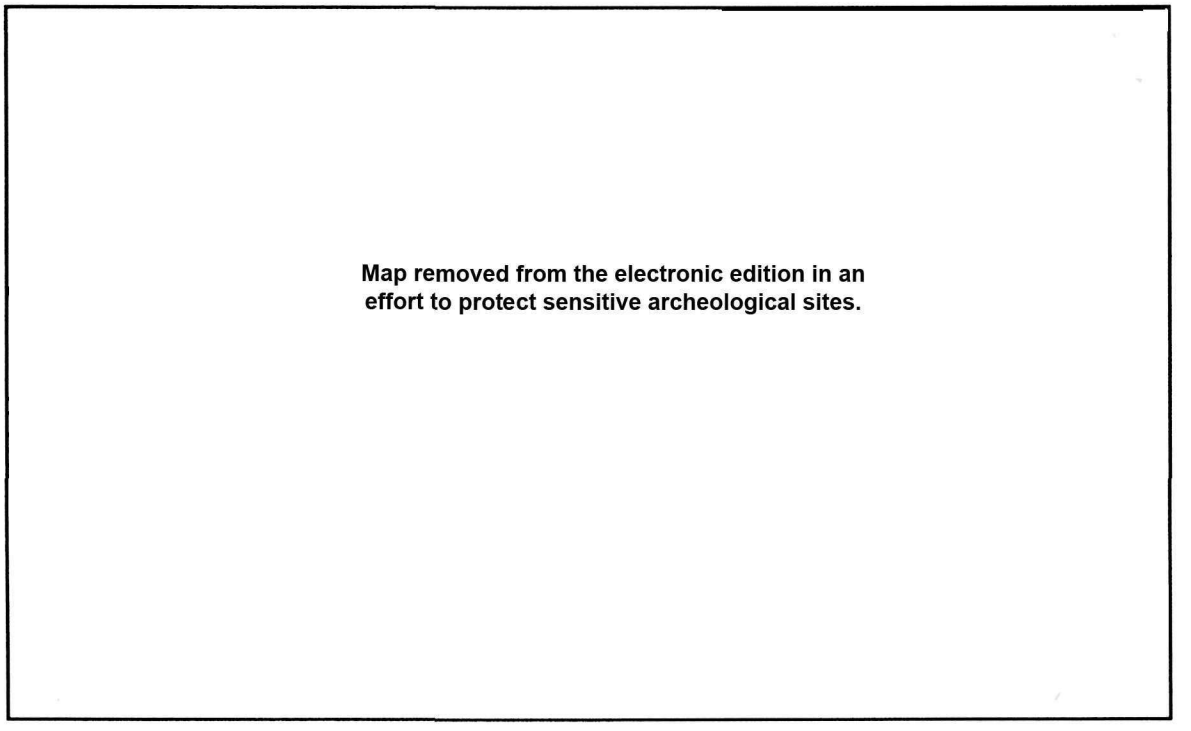


Figure 9.7 Map 6 of archeological sites in the Ross Lake Project Area designated by field site number.

9.1.3 Types of cultural resources recorded

All prehistoric sites, except 45WH245H and 45WH444, contain surface scatters of flaked lithics and/or lithic tools (sites vary greatly in the density of such scatters). Site 45WH245H consists of six small rock cairns associated with glass and nails. Site 45WH444 consists of five circular depressions visible on the ground surface. Two sites, 45WH457 and 45WH496, are rockshelters, and 45WH224 is both a rockshelter and lithic scatter. Faunal remains were found at 28 sites; most were highly fragmented, burned, and calcined. At 11 of the sites, the only recorded prehistoric features consisted of concentrations of fire-modified rock (FMR). At seven sites these features also contained faunal remains, most of which were highly fragmented and burnt. Because FMR were difficult to identify, particularly where reservoir erosion has created a lag deposit of gravels and where natural fractures were indistinguishable from cultural fractures, only discrete, clearly human-built FMR concentrations were recorded as features.

Modern artifacts were observed scattered across the reservoir bottom. Nearly all of these are small portable objects discarded by boaters and other recreationists (examples include fishing gear, glass bottles, aluminum cans, and assorted camping gear); these artifacts were not recorded. The reservoir bottom is littered also with metal and wood artifacts and features dating to the 1940s. These were left after clearing of

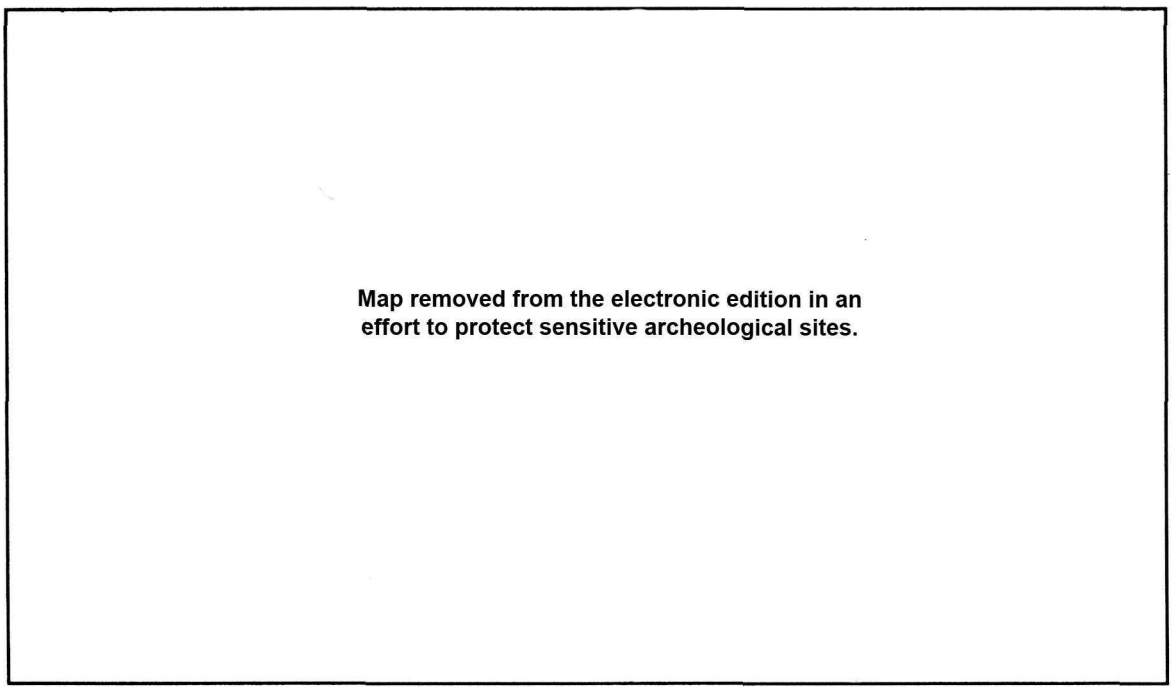


Figure 9.8 Map 7 of archeological sites in the Ross Lake Project Area designated by field site number.

forests in the drawdown tract prior to inundation. They include steel cables, discarded and rusted pieces of logging tools, logging haul roads, the partial remains of temporary log bridges, a possible logging camp site, and log landing and loading areas. A list was compiled of these historic features and isolated finds, and two historic sites were recorded on the site inventory forms. All of these are less than 50 years old and do not meet criteria for eligibility to the National Register of Historic Places.

9.1.4 Data collected during surveys

Appendix I provides a summary of each untested site's artifact inventory, elevation, landform type, and other descriptive information collected in the course of the survey phase (1988 and 1989). The information was coded and tallied on site record forms on file at the park. Artifacts diagnostic of time or cultural type and formed tools were collected. Except as noted in Appendix I, other recorded objects were left at the site.

Forty-one sites were recommended for test excavation in order to assess their eligibility for the National Register of Historic Places. Of these, thirty-six were exposed long enough to be tested. Information collected during the testing phase of the project is presented in section 10.

9.1.5 Sample and attribute selection

The analyses that follow use only survey data. Although more information is available from tested sites, use of this data would introduce sampling bias resulting from more intensive collection methods. Therefore, to maintain comparability of site assemblages, only artifact and feature inventories from initial recording are used in the following analysis. The exception to this is the use of all projectile points to establish site chronologies.

The distribution of sites is analyzed below on the basis of four attributes:

1. **Assemblage size**: Assemblage size is based on the number of artifacts recorded for the site. The definition of artifact in this instance is restricted to lithic materials, including debitage. Faunal remains and features such as fire-cracked rock concentrations or scatters are dealt with below. Based on the actual artifact counts, each site was placed into one of three size categories: **Small** (<40 items), **medium** (40-179 items) and **large** (>179 items). The limits of the three size categories are based on the distribution of artifact frequencies from all sites. This distribution was trimodal.

2. **Richness of tool types**: Richness of tool types means the number of different tool types recognized and recorded at each site. Richness is a form of diversity measurement (Kintigh 1989:26), and it is intended to gauge the relative breadth of different activities which contributed to the site assemblages in the project area. Tool-type richness was divided into two categories: **Low** (0-3 different types of tools present) and **high** (more than 4 tool types present). The choice of three as a cut-off between the two classes was based on a bimodal distribution of the number of tool types recorded in each assemblage. Eight was the largest number of different tools recorded at a single site. Because tool types were assigned in the field and the objects were not collected, it is impossible to create a new classification based on a single variable such as possible tool function. In reality, categories of tools employed when recording in the field tend to represent a mixture of functional, technological, and morphological attributes. Because of this limitation, richness should be viewed as a rough measure of the diversity of activities at sites in the area.

3. **Features/faunal remains**: Faunal remains and/or features such as fire-modified rock concentrations are indicated by presence or absence. Although attempts were made to quantify faunal remains and features in the field, there were, at times, discrepancies between sources (i.e., field notes, sketch maps, and site forms). Also, because the data are derived from surface observations of the site, it could not be determined whether (or how many) more faunal remains or fire-modified rock (FMR) features lie under the surface. Because of these uncertainties, simple presence or absence better reflects the accuracy of our data.

4. **Lithic material types**: A total of 18 lithic material types was identified and recorded in the course of the survey. All identifications were based on visual inspection. The number of sites at which nonlocal materials occur and the total number of lithic materials present at each site were derived from this information. Difficulty in correctly identifying the material type, especially in distinguishing between metasediment and basalt categories (see section 10.3.6), reduces the accuracy of these observations to some degree.

Each of these four attributes is examined in the following sections by their geographic distribution in the project area, and their distribution across different landform types. The chi-squared test (χ^2) of significance was done on selected distributions to see whether distributions among different parts of the valley or different classes of sites were too great to be attributed to chance alone. In cases where the null hypothesis is rejected, we cannot assert that the distribution is attributable to cultural factors alone. Sampling bias, due to our inability to examine all parts of the valley and our inability to account completely for the effects of this geographic limitation, makes us cautious in drawing conclusions about prehistoric land-use patterns. For example, much of the Skagit River flood plain in the drawdown tract was unavailable for study due to the presence of the reservoir. Where it was exposed, in the north end of the project area, it was covered with a thick layer of reservoir mud. As a result, the distribution of floodplain sites and how they compare with those of other landform types remains unknown. Despite these limitations, statistically significant results provide a basis for formulating hypotheses that might be tested in future archeological studies of the upper Skagit River Valley.

9.2 Site Distribution by Geographic Location in Valley

Prehistoric sites are not evenly distributed throughout the project area, and tend to aggregate in certain valley segments. The majority of inventoried sites (88%) are on the east side of the Skagit River channel. Only fifteen sites (10%) are on the west side of the Skagit River Valley. The remaining three sites (2%) are located in the Ruby Creek drainage, which is also east of the Skagit River.

From north to south, sites within the project area tend to cluster in six areas: Hozomeen Creek (Fig. 9.2), Boundary Bay (Fig. 9.3), Lightning Creek (Fig. 9.4), Dry Creek (Fig. 9.5), Roland Point/Big Beaver Creek (Fig. 9.6), and Ruby Creek (Figs. 9.7 and 9.8). These clusters offer a useful means of stratification and comparison of the site inventory and they provide a basis to delineate patterns of prehistoric use of the valley. Selection of a precise boundary between each area is partially arbitrary.

Assemblage size varies among clusters as shown in Table 9.2. Hozomeen Creek and Boundary Bay clusters have a similar number of sites and size distribution, with a nearly log-linear decline from small to medium to large site size. Lightning Creek cluster shares this type of distribution but has about twice as many sites. Most sites tend

to be found in the middle section of Ross Lake near Lightning and Dry Creeks. Toward the southern end of the project area the distribution of assemblage size is dominated by the small category (Roland Creek and Ruby Creek clusters). Ruby Creek cluster is substantially smaller than any of the others, and the assemblage size is entirely in the small size class. This corresponds with the narrowest part of the valley, where the Skagit River and Ruby Creek flow through steep-sided gorges. In this valley segment there are relatively few flat areas for camping or settlement.

Table 9.2 Distribution of Site Assemblages by Size, Class, and Cluster

Cluster	Small	Medium	Large	Total
Hozomeen Cr.	11 (55)	7 (35)	2 (10)	20
Boundary Bay	11 (50)	7 (32)	4 (18)	22
Lightning Cr.	24 (55)	16 (36)	4 (9)	44
Dry Cr.	19 (73)	6 (23)	1 (4)	26
Roland Cr.	18 (72)	6 (24)	1 (4)	25
Ruby Cr.	6	-	-	6

Parenthetical numbers are row percentages.

The distribution of sites by tool-type richness for each cluster is given in Table 9.3. Sites with high tool-type richness are found primarily at the north end of the project area: Boundary Bay and Hozomeen Creek clusters account for 70% of all sites with high tool-type richness in the project area. A χ^2 test indicates that these differences in distribution are statistically significant, indicating that differences between clusters in tool type richness are too great to be due to chance factors alone (see table 9.4). These differences may be due to noncultural factors such as the greater proportion of the flood plain that is exposed in the north of the project area. Alternatively, the greater diversity of tool types may reflect differences in land use and settlement between the clusters. For example, there may have been greater reuse, more intensive use, or longer duration of occupation of sites in the northern part of the project area. Any of these alternatives would increase the potential for different kinds of tools to be left at a particular location.

Table 9.3 Distribution of Sites by Tool-Type Richness and Cluster

Cluster	N/% High by Cluster	N/% Low by Cluster
Hozomeen Cr.	6 (30) [35]	14 (70)
Boundary Bay	6 (27) [35]	16 (73)
Lightning Creek	4 (9) [24]	40 (91)
Dry Creek	0	26 (100)
Roland Creek	1 (4) [6]	24 (96)
Ruby Creek	0	6 (100)

Parenthetical numbers are row percentages; bracketed numbers are column percentages.

Table 9.4 χ^2 Table of Tool-Type Richness by Cluster

Cluster	High Obs. (Exp.)	$(o-e)^2/e$	Low Obs. (Exp.)	$(o-e)^2/e$
Hozomeen Cr.	6 (2.4)	**5.40**	14 (17.6)	**0.74**
Boundary Bay	6 (2.6)	**4.45**	16 (19.4)	**0.60**
Lightning Cr.	4 (5.2)	**0.28**	40 (38.8)	**0.04**
Dry Cr.	0 (3.1)	**3.10**	26 (22.9)	**0.42**
Roland Cr.	1 (3.0)	**1.33**	24 (21.0)	**0.43**
Ruby Cr.	0 (0.7)	**0.70**	6 (5.3)	**0.09**
TOTAL	17	**15.26**	126	**2.32**

χ^2=**17.58**; df=5; **p<0.005**; Reject H_0

H_0: Observed differences in distributions between clusters is due to chance.
H_1: Observed differences in distributions between clusters is not due to chance.
Significance level=0.01

Table 9.5 summarizes other aspects of the lithic assemblages. The first column represents the frequency of sites that have debitage with cortex, indicating early stages in the reduction of lithic raw materials. The highest percentage of such sites are located in Boundary Bay and Hozomeen Creek, respectively. The lowest percentage is at Lightning Creek (except for Ruby Creek which consists of only six site assemblages). A confounding factor here is the relatively greater contribution of metasediment as a material type in the northern part of the project area. Metasediment can develop a weathered cortex relatively rapidly, which may be mistaken for cortex present on a

nodule before reduction. In those cases, presence of cortex, as noted by field observation, may not always be representative of stage of lithic reduction. Alternatively, it may indicate a less specialized, less intensive, and more opportunistic use of the lithic landscape in the northern part of the project area. In that case, areas such as Lightning and Dry Creek may represent areas used more intensively, with some sites specializing as lithic procurement and primary reduction sites, and others perhaps representing later stages of biface reduction and/or tool manufacture. The second column of Table 9.4 contains the frequency of sites per cluster for which no tools were recorded. The highest number of such sites is at Lightning Creek and Dry Creek, although the relative percentages are reversed. By contrast, Hozomeen Creek and Boundary Bay both have relatively few such sites.

Table 9.5 Frequency of Sites Without Tools and Containing Debitage with Cortex

Cluster	Freq. Sites w/ Debitage w/Cortex		Freq. Sites w/o Tools	
Hozomeen Creek	16	(80)	3	(15)
Boundary Bay	20	(90)	2	(9)
Lightning Creek	26	(59)	15	(34)
Dry Creek	18	(69)	13	(50)
Roland Creek	17	(68)	9	(36)
Ruby Creek	2	(33)	3	(50)

Parenthetical numbers are row percentages.

A total of 31 sites in the project area possess faunal remains, FMR concentrations, or both (see Table 9.6). Such sites tend to be found in the north end of the project area with the Hozomeen Creek and Boundary Bay clusters accounting for more than half. Sites with FMR features and/or faunal remains also make up a larger proportion of sites in those two clusters, ranging from one-third to one-half of the sites. Generally, there is a greater than expected proportion of sites with faunal remains and/or FMR concentrations in the large and medium size categories. The differences in the distribution of sites with faunal remains and/or FMR concentrations by assemblage size are significant, indicating that the differences are not likely to have arisen by chance factors alone (see Table 9.7). Because the combination of faunal remains and FMR concentrations represents processing and consumption of food, it is probable that Hozomeen Creek and Boundary Bay were the preferred locations for seasonal base camps.

Table 9.6 Distribution of Sites with FMR Concentrations/Faunal Remains

Cluster	Frequency	Total Percentage	Percentage of Cluster
Hozomeen Creek	9	29	45
Boundary Bay	8	26	36
Lightning Creek	6	19	14
Dry Creek	2	6	8
Roland Creek	5	16	20
Ruby Creek	1	3	17
TOTAL	31	100	--

Table 9.7 χ^2 Table of Presence/Absence of FMR Features/Faunal Remains by Assemblage Size Category

Size Category	Present Obs. (Exp.)	$(o-e)^2/e$	Absent Obs. (Exp.)	$(o-e)^2/e$
Small	11 (19.3)	**3.57**	78 (69.7)	**0.99**
Medium	15 (9.1)	**3.83**	27 (32.9)	**1.06**
Large	5 (2.6)	**2.22**	7 (9.4)	**0.61**
TOTAL	31	**9.62**	112	**2.66**

χ^2=**12.28**; df=2; **p<0.005**; Reject H_0

H_0: Observed differences in distributions is due to chance.
H_1: Observed differences in distributions is not due to chance.
Significance level=0.01

For the entire project area, sites that have a high tool-type richness tend to also have faunal remains and/or FMR concentrations present, in much greater proportions than sites with low tool-type richness. This difference observed between high and low tool-type richness was too great to be due to chance factors alone (see Table 9.8). Sites with low tool-type diversity and no faunal remains or features constitute 50% of the sites at Hozomeen Creek, 45% of those at Boundary Bay, 84% at Lightning Creek, 92% at Dry Creek, and 80% at Roland Creek, suggesting that processing of subsistence resources may have been relatively less prevalent in the four southernmost site clusters.

Table 9.8 χ^2 Presence/Absence of FMR Features/Faunal Remains by Tool Type Richness

Tool-Type Richness	Present Obs. (Exp.)	$(o-e)^2/e$	Absent Obs. (Exp.)	$(o-e)^2/e$
Low	20 (27.3)	**1.95**	106 (98.7)	**0.54**
High	11 (3.7)	**14.40**	6 (13.3)	**4.01**
TOTAL	31	**16.35**	112	**4.55**

χ^2=**20.90**; df=1; **p<0.001**; Reject H_0

H_0: Observed differences in distributions is due to chance.
H_1: Observed differences in distributions is not due to chance.
Significance level=0.01

Site clusters vary in the number of lithic material types present. Throughout Ross Lake site assemblages, lithic material type distributions are dominated by materials that are available locally, primarily microcrystalline silicas from the Hozomeen group and dark, opaque, fine-grained "metasediment," usually argillite. However, there is a wide variety of other lithic material present which, though representing only a very small proportion of the overall lithic assemblage, is found throughout the project area. Table 9.9 lists the lithic material types recorded during the survey.

Table 9.9 List of Lithic Material Types Recorded in Project Area*

Locally Available Materials	Materials Not Available in Project Area	Material, Source Unknown
Hozomeen Chert	Exotic Chert	Unknown
Hozomeen Chalcedony	Allenby Chert	
Hozomeen Jasper	Exotic Chalcedony	
Metasediment	Basalt	
Granite	Vitrophyre	
Andesite	Obsidian	
Slate	Other Igneous	
Soapstone		
Nephrite		
Quartz Crystal		

*As defined by Mierendorf (1991:tables 8.6 and 8.7), local materials are those that occur naturally in the Skagit River drainage. Nonlocal materials are those that only occur naturally outside the Skagit River drainage.

Data in Table 9.10 show that, generally, there is a greater variety of lithic material types in sites at the north end of the project area. The Boundary Bay cluster has the greatest variety of material types, followed by Hozomeen Creek and Lightning Creek clusters. The least variety is found in the Dry Creek (seven material types) and Ruby Creek (five material types) areas. The Hozomeen Creek and Boundary Bay clusters both have the highest maximum and median numbers of material types found at a single site. This figure declines from north to south in the project area. The greater number of material types found at Hozomeen Creek and Boundary Bay sites is reflected in the larger median number of material types in those site clusters. The median (a measure of central tendency) is not far from that of other clusters, indicating that the high maximum is probably caused by outliers rather than being an overwhelming trend toward greater number of material types in these areas. This observed difference in the Hozomeen Creek and Boundary Bay areas may be due to the greater number of large site assemblages there; the prevalence of small sites in the other clusters tend to restrict the number of material types found in those areas.

Table 9.10 Summary of Lithic Material Type Distributions by Site Cluster

Cluster	Total N Materials in Cluster	Max. N of Materials in a Site	Median N of Materials in Site
Hozomeen Creek	11	9	3
Boundary Bay	17	9	4
Lightning Creek	11	4	2
Dry Creek	7	4	1
Roland Creek	8	3	2
Ruby Creek	5	2	1

Table 9.11 shows that the greatest number of sites containing nonlocal (exotic) lithic types are located in the northern and central part of the project area. The area with the largest number of sites containing nonlocal lithic materials is Lightning Creek, followed by Roland Creek, Hozomeen Creek, and Boundary Bay. Sites with exotic lithic materials make up a greater proportion of sites in the Hozomeen Creek area. Despite having nearly the same number of sites with nonlocal lithic materials as Hozomeen Creek, Boundary Bay, and Roland Creek, the number of sites containing nonlocal lithic materials make up only a small proportion of the total at Lightning Creek because of the large number of sites there. The number and relative proportions of sites containing only Hozomeen chert are highest in Lightning Creek and Dry Creek clusters. They are much decreased in the other clusters.

Table 9.11 Summary of Exotic Lithic Material Type Distributions by Site Cluster

Cluster	N Sites w/Exotic Materials	% Sites w/Exotic Materials	% of Total Sites w/Exotic Materials	N/% Sites w/Hozo. Chert Only
Hozomeen Creek	8	40%	20%	1 (5%)
Boundary Bay	8	36	20	3 (14%)
Lightning Creek	11	25	28	19 (43%)
Dry Creek	3	12	8	13 (50%)
Roland Creek	8	32	20	5 (20%)
Ruby Creek	2	33	5	2 (33%)

Table 9.12 summarizes the relative abundance (based on artifact counts) of different lithic material types found in each cluster. These percentages are based on the artifact inventories recorded during the survey. These inventories have two main limitations. One is the potential for misidentification of lithic type in the field. The other is that at sites with large amounts of debitage of a single lithic type, counting of objects stopped at an arbitrary numeric threshold and only "greater than ..." frequencies were recorded. This underestimates the actual proportion of the most frequent material types in all areas, which are Hozomeen chert and metasediment. With these limitations in mind, Hozomeen chert seems to compose the majority of objects in the project area, followed distantly by metasediment and other categories of lithic material. Furthermore, Hozomeen chert is the most abundant material type in Lightning and Dry Creek clusters. It declines in relative abundance north and south from there. The relative abundance of metasediment in the cluster areas tends to be inversely related to that of Hozomeen chert. Other local microcrystalline silicas (MCS) tend to be most frequent at Dry Creek and Hozomeen Creek sites, but in all areas they are very rare. Nonlocal (exotic) lithic materials similarly comprise only a small proportion of all lithic assemblages. They tend to have a higher relative abundance at Hozomeen and Ruby Creeks.

Table 9.12 Relative Abundance of Material Type within Clusters

Material	Hozomeen	Boundary	Lightning	Dry	Roland	Ruby
Hozomeen Chert	48%	77%	95%	86%	69%	55%
Metasediment	42	19	4	7	26	33
Other local MCS	4	1	<1	7	0	0
Exotics	3	1	<1	<1	2	6
Other local	3	2	<1	<1	3	6
Total N	1425	2338	2447	1408	653	36

Note: "Other local MCS" includes Hozomeen chalcedony and jasper; "Exotics" includes basalt, vitrophyre, igneous, basalt, exotic chert and chalcedony, and Allenby chert; "Other local" includes nephrite, soapstone, slate, granite, andesite, and quartz crystal.

9.3 Site Distribution by Landform Type

Six landform types have been identified in the project area: alluvial fan (AF), flood plain (FP), steep slope (SS), terrace (T), bedrock bench (RB), and mass movement (MM) (see section 8 for definitions of these landform types). The type of landform on which each site is located was recorded in the course of the survey. Table 9.13 lists the area of each landform in the project area by drawdown and forested tract, and gives the frequency of sites in each landform category. From these data the site density for each

landform type was calculated. These data show that sites occur in greater densities on alluvial fans, terraces, bedrock benches, and mass movement, while the frequency of sites located on steep slopes and the flood plain are below the overall site density (unbolded total). The dearth of sites on the flood plain was noted by Mierendorf (1991) and is attributed to the difficulty of finding sites that are obscured by a thick cap of reservoir mud. This has the effect of lowering the overall site density for both the drawdown and forested parts of the project. By removing the flood plain sites and landform area from calculations of site density for the entire area, this distortion is reduced for the remaining landform types. The total site density, omitting the floodplain sites and area, is given in bold in Table 9.13. This adjusted site density provides a more accurate baseline with which to compare the site densities of individual landform types. In the drawdown zone alluvial fan site density differs little from the adjusted total density, mass movement and steep slope landform types have relatively lower site densities, and sites located on terraces and bedrock benches are nearly 2 and 3 times more frequent than the adjusted overall density, respectively. In the forested zone site densities are much lower due to greater difficulty in discovering sites in areas with heavy vegetation cover. Site densities here mirror the pattern found in the drawdown zone, with terraces and bedrock benches having greater than average site densities and all other landforms having much lower site densities. These data suggest that cultural selection for certain landform types was exercised by prehistoric populations in the project area, particularly for terraces and bedrock benches.

Table 9.13 Distribution of Sites by Landform and Site Densities

Landform	Area (km^2)	%	N Sites Observed	Site Density[1]
Drawdown				
Alluvial Fan	5.03	18.1	53	10.5
Flood Plain	15.99	57.6	10	0.6
Steep Slope	3.78	13.6	5	1.3
Terrace	1.90	6.8	38	20.0
Rocky Bench	0.62	2.2	20	32.2
Mass Movement	0.44	1.6	3	6.8
Total	27.76	100	129	4.6
Total[2]	11.77	--	119	**10.1**
Forested				
Alluvial Fan	2.77	14.5	2	0.7
Flood Plain	3.68	19.2	0	0
Steep Slope	10.24	53.4	2	0.2
Terrace	1.12	5.9	4	3.6
Rocky Bench	1.34	7.0	7	5.2

Mass Movement	0.01	<0.1	0	0
Total	19.16	100	15	0.8
Total[2]	15.48	--	15	**1.0**

[1]Site density = number of sites per km^2.
[2]Total area after subtracting floodplain (FP) area and sites.

Large site assemblages are found only on alluvial fans, terraces, and bedrock benches (see Table 9.14). Medium-sized site assemblages occur on all landforms, but again, primarily on the three above. Alluvial fans have the greatest proportion of medium and large sites, followed by bedrock benches and terraces. However, differences among landform types in distribution of large, medium, and small assemblage sizes were not statistically significant, meaning that chance factors cannot be ruled out as an explanation for these differences.

Table 9.14 Distribution of Assemblage Size by Landform Type

Landform	Small	Medium	Large
Alluvial Fan	30 (55)	20 (36)	5 (9)
Flood Plain	8 (80)	2 (20)	0
Steep Slope	4 (67)	2 (33)	0
Terrace	28 (66)	10 (24)	4 (10)
Rocky Bench	17 (63)	7 (26)	3 (11)
Mass Movement	2 (67)	1 (33)	0

Parenthetical numbers are row percentages.

Assuming that high and low tool-type richness are evenly distributed across all landform areas of the project, sites with high tool-type richness are located primarily on alluvial fans (61% or 11 of 18 sites), followed by bedrock benches (17% or 3 sites), terraces (11% or 2 sites), and flood plain (11% or 2 sites). However, within landform categories, sites with high tool type richness make up 20% of the flood plain and alluvial fan sites, 11% of bedrock bench sites, and 5% of terrace sites; none are found on steep slopes or mass movement landforms (see Table 9.15). Although high tool-type richness appears to be more common on alluvial fans, and less common on terraces, the differences in the distributions are not statistically significant, indicating that chance factors cannot be ruled out when explaining these differences.

Table 9.15 χ^2 Table of Site Distribution by Tool-Type Richness and Landform Types

Landform	High Obs.(Exp.)	$(o-e)^2/e$	Low Obs.(Exp.)	$(o-e)^2/e$	Row Percent High
Alluvial Fan	11 (6.9)	**2.41**	44 (48.1)	**0.35**	20
Flood Plain	2 (1.3)	**0.43**	8 (8.7)	**0.06**	20
Steep Slope	0 (0.8)	**0.76**	6 (5.2)	**0.11**	0
Terrace	2 (5.3)	**2.05**	40 (36.7)	**0.30**	5
Rocky Bench	3 (3.4)	**0.05**	24 (23.6)	**0.01**	11
Mass Movement	0 (0.4)	**0.38**	3 (2.6)	**0.06**	0
TOTAL	18	**6.08**	126	**0.89**	13

χ^2=**6.97**; df=5; **p>0.25**; Cannot reject H_0

H_0: Observed differences in distributions is due to chance.
H_1: Observed differences in distributions is not due to chance.
Significance level=0.01

9.4 Temporal Patterning of Prehistoric Site Location

In an earlier report (Mierendorf 1991) a chronological scheme was used to classify the collection of hafted bifaces (predominately projectile points) from the project area. Sixteen stylistic (morphological) types were defined. These were placed into five chronologic periods: Early, Early-Middle, Middle, Early-Late, and Late. This sequence has since been refined by incorporating projectile point typologies and chronologies from a larger number of studies from the northern Cascades and immediately adjacent areas. The revision resulted in 15 types which represent five time periods: **Paleoindian** (12,000 to 10,000 BP), **Early** (10,000 to 8,000 BP), **Early-Middle** (8,000 to 4,000 BP), **Late-Middle** (4,000 to 2,000 BP), and **Late** (2,000 BP to Contact). These roughly correspond to periods identified in many regional syntheses for both coastal and interior areas. (See Appendix D and section 10.3 of this report for a discussion of projectile point typology.)

The following analysis is based primarily on projectile points collected from the eroded reservoir bottom. None of these were directly associated with radiocarbon dates. We were able to place 116 projectile points from the project area into the 15 types. Fragmentary specimens and those that could not be otherwise assigned in the typology are not included. Table 9.16 shows the results of the classification, and Figures 9.9 displays the data graphically.

Using the frequency of projectile points per time period as a gross measure of the intensity of human use of the land is misleading, particularly because the units of comparison (i.e., the five time periods) are unequal in duration. For example, the Early-Middle period spans 4,000 years, while the Late-Middle is only 2,000 years. Presenting the data normalized to a standard period of time (500 year interval) eliminates this problem. Figure 9.9 gives a more accurate graphic depiction of these data. Thusly presented, the greatest frequency of projectile points from the project area (per 500 year interval) is in the Late-Middle Period (4,000 to 2,000 BP). Projectile points are not evenly distributed among sites; in fact, approximately one-fifth of the projectile points in the sample come from a single site (45WH79). Including three other sites (45WH231, 45WH262, and 45WH443), nearly 40% of the total number of projectile points are

Table 9.16 Frequency of Ross Lake Projectile Points by Time Period

Time Period	N Projectile Points	Percent
Paleoindian (12,000 to 10,000 BP)	1	1
Early (10,000 to 8,000 BP)	4	4
Early-Middle (8,000 to 4,000 BP)	48	41
Late-Middle (4,000 to 2,000 BP	43	37
Late (2,000 BP to Contact)	20	17
TOTAL PROJECTILE POINTS	116	100

accounted for. To overcome this problem, the frequency of dated *site assemblages* by time period is presented in Figure 9.10. This figure represents the frequency of only those assemblages that, based on projectile points, could be attributed to a single time period. The resulting distribution very closely reflects that found in Figure 9.9, indicating a relative greater number of sites utilized between 4,000 and 2,000 BP.

The ability to measure differences through time in size of site assemblages and in the richness of tool types is compromised by the likelihood that some site assemblages are mixtures of temporally distinct occupations. Due to reservoir erosion of site soil matrices, artifacts from such occupations have been deflated to form a single layer at some sites.

Assemblages of the Early and Late periods, of which there are relatively few, are restricted to the vicinity of Lightning and Hozomeen Creeks. Assemblages dating to the Middle Holocene, which includes both the Early-Middle and Late-Middle periods, tend to be spread throughout the project area and are less restricted spatially than those for

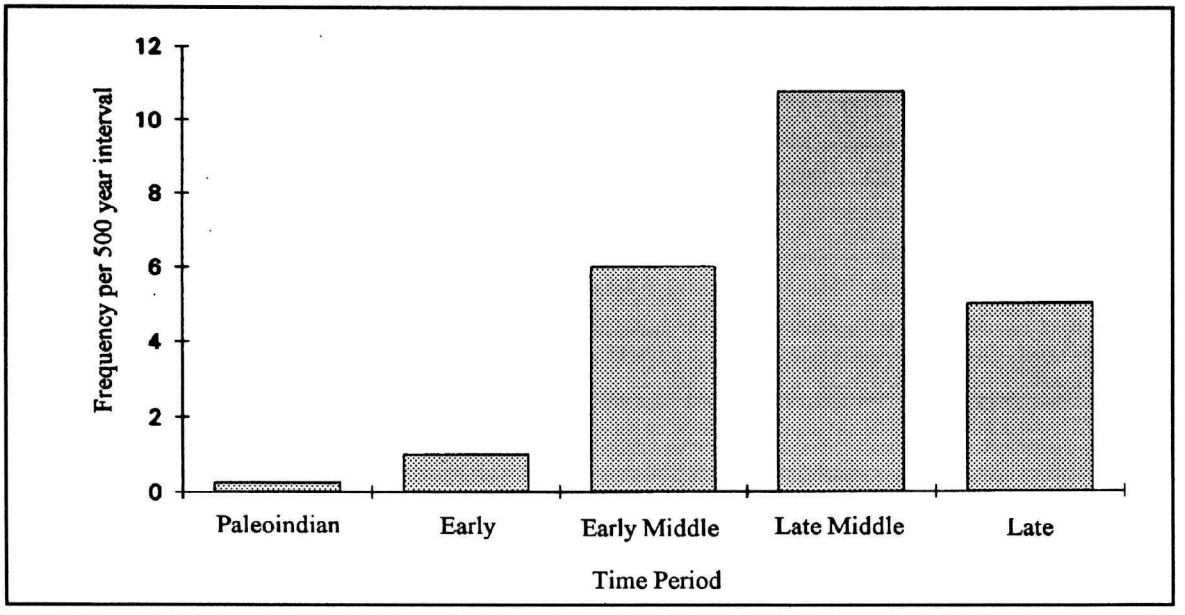


Figure 9.9 Projectile point frequency per 500 year interval by time period

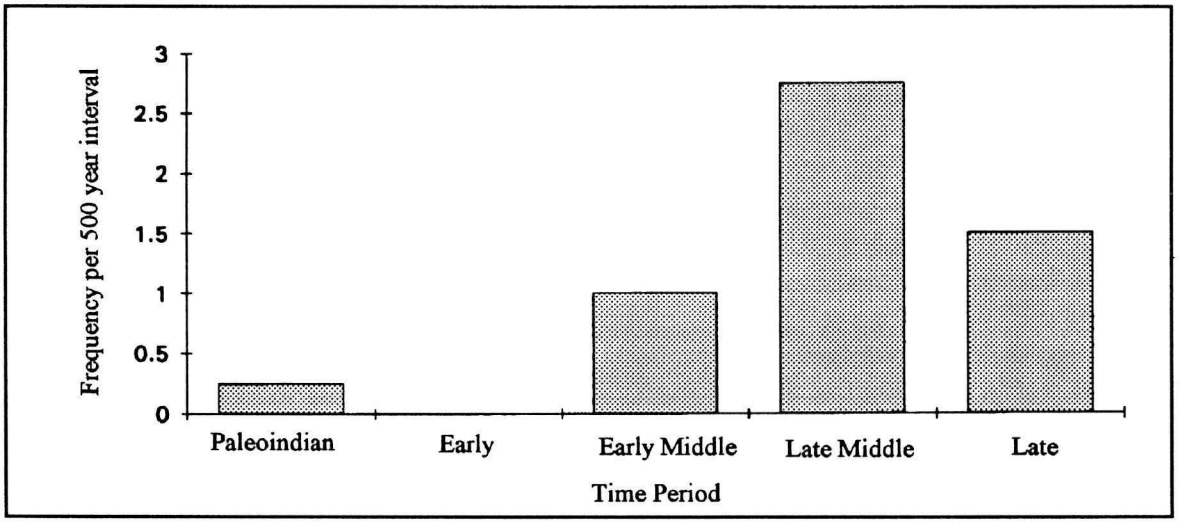


Figure 9.10 Site assemblage frequency per 500 year interval by time period

the Early and Late periods. There tend to be more sites from the Early-Middle and Late-Middle periods, and on a per 500 year basis Late-Middle period sites are the most frequent. This suggests that, based on projectile point-dated assemblages only, there may have been more extensive use of the project area during the Middle Period (8,000 to 2,000 BP), particularly the Late Middle Period (4,000 to 2,000 BP).

The relative decline in Late period projectile points, as reflected in our data, may be due to sampling bias. Only a portion of the upper Skagit River Valley was sampled

in this project. Evidence of prehistoric settlement activity in the valley is likely to be permanently submerged below the minimum allowable reservoir level or covered by sediments deposited by the reservoir. For example, Late period sites may be located on younger land surfaces of the Skagit River flood plain, which was largely covered with a thick layer of mud. Another factor that could contribute to sampling bias is the smaller size of Late period projectile points, which makes them more difficult to see on the ground surface compared with larger projectile points of earlier time periods. Although the patterns in chronological distribution of assemblages outlined here should be viewed with caution, they may be tested against independent data sets acquired in future studies.

9.5 Historic Cultural Resources

Historic cultural resources also were encountered in the project area (Table 9.17). Nearly all historic cultural resources observed in the drawdown are in a deteriorated condition. The land exposed during the 1988 and 1989 drawdowns revealed sections of haul roads, some of which were supported by timber and rock cribbing. These roads may have been built by the dam contractors in the 1930s to transport sand and gravel from a bar along the river about 5.6 km (3.5 mi) downstream to the dam site. These and other haul roads also may have been used or built by the logging contractors. Such features lack the integrity and historic significance required for eligibility to the National Register of Historic Places. Most historic artifacts in the drawdown consist of scattered segments of rusted logging cables and isolated, scattered metal fragments of tools, motor parts, and machinery parts. The sites of neither the Ruby nor Boundary ranger stations were exposed during low drawdown seasons. Although the potential exists, it is unlikely that any remnants of above-ground structural features from these early USFS stations remain.

While none of the historic sites observed in the drawdown tract appear to be eligible for inclusion in the National Register of Historic Places, five sites in the forested tract may have subsurface historic archeological remains that meet eligibility criteria. The structural, above-ground portions of these sites have been evaluated previously and were determined to be ineligible for nomination to the National Register (Luxenberg 1984). It is possible, however, that archeological remains at these sites may contribute important information regarding early Euroamerican settlement of the upper Skagit River Valley. Such remains have the potential to meet criterion d of the National Register of Historic Places. In the remainder of this section the sites are briefly described and recommendations are made for their treatment in the event that they become subject to the effects of ground-disturbing activities. None of the sites have been evaluated on the basis of their subsurface remains.

Table 9.17 Historic Cultural Resources Recorded in the Survey Area

Field No.	Description

88H-11	Scatter of fragments of china plates, cups, glass bottles, and wire rope with some fragments scorched, located near N. buoy near Ruby Pt.
88H-2	Rock Cairn 15 m north of rock ring (1 x 1.5 m oval), part of site 45WH246.
88H-3	Various logging debris, piled and burned.
88H-4	Five rock cairns aligned east-west, each about 2 m apart, with 1 cairn 3 m south of east most: Site 45WH245H.
88H-5	Haul road log stringer bridge.
88H-6	Two boulder-filled (>20 cm diameter) haul road/trail stringer bridge abutments (3 x .8 x 2.5 m). Notched log (20 cm diameter) cribbing with guy wire rope tail-holds on north structure only.
88H-7	Cabin or logging camp scatter (20 x 25 m) with metal, electrical, and wire rope fragments.
88H-8	Scatter of fragments of china plates, cups, glass bottles, wire rope, tools, boat props. Historic component of site 45WH279.
88H-9	Pack trail segment on east bank north of Jack Point. 300 m long with 492 m average elevation.
88H-10	Logging related features: end of haul road, large landing, log cribbing, brush pile, wire rope, whipsaw.
88H-11	Haul road log cribbing.
88H-12	Structural remains of lapstrake boat, 11 m long, with engine mounts, shaft housing, steel prow, steel keel. West of East Landing.
88H-13	Scorched debris west of East Landing.
88H-15	Haul road bridge, collapsed, on road used for map baseline west of Winnebago Flats.
88H-16	Various haul road segments from south of Ten Mile Island to International Boundary.
RCC	Remnants of log structure called Ruby Creek Cabin, 75 m west of 45WH456.
GHC	Remnants of George Holmes' log cabin.
JMH	Remnants of John McMillan Homestead at Big Beaver Creek, river mile 1.9.
TRH	Remnants of Tommy Rowland Homestead between Little Jerusalem Island and Casino Bay.

The historic archeological sites discussed below were examined and described in the field. A planview sketch map was drawn at each site and records made regarding site condition, setting, disturbances, and presence and abundance of historic and prehistoric artifacts. All information was recorded in field notebooks. The sites were photographed using black-and-white prints and color slides. No excavations were made, and no artifacts were collected. Descriptive information about each of the sites was recorded on Washington State Site Inventory Forms and site numbers assigned by the Office of Archeology and Historic Preservation (shown in parentheses behind each site name).

Three of the five sites discussed here were recorded previously in two documents prepared by NPS (Luxenberg 1984, 1986). Of the three, the McMillan and Rowland homesteads were accurately located and described. One site, the Himlock II mining claim (George Holmes Cabin), was misidentified in the earlier study, but has been corrected here. This section of the report updates these earlier documents and reflects the most accurate and current information about these properties.

JOHN McMILLAN HOMESTEAD (37-6)

Although the McMillan homestead is in relatively poor condition, several above-ground structures and features are still visible. A wood frame cabin in an advanced stage of decay rests next to a log barn. The cabin walls have almost completely disintegrated and the barn walls have partially collapsed. A large depression marks the location of a collapsed root cellar and two trash pits and a possible outhouse is southwest of the main house (Figure 9.11).

Historic debris including glass, metal, pipes and stove parts are scattered around the structures. A gravesite with John McMillan's name is north of the house and is marked by a headstone that was replaced several years ago by a Park Service employee (personal communication with Jim Harris). No evidence remains of fences or outbuildings in the greatly overgrown pasture bordering the western edge of the homestead.

Historic records indicate that John McMillan was one of the first white settlers of the upper Skagit Valley. He arrived some time around 1884, and during his long tenure lived on separate occasions with two women. The first is reported to have been a Native American woman from the Thompson River of British Columbia (Jenkins 1984:108). Little is recorded of their life together, but it is possible that the woman's presence had an effect on McMillan's daily subsistence practices. For example, her knowledge and use of wild foods may be manifested in the material artifacts preserved at the homestead. McMillan later married a Caucasian woman and moved his primary residence to a boarding house at the site of Ruby City.

Since the site was abandoned in the 1930s by the Forest Service, the house has collapsed completely and trees, rooted into the timbers and siding, have reduced it to a

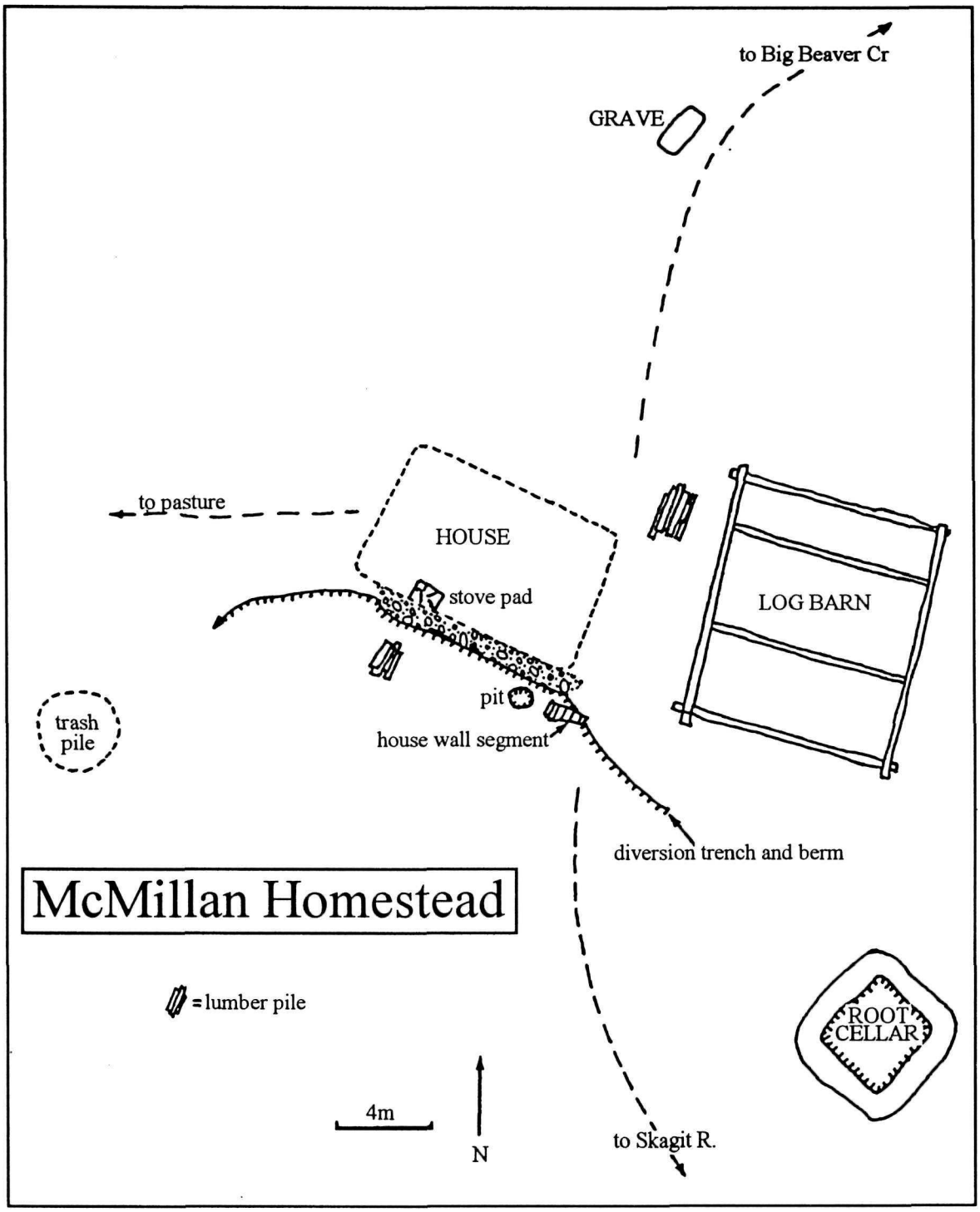


Figure 9.11 Planview map of McMillan Homestead

mound of decayed organic rubble. The barn is in better condition, but it is only a

remnant of its former self. Clearing the structures of encroaching vegetation is a temporary measure, and eventually all above-ground structural remains will disappear.

Early historic occupation sites in the interior of the North Cascades are rare, particularly those with an original gravesite. It is possible that John McMillan's homestead, and the historic artifacts associated with it, embody important and significant information regarding the early mining and frontier history of the upper Skagit River Valley, a way of life only poorly documented in historic records. In the event that the site becomes subject to the effects of proposed ground-disturbing activities, it should first be evaluated for eligibility to the National Register of Historic Places based on information embodied in its subsurface archeological remains.

ROWLAND HOMESTEAD (37-5)

The above-ground structural remains of the Rowland homestead are in poor condition. The barn has collapsed and the house is almost completely gone. Unlike the McMillan homestead, the Rowland homestead has not been invaded by dense forest vegetation. As a result the structural elements are still easily recognized, although they are deteriorated. The roof and most of the walls of the barn are missing and the foundation logs are all that remain of the house.

The Rowland homestead lies in close proximity to a boat-in campground. The increased accessibility to the site offered by the campground and the impoundment of Ross Lake has resulted in some site vandalism. While this activity has probably resulted in the loss of small artifacts and the deterioration of structural elements, buildings and features are still identifiable (see Figure 9.12). The main cabin consists of a rectangular arrangement of decaying foundation logs emanating from a stone fireplace. The log barn has three outer walls and one inner wall still standing. Two collapsed root cellars mark the southern boundary of the site and a stone cairn marks the northern edge. The dilapidated remains of an outhouse are between the main house and a swamp that was once drained by Tommy Rowland. Several small pieces of glass and metal lie scattered over the site with concentrations found around the house and a trash pile east of the house.

Sometime around 1885, Tommy Rowland constructed the buildings found at this site. This homestead operated in conjunction with a pasture and barn on the flood plain of the Skagit River, a location now permanently submerged by Ross Lake. Even though he suffered from mental instability and may have been institutionalized as the result of a conspiracy to obtain his mining claims, Rowland lived in the upper Skagit River Valley longer than any other known historic figures. For over thirty years, Rowland worked his land in virtual isolation.

It is possible that subsurface artifacts and features at this site could reveal important information about Rowland's pioneering life in the upper Skagit River Valley and that

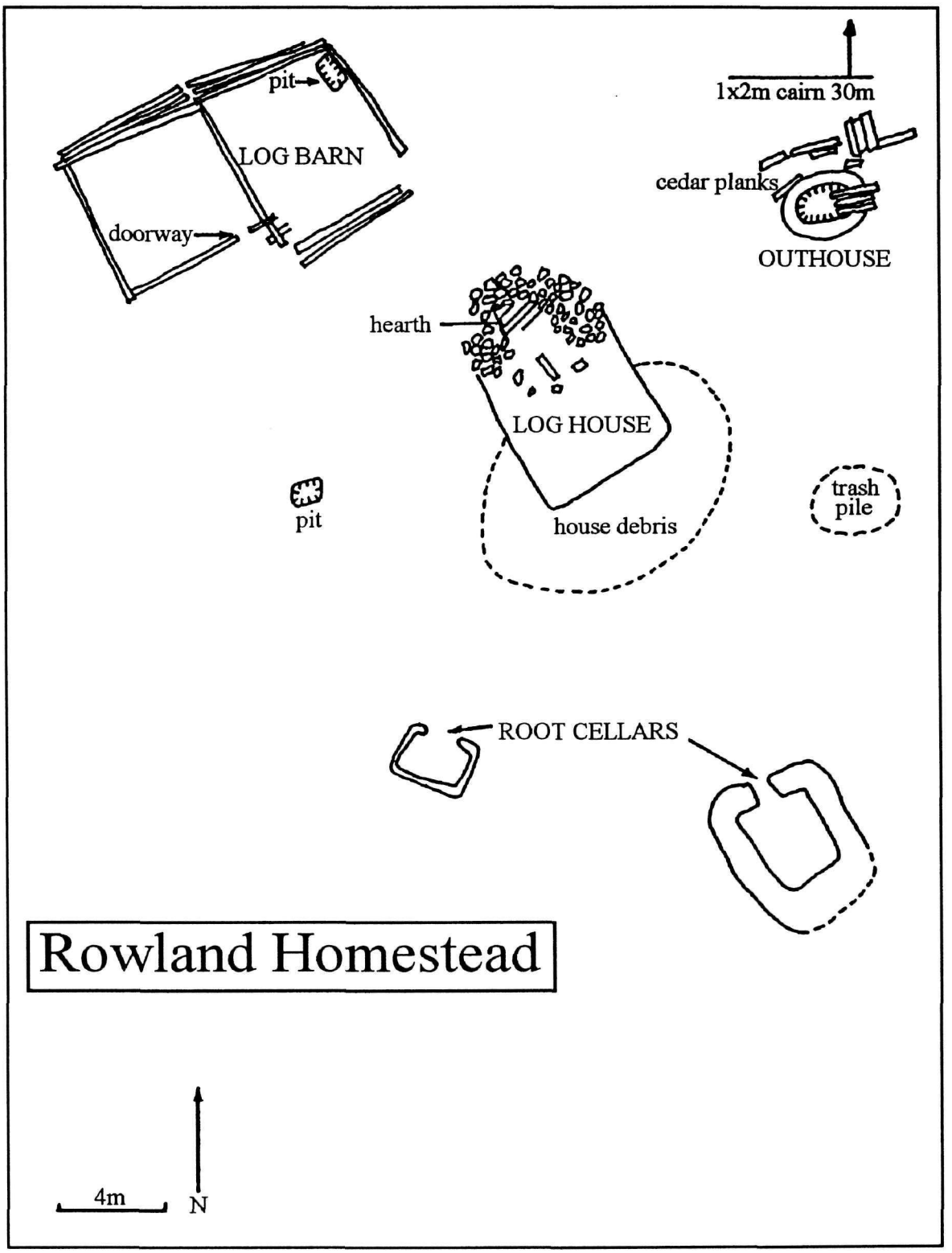


Figure 9.12 Planview map of Rowland Homestead

the site may be eligible for inclusion in the National Register of Historic Places. In the event that the site becomes subject to the effects of proposed ground-disturbing activities, it should first be evaluated for eligibility to the National Register.

RUBY CREEK CABIN (37-4)

The Ruby Creek cabin is located along the south bank of Ruby Creek approximately 40 meters (131 ft) west of its confluence with Panther Creek. The cabin rests on a small terrace cut into the Panther Creek alluvial fan, 4 m (13 ft) above Ruby Creek. There is a collapsed fireplace along one wall (see Figure 9.13), but the absence of metal and trash sets it apart from all but one other historic site in the survey area.

This ruin was recorded previously as the Himlock II mining claim. It may be associated with George Holmes, an early miner of the region, based on the description and map in Luxenberg (1984). However, this cabin and the Holmes cabin are two different sites spaced 350 m (1,148 ft) apart. Observed structural evidence suggests that the Ruby Creek cabin is older and was constructed by a different builder.

The Ruby Creek cabin shows evidence of having burned. The charred exterior of the house logs and unburned interior indicate an external source of the heat, most likely from a forest fire. Burned adze marks dispel the notion that the house logs were procured from burned trees, unlike the Holmes cabin.

The evidence of exterior burning suggests that this house may predate the Holmes Cabin. Because George Holmes used burned trees to construct his cabin, it is possible that the same fire that burned the forest near the Holmes cabin also burned the Ruby Creek cabin. The absence of metal artifacts might indicate greater age, dating the cabin to a time prior to development of the lower Skagit River Valley, when the effort of procuring metal items was prohibitive. However, this reasoning is circumstantial at best, and does not provide conclusive evidence for determining the relative age of the two cabins. Further site investigation is necessary to answer this question.

Finally, architectural characteristics differ between the two cabins. Whereas the Ruby Creek cabin is constructed with dovetail joints at the corners, the Holmes Cabin is built with crude saddle notches. It is, therefore, unlikely that the two were built by the same individual. Although these interpretations are not conclusive, they may be corroborated by analysis of historic artifacts associated with each of the cabins. This evidence also could be used to date the sites.

It is possible that subsurface artifacts and features at this site could reveal important information about early historic settlement in the upper Skagit River Valley and that the site may be eligible for inclusion in the National Register of Historic Places. In the event that the site becomes subject to the effects of proposed ground-disturbing activities, it should first be evaluated for eligibility to the National Register.

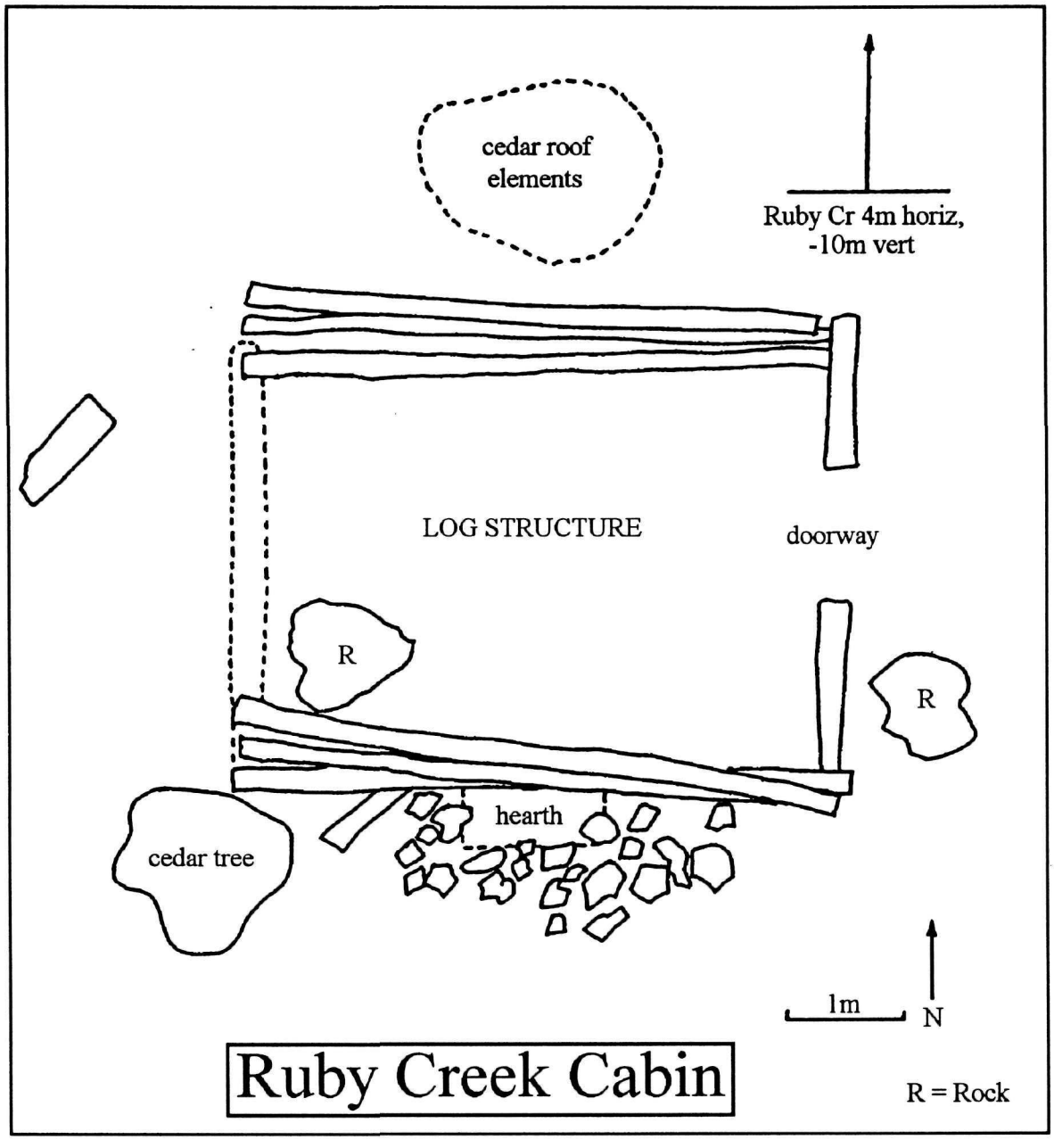


Figure 9.13 Planview map of Ruby Cabin

HOLMES CABIN SITE (37-3)

The George Holmes cabin site is located on the south bank of Ruby Creek approximately 350 m west (downstream) of the Ruby Creek cabin site. This site was not included in Luxenberg (1984) because its presence was unknown to the author. The Holmes site consists of a cabin made of split, saddle-notched logs, various water control features and pipes and several gullied mineral prospects, one of which contains a hand winch and gin pole (see Figure 9.14). Historic trash is abundant and includes bottle glass and various metal objects and equipment. Four walls of the cabin still stand, entries remain evident, and some of the interior furniture can still be seen on the floor.

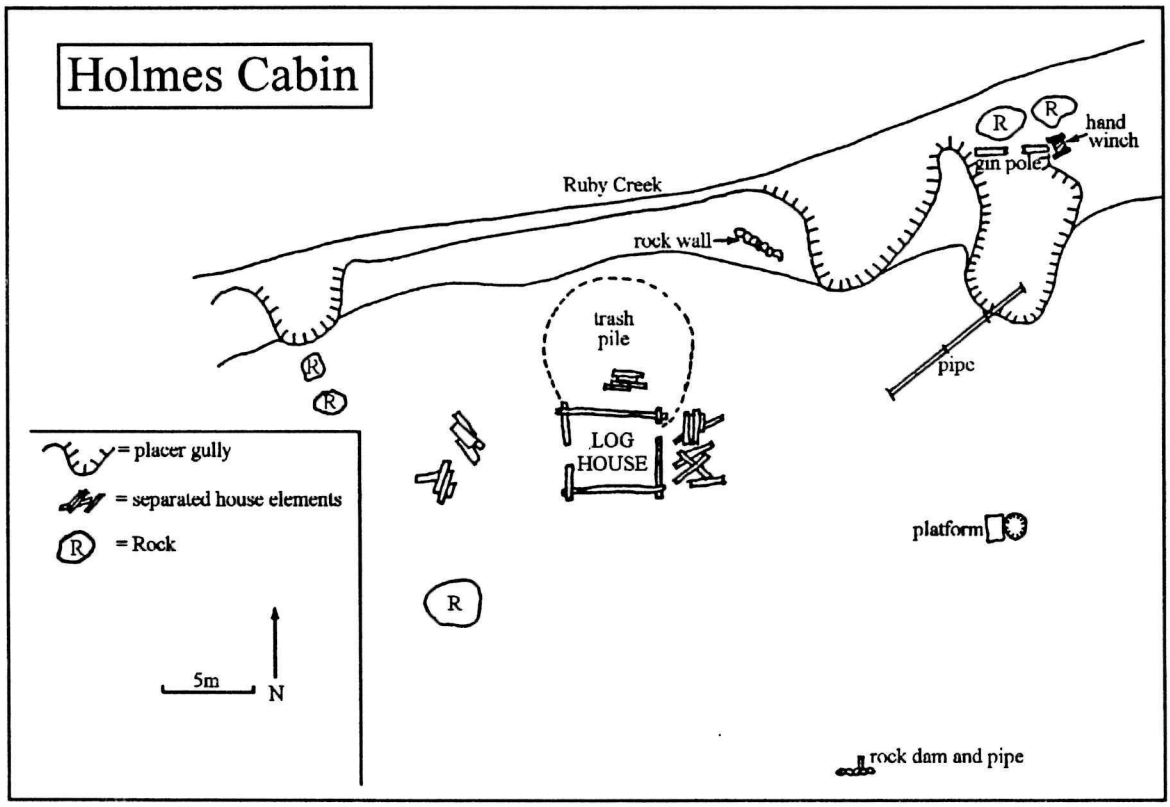


Figure 9.14 Planview map of Holmes Cabin Site

The condition of the cabin today differs from that reported by Luxenberg (1986), where the Holmes cabin is described as no longer standing and that,

> [t]he foundation logs of another cabin remain intact to the west of the Holmes cabin site. This cabin may have been associated with the Himlock mining claims located by G.W. Holmes and F.E. Rautman on April 27, 1903 (Luxenberg 1986:210).

The Holmes cabin is in poor condition. The roof has been removed and the wall logs are rapidly decaying. Although some looting and vandalism have occurred, the site is in stable condition. Test excavations and more detailed mapping and review of the local fire history for this portion of Ruby Creek would likely contribute important new information about George Holmes' life in the Ruby Creek valley, the relationship of this site to the Ruby Creek cabin, and early mining technologies utilized in the North Cascades.

It is possible that subsurface artifacts and features at this site could reveal important information about early historic settlement in the upper Skagit River Valley and that the site may be eligible for inclusion in the National Register of Historic Places. In the event that the site becomes subject to the effects of proposed ground-disturbing activities, it should first be evaluated for eligibility to the National Register.

PANTHER CREEK HISTORIC SITE (45HW456H)

On the East Bank Trail 200 m (656 ft) below Highway 20, a rock shelf has been excavated from the rocky slope above the Panther Creek alluvial fan. A piece of decaying wood suggests that the platform had at least one row of logs on it and a rock step indicates the position of a door. No trash deposits were immediately apparent and no other associated features were found (see Figure 9.15). This stone foundation has not been previously recorded, and it's function and origin are problematic. It may be the foundation of a prospector's cabin dating back to the Ruby gold rush, or it may be a trapper's cabin. George Holmes, the resident of the Ruby Creek cabin, or the U.S. Forest Service may have constructed it. The structure is protected from vandalism by its secluded location. Subsurface testing could reveal important information concerning its age, use, and affinity. It is possible that subsurface artifacts and features at this site could reveal important information about early historic settlement in the upper Skagit River Valley and that the site may be eligible for inclusion in the National Register of Historic Places. In the event that the site become subject to the effects of proposed ground-disturbing activities, it should first be evaluated for eligibility to the National Register.

The historic structures described here constitute the physical remains of residences and work areas of a hardy group of individuals who chose to live in a frontier at the end of the last century. Their tenacity, self-reliance, independence, and resourcefulness are manifested in the structures and artifacts that remain. Investigations using archeological excavation techniques can provide information that complements historic documents and oral histories. In the specific cases discussed here, information from excavation is likely to provide details about aspects of pioneer life, such as diet, access to commercial markets, mining technology, and others. Where historic documentation is lacking, archeological evidence can be the primary source of historic data. Because a number of the recorded structures are of unknown origin, association, and age, archeological testing may provide the only data now available to address these questions.

The Holmes cabin site and the McMillan and Rowland homesteads may qualify for inclusion in the National Register of Historic Places as archeological sites on the basis of information embodied in the association of artifacts that may be present in the upper layers of soil at these sites. The same may also be true of the other historic sites. A program of archeological testing is needed to assess this potential prior to alteration of the integrity of association, setting, workmanship, feeling, materials, design, and location, beyond that which has already occurred. Evaluations for inclusion in the National Register of Historic Places should be performed by a qualified historic archeologist.

9.6 Section Summary and Conclusions

9.6.1 Overall Nature and Distribution of Sites

A total of 150 archeological sites is located in the Ross Lake project area. Prehistoric sites numbered 144, historic sites 6. In addition, 66 isolated artifacts were recorded. The density of sites observed in the drawdown tract is 4.6 sites/km^2 and in the forested tract, 0.8 sites/km^2. Nearly all prehistoric sites consist of scatters of lithic debitage and tools. Some sites also contained faunal remains, mostly burned and fragmented, and/or concentrations of thermally altered rock. There is strong asymmetry in the east-west distribution of sites, with 88% located east of the Skagit River channel. Sites tend to cluster where major tributary creeks enter the Skagit River Valley, but not invariably so. The majority of sites are located in the Lightning Creek-Dry Creek area.

The prehistoric site assemblages are indicative of subsistence pursuits and other economic activities. The formed tools and flaked stone debitage inventoried at the sites represent utilitarian aspects of the material culture of people practicing a hunting, gathering, and fishing economy in a mountainous landscape. This is further corroborated by the physical association of formed tools with indicators of domestic activities, particularly the processing of food (burned animal bone fragments, charcoal, and rock cooking hearths). Additionally, the presence of flaking debris at numerous lithic material sources and the predominance of local rock types in assemblages suggests the importance of procuring stone to the valley's prehistoric inhabitants. Only two artifacts from the project area might be associated with noneconomic, leisure or ceremonial activities, these being carved soapstone pipebowl fragments (from 45WH241 and 45WH303). Both pipebowl fragments were found associated with animal bone cooking features.

9.6.2 Evaluation of the Survey Methodology

The survey was successful in documenting a relatively large number of sites in the project area. Although the survey was planned with the benefit of prior reconnaissance-level data (Mierendorf 1986, 1987a; Mierendorf and Luxenberg 1987), other factors influenced the implementation of the survey and its final outcome. These factors are discussed here briefly.

The number and density of archeological sites observed early in the first field season far exceeded expectations. This required immediate adjustments in the allocation of field staff time for site recording and modifications of field forms to record the diversity of the assemblages being found. By the end of the first field season in 1988, data categories recorded on field forms attained a degree of detail that earlier, simpler forms lacked. Inconsistencies were thus introduced in data recording which we attempted to correct in the 1989 and 1990 field seasons through re-examination and re-recording but this, however, was not always possible.

The survey was designed using an estimated survey rate of 0.16 km^2 (39 acres) per person-day. The actual survey rate for the drawdown tract averaged 0.23 km^2 (57 acres) per person-day. This does not include travel or other support activities. These rates may be useful to others designing or implementing site surveys.

The definition of "site" and "isolated find" adequately met the needs of the research design to record all visible evidence of prehistoric cultural activity. Most sites far exceed the minimum artifact total required by the definition (two artifacts or one artifact and one feature) and only in one locality was there ambiguity in separating sites on a landform of immense scale (Lightning Creek alluvial fan).

Overall, the drawdown survey provided intensive coverage of a ground surface having good visibility of cultural resources. It is not likely, however, that all sites in the drawdown tract were found. Isolated finds, very small sites, very low density lithic scatters, and historic/prehistoric trails were surely missed. In field seasons subsequent to the surveys, we recorded additional sites in the drawdown tract that we had missed earlier. It is likely that new sites will be encountered in the future.

In surveying the forested tract, crew members initially used small, portable screens of .63 cm (1/4 in.) mesh size in order to sift soil removed from trowel-excavated holes. Through trial and error a more successful strategy was discovered wherein the trowel edge was used to carefully shave thin (ca. 1 mm [.394 in.] thick) layers of mineral soil at a time. A number of sites were thus found in the forest survey tract based on the presence of small pressure flakes that otherwise would have fallen through the screen mesh.

These survey data are likely to be statistically biased. "Biased," as used here, means that the data are not to be considered *a priori* a representative sample of some hypothetical or real universe. First, the data are not representative of all landform types in other montane environments, although they surely represent ubiquitous landform types, such as alluvial fans, glacially scoured bedrock forms, glacial terraces, steep slopes of valley walls, and mass wasting deposits. Second, the data are not representative of all landform types within the Skagit River Valley or the project area. Third, the range of artifact categories and their relative proportions are not likely to be representative because different artifact categories exhibit different "visibilities." For example, it is

likely that pecked, battered, or ground stone artifacts are underrepresented in the artifact inventories because their shapes and colors are matched by the bouldery and rocky sedimentary matrices of project landforms. Probably the most underrepresented and least recognizable artifact category is fire-modified rock. This is due also to the bouldery character of landform surfaces, and additionally, to the fact that natural freeze-thaw cycles and ground fires create some fire-modified rock morphologies. Clearly recognizable fire-modified rocks occur in rock aggregated features, charcoal-rich hearths, and on landforms characterized by sandy sediments where rocks of any kind are exotic to the local terrain.

9.6.3 Summary of Results

In summarizing these results, they will be used to answer three general questions relating to prehistoric land use in project area.

1. Is there geographic variability in the use of different segments of the upper Skagit River Valley as represented by the Ross Lake project data?

The majority of larger site assemblages (those with >40 items) are located in the northern half of the project area. Tool-type richness seems to be higher in the northern part of the project area, particularly around the Hozomeen Creek and Boundary Bay areas. It declines southward from there. The co-occurrence of these two attributes indicates possible effects of sample size. Higher tool-type diversity may be attributable to site reuse over time rather than to a large number of different activities taking place during single occupations. Sites with faunal remains and/or FMR concentrations are found throughout the project area, but also tend mostly to be in the Hozomeen Creek and Boundary Bay areas. As a proportion of total sites in a cluster, faunal remains and/or FMR concentrations are also highest in these two areas, although the Lightning Creek cluster comes close in terms of the actual number of such sites there.

A total of 18 different lithic material categories was recognized in the entire project area. Hozomeen chert and metasediment dominate the assemblages in all site clusters. Generally, the greatest variety of lithic materials is found in the northern part of the project area, at Boundary Bay, followed by the Hozomeen and Lightning Creek clusters. The greatest number of sites with nonlocal lithic materials is at Lightning Creek, although it is not much greater than in the Hozomeen Creek, Boundary Bay, and Roland Creek clusters. However, the proportion of such sites by cluster is much higher in the Hozomeen Creek area, although the differences are not statistically significant. In the entire project area local lithic material types account for 97% or more of the total number of objects recorded. Hozomeen chert tends to dominate assemblages in the middle part of the study area (Lightning and Dry Creeks), and its relative contribution declines north and south from there, where it is replaced by metasediment or other local forms of MCS.

Explanations for these differences in site assemblages between Hozomeen Creek/Boundary Bay areas and the rest of the project area may be due to differences in the use of the landscape. At the Hozomeen Creek and Boundary Bay sites, a greater proportion of large sites, combined with greater number of features present and less concentrated use of Hozomeen chert, may indicate more expedient use of near-site lithic resources in conjunction with subsistence activities, such as hunting. In the Dry Creek and Lightning Creek areas, sites may be relatively more specialized and less related to subsistence activities such as hunting. The higher relative abundance of small sized sites with lower tool-type diversity and a lower proportion of sites with features or faunal remains suggest many are related to procurement and reduction of Hozomeen chert. A more detailed study of lithics from the tested sites of each area may shed more light on this question. The combined data suggest differences in land use between the upper, middle, and lower segments of this twenty-four mile long reach of the upper Skagit River Valley.

2. Are there differences in the use of the various kinds of landforms found in the project area?

Distribution of sites by landform type shows definite preferences for certain landforms in project area. Although numerically most sites are located on alluvial fans, many more sites than expected (assuming that use is in proportion to area of landform type) occur on bedrock benches and terraces; far fewer than expected occur on steep slopes. Large- and medium-sized sites tend to be found on alluvial fans, terraces and bedrock benches. Sites with high tool-type richness make up the highest proportion of sites on the flood plain and alluvial fans, followed by bedrock benches and terraces. Because these differences are not statistically significant, chance factors cannot be ruled out in explaining the distributions. Factors that may influence preferences for terraces and bedrock benches for site location include the relative stability of these surfaces over time (little deposition or erosion); the presence of a particular resource in greater abundance than on other landforms, such as lithic raw materials; and their location on the landscape may be ideal for maximizing access to multiple resources; for instance, these particular landforms may be on the boundary between different land-use zones in the project area; they are flat and accessible. Like the answer to the first question, the data suggest differences in land use for parts of the project area, in this case on different landform types.

3. Are there changes through time in the use of various parts of the upper Skagit River Valley?

Based on projectile point ages, most sites in the project area appear to date from 8,000 to 2,000 BP with the greatest concentration dating to the latter part of this time period (4,000 to 2,000 BP). Both Early (10,000 to 8,000 BP) and Late Period (2,000 to 150 BP) projectile points are restricted to Hozomeen and Lightning Creek areas, while Middle Period projectile points tend to be found throughout the project area. It is

difficult, however, to determine how accurate this depiction of changing land use through time is because we lack data for large parts of the valley, especially the flood plain.

9.6.4 Conclusions

The results of these investigations may contribute to an understanding of the prehistory of other areas of the Pacific Northwest. Traditional and current models of Pacific Northwest prehistory pay scant attention to the use of interior montane environments and could not have predicted the intensity of use documented in the project area. If these findings are broadly representative of the scale of prehistoric use of other large, interior mountain valleys, then it is likely that many hundreds of archeological sites remain undiscovered in the Cascade Mountains of Washington State.

Within the context of interior montane settings, the data provide an opportunity to investigate the influence of key environmental variables on settlement patterns. The strong east-west asymmetry in site distribution, for example, may be a predictable response to environmental factors that are operative in numerous other montane settings. In the case of the upper Skagit River Valley, the great preponderance of sites located on the east side of the valley coincides with the largest expanses of flat landforms, the greatest solar insolation, more xeric open vegetation, and protection from avalanches. In contrast, canyon segments and steep valley walls, where solar insolation is low, flat landforms are few, and avalanches are common, present a pattern characterized by few and small sites (Mierendorf and Luxenberg 1987; Lewarch and Larson 1990). These results suggest that microenvironmental variability is reflected in human selection of particular landforms by site function (cf. Thompson 1978) and that references to an undifferentiated "upland" environment are likely to obscure important patterns in land uses.

Site density serves as a useful, albeit rough, measure of the overall intensity of land use in the project area. Use of this variable helps to clarify and quantify the problem of finding archeological sites in densely forested tracts by providing a comparison with an adjacent unvegetated tract offering good ground visibility. The intensive and reconnaissance-level surveys documented a large number of archeological sites and found a high site density on some landforms. These results are in marked contrast with the results of earlier surveys, which concluded that prehistoric Indian people made little if any use of the upper Skagit River Valley (Rice n.d.a.) or that found minimal evidence of prehistoric use of this portion of the valley (Grabert and Pint 1978). The survey results also invalidate claims that prehistoric sites in the project area are probably confined to the banks of the Skagit River, or that prehistoric people made no use of steep valley walls, and that "there are not many places where archeological sites might logically be expected" (Rice n.d.a.). On the contrary, there are many places where archeological sites ought to be expected. When compared with the density values of other surveys in the region and beyond, the density of sites observed in the drawdown tract is comparable to site densities reported from other systematic, intensive

archeological surveys from mountainous landscapes of western North America (Mierendorf 1986: Table 5-4, p. 104).

10. TESTING RESULTS: SITES ASSESSED AS ELIGIBLE TO THE NATIONAL REGISTER OF HISTORIC PLACES

10.1 Introduction

This section describes the results of the test excavations conducted at 16 sites in the reservoir drawdown. The physical location, setting, artifact inventory, chronology, function, stratigraphy, and condition of each site is described and discussed. Each of the sites is assessed as eligible to the National Register of Historic Places based on criterion D of the Register (note that each site assessment stands as a recommendation until the Washington State Historic Preservation Office concurs with the assessment, after which time the sites will have been formally determined eligible). Most generally, the effects of nearly five decades of reservoir operations have resulted in erosion and dispersion of soils and, often, of the archeological remains contained within them. While conducting the site inventory and test excavations described here, it became clear that few sites retained integrity of location and association of artifacts, features, and sedimentary matrices. Consequently, the sites described in this section either wholly or partially contain artifact associations, cultural features, soils, or sedimentary strata that had escaped erosion and the loss of site integrity. The specific categories of information in each site that contribute to its National Register significance is described in section 13 of the report. Table 10.1 provides a summary of information about each of the 16 sites.

10.2 Results of Site Testing

10.2.1 45WH224 (FS#48) Desolation Chert Quarry

This site consists of a prehistoric chert quarry covering a sizeable area (>15 acres) of a steep hillside within the project area. It is bisected by the drawdown and forested tracts. Most of our knowledge of this site is derived from a test and evaluation of the forested part of the site (Mierendorf 1993a). Although the drawdown portion above the 1,492 ft contour line is severely eroded and appears to lack integrity, this portion may contribute to the site's eligibility due to the superlative nature of the site itself and the extent and quantity of flaking debris. It is important to note that the portion of the site below the 1,492 ft contour has yet to be exposed above the reservoir pool. Testing of this lower portion will be necessary to accomplish a complete assessment of the site. Stabilization of bank faces may be necessary to conserve intact artifact-bearing deposits eroding at the reservoir shoreline.

Additional information regarding this site is not presented in this report because more than any other site in the project area, its significant qualities are at risk from degradation due to vandalism, looting, loss and removal of artifacts, and degradation from visitation. Detailed information regarding this site is on file in the project records.

Table 10.1 Summary of Eligible Site Information

Order	FS/Smith	Name	Pg.	Site Type	Activity/Function	Location	Elevation	Age BP	No. of Artifacts	Volume (m^3)	Significant Remains
1	48 (WH224)	Desolation Chert Quarry	100	high-density lithic scatter & rockshelter	quarrying	confidential	488 m 1,602.5 ft	7,600-290	Uncounted	>60,730	extensive Hozomeen chert quarry
2	54 (WH234)	East Landing #1	102	moderate-density lithic scatter	short-term base camp, hunting	Hozomeen area	477 m 1,569 ft	6,800-2,000	246 chipped stone, 49 bone	1,620 640 intact	Mazama ash, faunal remains, intact soil
3	57 (WH237)	Casino Bay #1	111	moderate-density lithic scatter	lithic reduction workshop	Roland Pt. area	465 m 1,527 ft	older than 230	1,015 chipped stone	150 106 intact	biface reduction workshop
4	59 (WH239)	Casino Bay #3	118	moderate-density lithic scatter	procurement and prep of local material	Roland Pt. area	480 m 1,575 ft	6,000-1,400	33 chipped stone	450	climatic and sedimentary depositional history of the Holocene
5	61 (WH241)	Casino Bay #4	127	moderate-density lithic scatter & high-density bone layer	short-term base camp, mammal butchering	Roland Pt. area	476 m 1,563 ft	1,900-1,400	123 chipped stone, 2896 bone, 2 teeth	1,812	midden-like burned bone layer, identifiable taxa, pipe bowl
6	73 (WH253)	N. Tenmile Is. #2	134	low-to-moderate density lithic scatter	lithic reduction workshop	Tenmile Is.	482 m 1,580 ft	7,000-500	443 chipped stone	2,325	lithic reduction, intact soil
7	75 (WH255)	N. Tenmile Is. #3	141	low-density lithic scatter w/2 circular FMR features	task site for processing local resources	Tenmile Is.	477 m 1,565 ft	500-180	13 chipped stone, 2 hearth features	5,040 1,000 intact	intact hearths
8	82 (WH262)	Devil's Junction Cr. #2	147	high-density lithic scatter	lithic reduction workshop & biface manufacturing	Devil's Cr. area	479 m 1,570 ft	7,000-300	4,979 artifacts, including 58 bifaces	640 450 intact	specialized biface manufacturing, Hozomeen chert biface workshop
9	88 (WH268)	N. Lightning Cr. #4	165	high-density lithic scatter	task site for processing local resources	Cat Is. area	473 m 1,550 ft	4,000-1,000	53 chipped stone	100 intact	intensive biface manufacturing
10	95 (WH275)	N. Lightning Cr. #7	172	moderate-density lithic scatter	task site for processing resources	Lightning Cr. area	485 m 1,590 ft	unknown	124 chipped stone	1,680 1,100 intact	microblade technology
11	103 (WH283)	Boundary Bay #4	179	high-density lithic scatter w/diverse tool and raw materials	tool manufacturing, food & processing local resources	S. Boundary Bay	473 m 1,550 ft	1,500-1,200	566 artifacts	3,300 ~300 intact	many formed tools, microblade technology, and food preparation
12	106 (WH286)	Lightning Cr. #10	189	low-to-moderate density lithic scatter	short-term base camp for hunting	Lightning Cr.	468 m 1,535 ft	4,000-2,000	111 artifacts	1,800	woodworking (adz blade) and microblade tech. (blades and cores)
13	120 (WH300)	Perry Point #2	200	moderate-to-high density lithic scatter & FMR features	seasonal residential site	Little Beaver Cr.	462 m 1,515 ft	1,950-1,650	73 artifacts of chipped stone and bone	2,500	large residential site, intact hearths, microblade technology
14	123 (WH303)	Hozomeen Cr. #5	213	moderate density lithic and FMR scatter, & burned bone	short-term base camp & ungulate butchering	Hozomeen Cr.	482 m 1,580 ft	500	46 chipped stone, 107 bone	250 intact	soapstone pipe bowl, climatic and depositional flood plain Holocene record
15	197 (WH473)	N. Cat Island #10	225	low-density lithic scatter & 2 FMR features	task site for processing ungulates	Cat Island area	465 m 1,523 ft	400-300	18 lithic artifacts, 54 bone	<100	intact hearth
16	214 (WH496)	Boundary Bay #18	230	moderate-density lithic scatter	lithic reduction workshop, biface manufacturing	Boundary Bay	467 m 1,532 ft	4,000-2,000	52 chipped stone	77	intact artifact-bearing soil

For information regarding the significance, age, functions, and regional context of the site, the site testing report (Mierendorf 1993a) should be consulted.

10.2.2 45WH234 (FS#54) East Landing #1

Site Setting

This site is located on the east side of the valley at the northern portion of the project area, about 2.4 km (1.5 mi) south of the Hozomeen vicinity. It is circa 500 m (1,640 ft) south of a log-cribbed structure known as East Landing and within the main arterial of the historic logging haul road used to clear the drawdown prior to impoundment of reservoir waters. The site is situated at 477 m (1,560 ft) elevation on the distal end of a small alluvial fan that has been built on the Skagit River flood plain by an intermittent creek. The historic main channel of the Skagit River flows circa 1 km (.6 mi) west of the site and circa 6 m (20 ft) lower in elevation. The landform has a western solar exposure and a slight 0-3% slope to the west. From this location one looks west across the broad Skagit River flood plain, to the western valley wall which is split where Silver Cr. joins the Skagit valley, and beyond that is the glaciated Mt. Spickard massif, which forms the headwaters of Silver Cr. At the back (east) of the site the land rises steeply (to an elevation of 1,342 m [4,400 ft] in less than a mile) to the rock walls and buttresses of Little Jackass Mtn. The moderate-density artifact scatter that comprises the site is oblong and is confined to the distal end of the alluvial fan. The western and northern site boundaries are defined by a natural stream-eroded escarpment of the distal end of the fan. The eastern boundary is the abandoned reservoir haul road. The southern boundary spills out for a short distance on the adjacent Skagit River flood plain.

Historic logging, logging haul road construction, and reservoir erosion have been the primary sources of disturbance to the site. The southern, western, and northern margins of the site are most severely eroded where the force of waves is dissipated against the sloping landform escarpment. Near the base of this escarpment are a series of reservoir "strand lines" consisting of the redeposited sands and silts, soil particles, and artifacts. Haul road construction involved grading of the site surface along the road alignment and the construction of a small, adjacent turn-out. Prior to vegetation clearing and impoundment of reservoir waters, the vegetation, as inferred from the remaining stumps, consisted of an open canopy, mature, conifer forest.

General Site Description

The site dimensions are circa 90 m (295 ft) north-south and circa 45 m (148 ft) east-west, which covers an area of 4,050 m^2 (43,571 ft^2) (Figure 10.1). Artifact depth, determined during testing, ranged from the surface to 80 cm (32 in) below the surface. Using a mean depth of 40 cm (16 in), it is estimated that 1,620 m^3 (57,169 ft^3) of artifact-bearing deposits are at the site. The site is characterized as a moderate-density lithic scatter. The types of artifacts present are projectile points, formed tools, debitage, cores, and charred faunal remains. The lithic material types in the chipped stone assemblage consists of a high proportion of locally available Hozomeen chert and

metasediment with minor amounts of exotic chalcedony and jasper. Also, a variety of vitrophyre (igneous) material is present in the debitage assemblage. It is not known if this material is from a local or exotic source.

Testing Methods and Rationale

This site was observed and noted during a reconnaissance of the drawdown in March of 1988, just prior to the beginning of the project survey (Mierendorf 1987b). The site was fully documented and recorded in 1989 by project crew members, and was tested and surface collected in 1989. Testing was performed by excavation of two 1 x 1 m (39 x 39 in) test units, one 1 x 3 m (39 x 118 in) shovel skim unit, and eight 50 x 50 cm (19 x 19 in) test pits. Site sediments were excavated in 10 cm (3.94 in) levels and screened through .64 mm (.25 in) wire mesh.

The test units were situated in the vicinity of the highest density of artifacts exposed on the surface. Test units 1 and 2 were placed on the western edge of the site midway between the severely eroded sloping distal end of the alluvial fan to the west and the graded flats of the haul road turn-out to the east. Test unit 3 was placed on a small wave-deposited terrace near the eroded base of the alluvial fan in order to gather a sample of the abundant burned animal bone fragments that had been eroded from the site sediments. This 1 x 3 m (39 x 118 in) block was shovel skimmed and screened through .32 cm (.125 in) and .64 cm (.25 in) mesh screen. Only the loose, redeposited sediments were removed and no vertical provenience data was recorded because the artifacts within lacked locational integrity other than their known association with the site. The series of smaller test pits were positioned to more clearly delineate the vertical and horizontal site boundaries.

Table 10.2 Inventory of Surface Collections from 45WH234

	NCCA
1 Projectile Point, Hozomeen Chert	7111
1 Core, Hozomeen Chalcedony	7112
1 Biface, Hozomeen Chert	7169
1 Flake, Hozomeen Chert	7170
1 Scraper, Hozomeen Chert	7171
24 Bone Fragments: 22 Unidentifiable; 1 Mandible, Beaver; 1 Incisor, Rodent	7673
4 Bone Fragments, Unidentifiable	7695

Description of Testing Results

The total assemblage of artifacts observed at the site includes a projectile point, a core, a biface, a scraper, chipped stone debitage, and numerous charred animal bones. Cultural remains excavated from test units and pits consist of debitage and charred animal bones. A total of 246 chipped stone artifacts and 49 charred bone fragments was

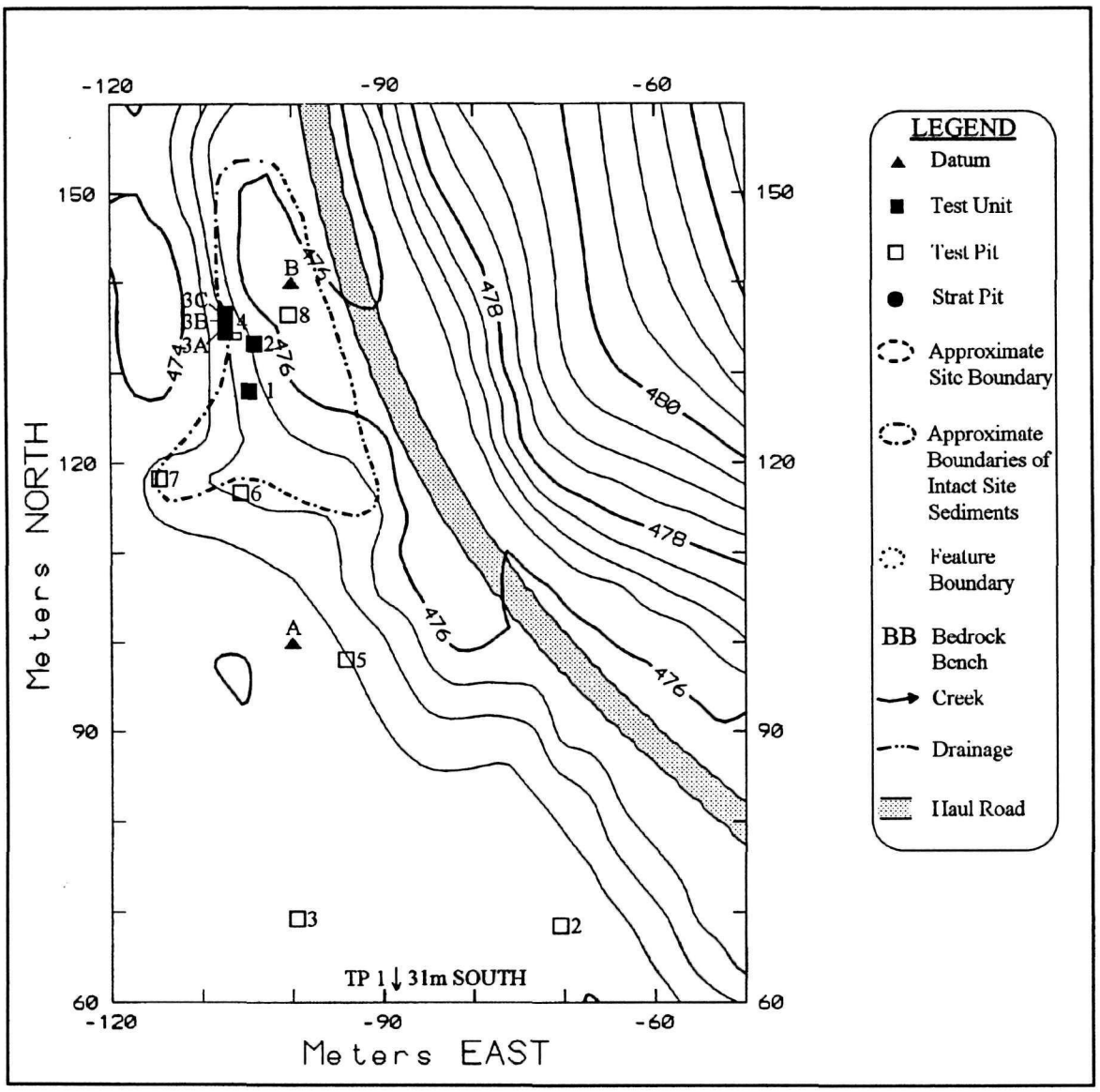


Figure 10.1 Topographic map of Site 45WH234 (FS 54)

recovered from the excavated deposits. Of these, 203 chipped stone artifacts and 8 bone fragments were excavated from intact soil B-horizon deposits from test units 1 and 2 and from test pit 8. The remaining artifacts were recovered from reservoir-disturbed deposits. No features of cultural origin were observed at the site.

The western edge of the terrace has sustained severe erosion from wind-generated waves breaking against the sloping, distal end of the alluvial fan. The erosive effect of the reservoir shoreline is mitigated somewhat by the gravelly nature of the landform. The abundance of cobble and boulder-size clasts in the sedimentary matrix of the alluvial fan have helped to armor the site deposits and forestall the complete loss of site integrity.

Unlike most sites within the reservoir, intact, artifact-bearing deposits exist to some depth below the surface.

One diagnostic artifact was found on the eroded site surface. The projectile point (NOCA 7111), manufactured of Hozomeen chert, is classified as a Type 10C (Rabbit Island Stemmed). Formed tools from the eroded site surface consist of a multi-directional flake core (NOCA 7112), an oval-shaped Stage III biface fragment (NOCA 7169), and a crescent-shaped, bifacially-flaked tool with a steeply-beveled margin that appears to have served as a scraping edge (NOCA 7171).

The majority of chipped stone debitage from the intact site deposits consists of complete and broken flakes with a lesser amount of shatter. A small portion of the flakes are biface-thinning flakes of high quality Hozomeen chert, Hozomeen chalcedony, and metasediments, indicating that manufacture of locally-available lithic raw materials into bifaces was undertaken. Two exotic lithic raw material types, obsidian and vitrophyre, also were used at the site. The obsidian is a broken piece of a pressure flake, probably detached from a tool during resharpening of a margin. Two vitrophyre flakes excavated from intact site deposits in test unit 1, one from level 2 and one from level 5, were submitted for XRF analysis. Both specimens produced chemical signatures that did not match any known source, and both were tentatively assigned to Unknown Source 1 (see section 10.7). Based on visual comparison of macroscopic characteristics with other vitrophyre debitage collected from archeological sites in North Cascades National Park (unpublished site records and collections), and with the mapped distribution of volcanic rock types in the North Cascades, it is possible that the unknown source is west of the Ross Lake area, within the Hannegan Volcanics or Skagit Volcanics mapping units (Staatz et al. 1972; Mierendorf 1987b). Both of these mapping units are west of the project area.

Only two of the charred bone fragments recovered from the site are identifiable to a taxonomic level. Both are from the eroded site surface. One of these is a beaver (*Castor canadensis*) mandible and the other is a rodent incisor (cataloged in lot NOCA 7673). The remaining bones are too fragmented for identification. This degree of fragmentation could be the result of intentional crushing by the site inhabitants in order to extract bone marrow and bone grease.

The following table shows, by level, all cultural material collected from excavation units at this site.

Table 10.3 Cultural Material From Excavation Units at 45WH234

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Flake, Hozomeen Chalcedony	7172
	1 Tephra, Unidentifiable	7718
L:2 (20-30 cm BD)	6 Debitage, Metasediment, Vitrophyre	7174

L:3 (30-40 cm BD)	5 Debitage, Hozomeen Chert, Metasediment	7180
	2 Bone Fragments, Unidentifiable	7697
L:4 (40-50 cm BD)	6 Debitage, Hozomeen Chert, Vitrophyre	7175
	2 Bone Fragments, Unidentifiable	7696
L:5 (50-60 cm BD)	5 Debitage, Metasediment, Vitrophyre	7173
L:6 (60-70 cm BD)	6 Debitage, Hozomeen Chert, Metasediment	7179
L:7 (70-80 cm BD)	11 Debitage, Metasediment	7176
L:8 (80-90 cm BD)	1 Debitage, Metasediment	7177
L:9 (90-100 cm BD)	3 Debitage, Hozomeen Chert, Metasediment	7178

test unit: 2 (1x1 m)

L:S (surface)	8 Debitage, Hozomeen Chert, Metasediment	7190
L:1 (10-20 cm BD)	19 Debitage, Hozomeen Chert, Metasediment, Vitrophyre	7192
L:2 (20-30 cm BD)	20 Debitage, Hozomeen Chert, Metasediment	7186
L:3 (30-40 cm BD)	45 Debitage, Hozomeen Chert, Metasediment	7187
L:4 (40-50 cm BD)	44 Debitage, Hozomeen Chert, Metasediment, Obsidian	7189
	3 Bone Fragments, Unidentifiable	7702
L:5 (50-60 cm BD)	8 Debitage, Hozomeen Chert, Metasediment	7191
L:6 (60-70 cm BD)	8 Debitage, Hozomeen Chert, Metasediment	7185
	1 Bone Fragment, Unidentifiable	7698
L:7 (70-80 cm BD)	3 Debitage, Hozomeen Chert, Metasediment	7188
L:8 (80-90 cm BD)	0 Collections	

test unit: 3 (1x3 m)

L:S (Surface)	14 Debitage, Hozomeen Chert, Metasediment	7160
	7 Debitage, Hozomeen Chert, Metasediment	7161
	4 Debitage, Hozomeen Chert, Metasediment	7162
	2 Debitage, Vitrophyre	7163
	16 Bone Fragments, Unidentifiable	7699
	8 Bone Fragments, Unidentifiable	7700
	8 Bone Fragments, Unidentifiable	7701
	9 Bone Fragments, Unidentifiable	7703

test pit: 1 (50x50 cm)

L:S (Surface)	0 Collections
L:1-5 (5-55 cm BS)	0 Collections

test pit: 2 (50x50 cm)

L:S (surface)	0 Collections
L:1 (10-20 cm BS)	0 Collections

test pit: 3 (50x50 cm)

L:S (surface)	0 Collections	
L:1-2 (10-30 cm BD)	0 Collections	
L:3 (30-40 cm BD)	1 Tephra Sample, Source Unknown	7717

L:4-6 (40-70 cm BD)	0 Collections	
test pit: 4 (50x50 cm)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	2 Debitage, Hozomeen Chert, Metasediment	7184
L:2 (20-30 cm BD)	1 Debitage, Hozomeen Chert	7183
L:3 (30-40 cm BD)	1 Debitage, Hozomeen Chert	7182
L:4 (40-50 cm BD)	1 Debitage, Hozomeen Chert	7181
test pit: 5 (50x50 cm)		
L:S (surface)	0 Collections	
L:1-6 (10-70 cm BD)	0 Collections	
L:7 (70-80 cm BD)	1 Debitage, Metasediment	7165
test pit 6 (50x50 cm)		
L:S (surface)	0 Collections	
L:1-7 (10-80 cm BD)	0 Collections	
test pit 7 (50x50 cm)		
L:S (surface)	0 Collections	
L:1-3 (10-40 cm BD)	0 Collections	
L:4 (40-50 cm BD)	1 Flake, Metasediment	7164
L:5 (50-60 cm BD)	0 Collections	
test pit 8 (50x50 cm)		
L:S (surface)	0 Collections	
L:1-3 (10-40 cm BD)	0 Collections	
L:4 (40-50 cm BD)	8 Debitage, Hozomeen Chert, Metasediment	7168
	Tephra, Mazama O, Glacier Peak B, M, or G	7719
L:5 (50-60 cm BD)	3 Debitage, Hozomeen Chert	7166
L:6 (60-70 cm BD)	2 Debitage, Hozomeen Chert	7167
L:7 (70-80 cm BD)	0 Collections	

Site Chronology

Due to the diffuse and scattered distribution of charcoal, no samples were collected. Of the three tephra samples collected, one was selected for electron microprobe analysis. This sample was selected because it appeared to be a remnant of a primary layer and because it was bedded within intact artifact-bearing deposits. The provenience of the sample and the results are shown below.

Table 10.4 Table Of Identified Tephra from 45WH234

TU	Level	NOCA	Bulk Glass	Glass 1
TP8	L-4	7719	Mazama O	Glacier Pk B, M, or G
Number of shards analyzed			19	2

The sampled tephra layer is likely to be from the 6,800 BP eruption of Mt. Mazama. As shown in the table, two anomalous glass shards exhibited a chemical signature matching an earlier eruption of Glacier Pk. There are two possible explanations for this occurrence. One is that the sampled tephra layer is a secondary deposit that was mixed with tephra from Glacier Pk. after one or more erosional-depositional cycles. Another is that the sampled ash is a primary deposit and that plant root growth or rodent or insect activity introduced the earlier volcanic tephra into the primary layer from the surrounding sedimentary matrix. Although neither explanation can be confirmed with any certainty, it is tentatively concluded that the tephra layer is a primary deposit. If this is the actual case, then the few artifacts excavated from below the tephra layer are older than 6,800 radiocarbon years.

The only other means presently available for estimating the age of the occupation is by typological dating of the one time-sensitive projectile point found at the site. This tapering stemmed, triangular point (NOCA 7111) is classified as a Type 10C (Rabbit Island Stemmed). Based on regional radiocarbon chronologies, such points are assigned an age between 4,000 and 1,500 years BP. From these data, it can be concluded at present that site 45WH234 was occupied by prehistoric people during a timespan beginning prior to 6,800 years ago and continuing perhaps to 2,000 years ago.

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 10.2. The site is partially capped by a gravelly sandy reservoir deposit containing flaked stone and burned bone artifacts that have been eroded from the site soils. In some parts of the site, the eroded tops of subsoil layers outcrop on the landform surface. Under this eroded surface (erosional unconformity) is a strongly weathered, dark reddish-brown, gravelly silty sandy B-horizon. In test pit 8 this B-horizon is differentiated into upper and lower subunits based on the Mazama O tephra. If the ash layer is primary, then the upper subunit is younger than 6,800 BP and the lower is older than 6,800 BP. This soil horizon grades into an underlying yellowish-brown, gravelly silty sand BC-horizon, which grades, in turn, into a brown, matrix-supported, sandy bouldery gravel. The relatively high content of gravels (granules, pebbles, cobbles, and boulders) in the sedimentary matrix is derived from the colluvium at the base of the steep valley wall.

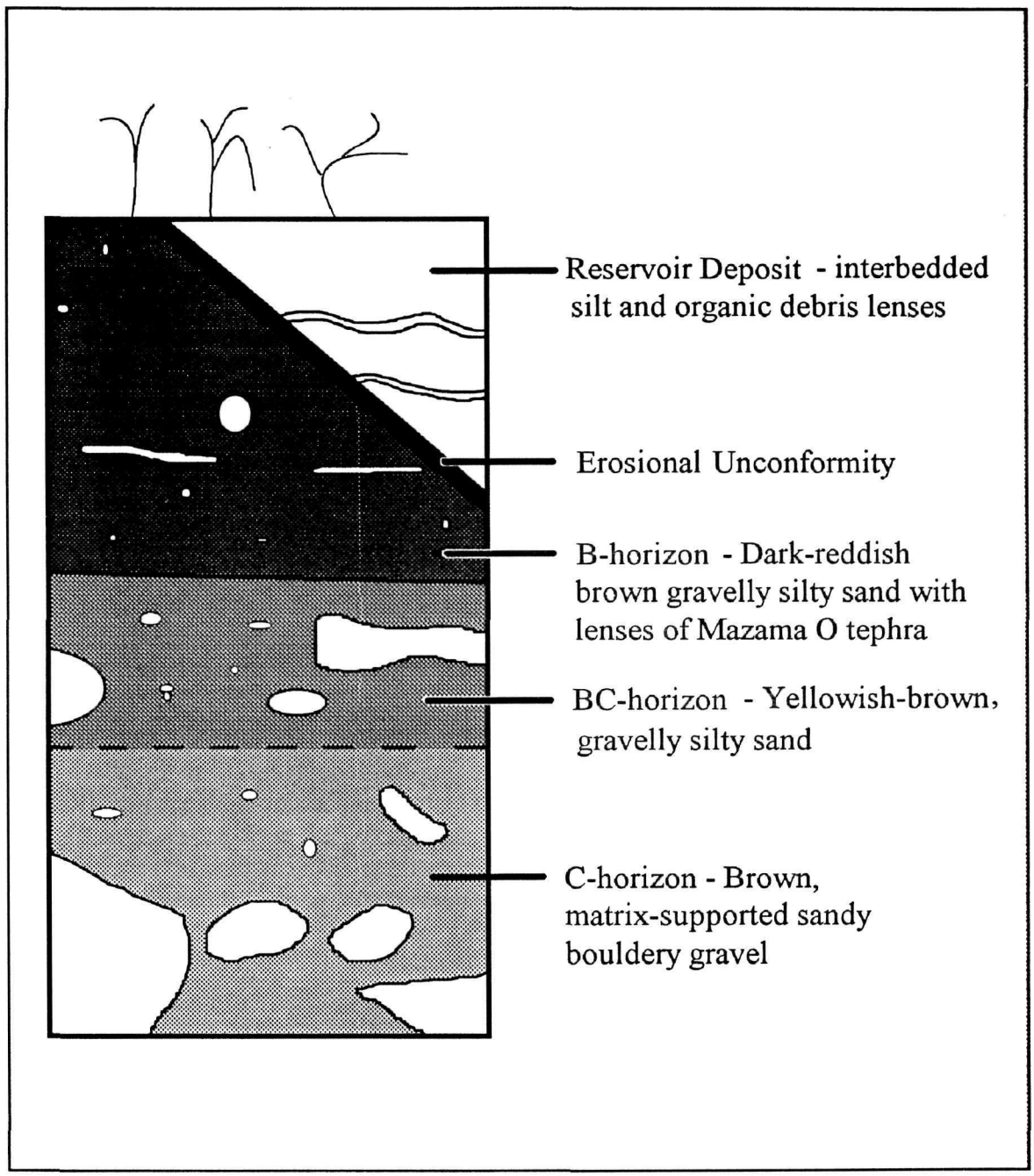


Figure 10.2 Generalized schematic of stratigraphy at Site 45WH234 (FS 54)

Only a part of the depositional history of the landform can be inferred from surficial and morphological characteristics and from the weathering profile of the soil that caps it. Sometime prior to the eruption of Mt. Mazama, 6,800 years ago, the alluvial fan had begun to build through the deposition of sands and gravels from the adjacent western base of Little Jackass Mountain. The stratigraphic column exhibits a fining-upward sequence. The largest rock fragments accumulated early in the fan's growth, followed by a decrease in the average size of the gravels in the upper deposits. The

gravels are supported in a fine-grained sandy and silty matrix, indicating that alluviation, and possibly aeolian deposition, contributed to the fan's growth. Vertical accretion of the fan surface continued after the deposition of Mazama tephra layer O, possibly into the historic period. The overall rate of deposition appears to have been very slow and to have permitted the continual weathering of the deposits, with the concurrent formation of an iron-rich soil B-horizon. It also provided a landform stable enough for use by the prehistoric occupants of the valley.

Other parts of the alluvial fan may have a different depositional history than the one inferred here. Above the haul road that marks the eastern site boundary, the fan surface is covered with large angular boulder blocks that have tumbled down from the bedrock walls above. Such colluvial deposition is likely to be on-going today, and consequently, it would be invalid to conclude that the portion of the alluvial fan abutting the valley walls (proximal end of the fan) is stable. Site 45WH234 occupies the extreme distal end of the fan.

Conclusions and Assessment

Site 45WH234 appears to have served as a short-term or seasonal base-camp for prehistoric occupants of this part of the valley during the mid-Holocene. The periods of occupation were probably intermittent and of short duration, involving small groups of people. The artifact assemblage indicates hunting, lithic manufacture, butchering, cooking, and probably consumption of beaver and other mammals. These inhabitants relied mostly on the locally-available chert and metasediments to manufacture their tools. Notably represented in the assemblage of chipped stone debitage are biface thinning flakes from the production of bifaces, and possibly, from the sharpening of tool edges. The use of vitrophyre from as yet unidentified sources, but ones probably located in the mountains to the west of the valley, suggests that the occupants traveled into the Silver Cr. drainage to hunt and procure stone for their tools.

Reservoir-induced erosion and logging activities related to vegetation clearing have adversely affected portions of this site. Nevertheless, intact and undisturbed artifact-bearing deposits remain under the reservoir bottom. They occupy an area approximately 40 m long by 20 m wide by 80 cm deep, and have an estimated volume of 640 m^3 (22,585 ft^3). Within these intact deposits were excavated chipped stone and burned bone artifacts. A lens of volcanic ash assignable to the 6,800 BP eruption of Mt. Mazama suggests that cultural remains may be separable into pre-6,800 and post-6,800 artifact assemblages.

Site 45WH234 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts they contain retain integrity of location and association. Through scientific excavation and study of these deposits, the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest region.

10.2.3 45WH237 (FS#57) Casino Bay #1

Site Setting

Located near the southern end of the project area, this site is on the east side of the valley, on the southern end of Roland Pt. The main part of the site is situated at 465 m (1,527 ft) elevation on a small glacial terrace remnant deposited between two bedrock benches. These benches constitute the lower portion of a weakly-defined bedrock ridgeline that leads to the summit of Roland Pt. The site has two distinct parts. The flat, main portion of the site is on the glacial terrace remnant and a contiguous, glacially scoured bedrock surface. This part of the site overlooks Roland Cr. and its alluvial fan; the creek's channel is circa 4.0 m (13 ft) below the site. The site also overlooks the Skagit River, which flowed .85 km (.5 mi) to the south and 75 m (247 ft) lower in elevation. The other portion of the site is on the steep (40% gradient) southern side of the ridgeline. Here a cluster of redeposited chipped stone debitage was observed at the base of the slope, where it meets Roland Creek's alluvial fan. The site has a northern-eastern-southern exposure. Prior to reservoir impoundment, one could look south into the head of the Skagit River gorge, the beginning of an approximately 16 km (10 mi) long rock-walled canyon; west to a portion of the Skagit flood plain near the mouth of Big Beaver Cr.; north to the forested hills of glacially-rounded Roland Pt.; and east to where the skyline was dominated, as it is today, by the abrupt rise of the steep, western slopes of Jack Mtn., 2,763 m (9,063 ft) in elevation. The artifact scatter that comprises the site is irregular in shape, and except for that portion of the scatter at the base of the slope, is clearly bounded by the sharply-defined terrace edges.

Historic logging of the drawdown area and reservoir erosion have been the primary sources of disturbance. The portion of the artifact scatter on the ridgeline slope appears to have eroded from the flat terrace and bench above and then to have slid down the slope. Secondary disturbance processes include penetration by large tree roots and the activity of burrowing rodents. The pre-reservoir vegetation, as inferred from the remaining stumps, consisted of small clustered stands of conifers on an open grass and brush-covered bench.

General Site Description

Dimensions of the main portion of the site are 10 m (32.8 ft) north-south and 30 m (98.4 ft) east-west, an area of 300 m^2 (3,228 ft^2) (Figure 10.3). The cluster of redeposited artifacts at the base of the slope has dimensions of about 10 x 30 m (32.8 x 98.4 ft). Artifact depth of the intact portion of the site, as determined during testing, ranges from the surface to 60 cm (23.64 in) below the surface. The estimated volume of intact, artifact-bearing deposits at the site is 138 m^3 (4,873 ft^3). The site is characterized as a moderate-density lithic scatter. When it was recorded, the scatter extended from the top of the bedrock knob, across the sandy saddle (glacial terrace remnant), to the toe of the ridgeline slope. The types of artifacts present at the site are biface fragments, cores, debitage, and possibly some fire-modified rocks. The stone raw material types represented in the chipped stone assemblage consist almost exclusively of

the locally available varieties of Hozomeen chert. There is also a small proportion of metasediments. One presumed nonlocal material, a quartz crystal, was found on the site. One bifacially worked flake is made of a banded brown chert or metasediment of unknown source.

Testing Methods and Rationale

The site was documented and recorded during the first project field season in the spring of 1988. It was reexamined and the redeposited cluster of artifacts was documented in the 1989 field season. The site was tested in 1990 through the excavation of two 1 x 1 m (3.28 x 3.28 ft) test units. Deposits were excavated in 10 cm (3.94 in) levels and screened through .64 cm (.25 in) wire mesh. After the realization during excavation that small flakes were passing through the .64 cm (.25 in) screen of test unit 2, the screened backdirt was rescreened through .32 cm (.125 in) wire mesh to recover the small debitage. Both test units were placed on the top of the terrace remnant in order to locate undisturbed cultural deposits. The artifact cluster on the bedrock bench formed a lag concentration of the bedrock surface.

Table 10.5 Inventory of Surface Collections from 45WH237

	NOCA
1 Quartz Crystal	7924

Description of Testing Results

The assemblage of artifacts observed at the site consists predominately of chipped stone flakes and shatter, a few irregular cores, biface fragments, and a euhedral, mostly transparent, quartz crystal exhibiting little, if any, evidence of cultural modification. Compared to other sites in the drawdown, cultural materials were found buried relatively deeply within an intact soil B-horizon. A total of 1,015 pieces of chipped stone was recovered from intact deposits in the two test units. Only one artifact was recovered from the disturbed reservoir deposits. Although the sloping edges of the terrace remnant have sustained wave erosion and some areas of the site surface have been eroded into the weathered subsoil, artifacts within intact deposits retain integrity of location and association.

The debitage recovered from test unit 1 includes biface thinning flakes of high quality Hozomeen chert and chalcedony and secondary reduction flakes and shatter of poorer quality Hozomeen chert varieties. This suggests that chert nodules were procured locally and reduced on-site through primary reduction.

The much larger assemblage from test unit 2 also consists predominately of percussion flakes and shatter of Hozomeen chert and chalcedony. Only a very small proportion of the raw material here is made from the local metasediment. Most of the

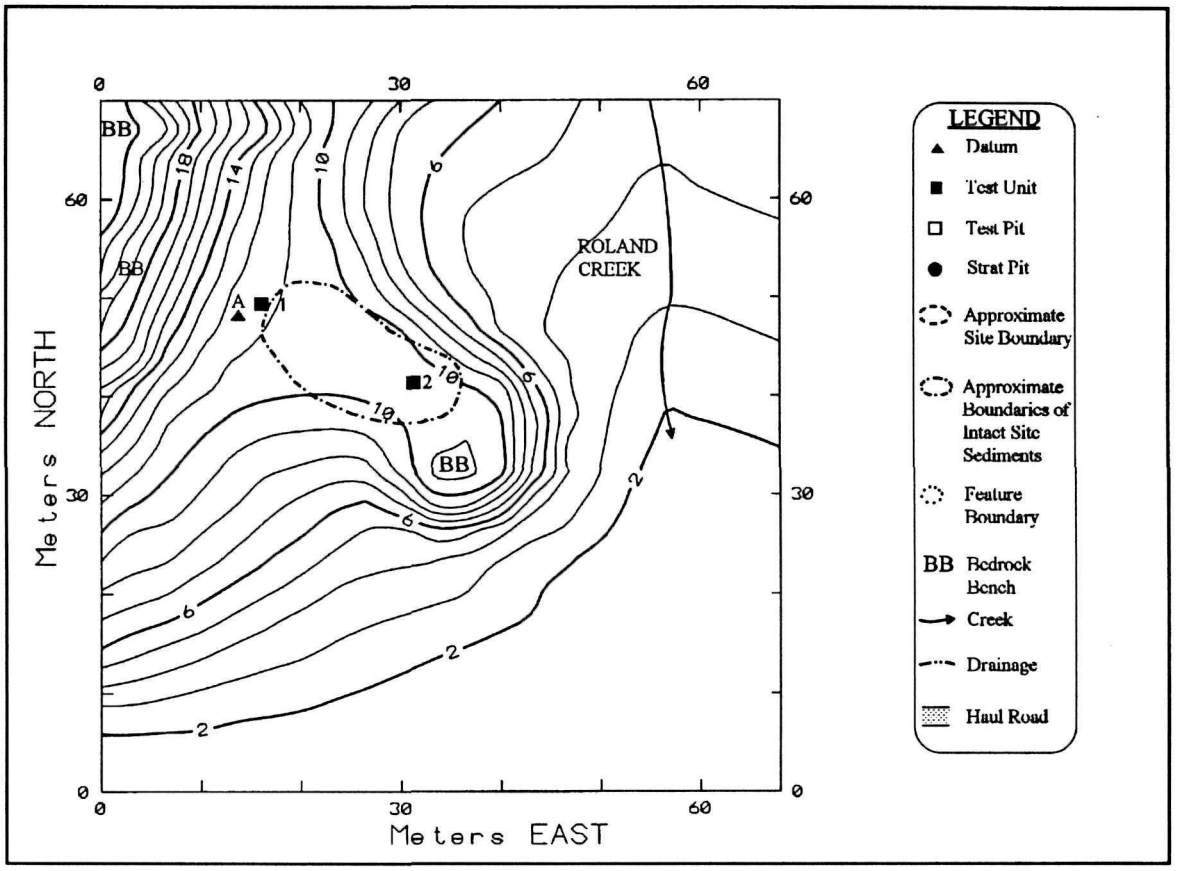


Figure 10.3 Topographic map of Site 45WH237 (FS 57)

whole and broken flakes lack cortex and are indicative of secondary reduction of chert by percussion flaking techniques. There is a significant proportion of biface-thinning flakes, many of which are thin and fragmented. Pieces of shatter are common but not abundant in the assemblage. Cortex surfaces on shatter are of two kinds: that characteristic of weathered bedrock and that of glacial or alluvial fan gravels. A few pieces of shatter in the assemblage are morphologically identical to a lithic reduction artifact category recognized at the Desolation Chert Quarry (45WH224) that is termed bedrock corner (Mierendorf 1993:E-4). This artifact category is comprised of fragments of stone that were removed from outside corners or protrusions of outcropping chert bedrock. The sample of debitage retained in the .32 cm (.125 in) mesh screen (NOCA 7908) consists of flake and shatter fragments. Although a few clear biface thinning flakes are present, the majority of flakes resulted from biface margin preparation during the initial stages of biface production. Such margin preparation flakes appear to have resulted from percussion flaking and edge abrasion and grinding.

No diagnostic artifacts, cultural features, or clearly-defined strata of cultural origin were found at the site. Based on the lithic assemblage, the site is the location of a major lithic reduction workshop where the locally procured varieties of Hozomeen chert were reduced into early-stage bifaces.

The table below shows all cultural material collected from excavation units, by level, from site 45WH237.

Table 10.6 Cultural Material From Excavation Units at 45WH237

test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	7 Debitage, Hozomeen Chert	7883
	2 Debitage, Hozomeen Chert	7884
L:2 (20-30 cm BD)	1 Debitage, Hozomeen Chert	7885
	13 Debitage, Hozomeen Chert	7886
	11 Debitage, Hozomeen Chert	7887
L:3 (30-40 cm BD)	1 Debitage, Hozomeen Chert	7888
	1 Debitage, Hozomeen Chert	7889
L:4 (40-50 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	0 Collections	
L:2 (20-30 cm BD)	1 Debitage, Hozomeen Chert	7890
L:3 (30-40 cm BD)	281 Debitage, Hozomeen Chert	7891
	91 Debitage, Hozomeen Chert	7892
	17 Debitage, Hozomeen Chert	7893
	53 Debitage, Hozomeen Chert	7895
	1 Biface, Chert	7894
L:4 (40-50 cm BD)	4 Debitage, Hozomeen Chert	7896
	114 Debitage, Hozomeen Chert	7897
	31 Debitage, Hozomeen Chert	7898
	54 Debitage, Hozomeen Chert	7899
	^{14}C, 230$\pm$80 BP, Beta 40693	
L:5 (50-60 cm BD)	34 Debitage, Hozomeen Chert	7900
	10 Debitage, Hozomeen Chert	7901
	3 Debitage, Hozomeen Chert	7903
	23 Debitage, Hozomeen Chert	7909
	1 Biface, Hozomeen Chert	7902
L:6 (60-70 cm BD)	4 Debitage, Hozomeen Chert	7904
	3 Debitage, Hozomeen Chert	7905
	3 Debitage, Hozomeen Chert	7906
	15 Debitage, Hozomeen Chert	7907
L:7 (70-80 cm BD)	0 Collections	
L:1-L:7	236 Debitage, .32 cm (.125 in) Screen, Hozomeen Chert	7908

Site Chronology

No clear tephra strata or time-sensitive artifacts were observed at or collected from the site. Estimation of the site age and time of occupation is based on one radiocarbon date, shown in the table below, and on the degree of soil B-horizon development. The charcoal sample from the site was collected *in situ* from the top of the strongly weathered soil B-horizon matrix. It was found as a small concentration in direct association with chipped stone artifacts. The sample is probably of cultural origin, and it lacked association with rodent burrows or roots. Flaking debris was excavated from stratigraphically above and below the sample. Two bifaces were found in this test unit, one above the ^{14}C date and one below. These two bifaces were the only formed artifacts found in a specifiable context relative to the radiocarbon dated sample. The upper biface (NOCA 7894) consists of a bifacially worked flake fragment made on a fine-grained, banded brown chert or metasediment. Margins of the flake had been used as a cutting or scraping tool. The lowermost of the biface fragments (NOCA 7902) is classified as Stage II (defined in Appendix A) which represents an early-stage in the sequence of biface manufacturing.

Table 10.7 Table Of ^{14}C Dates from 45WH237

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU2	L-4	Beta 40693	230±80

If this date provides a reliable estimate of the site age, it indicates only that the site was used before and up to about 230 radiocarbon years ago. However, judged by soil B-horizon field properties, the thickness and color (reddening) are indicators of strong weathering, suggesting an age measured in thousands of years. It is likely that site use spanned a long time.

Site Stratigraphy

The generalized site stratigraphic sequence is shown in Figure 10.4. The uppermost stratum is a reservoir deposit with stratified sands, gravelly sands, and clayey silts resulting from exposure of the landform to erosion-deposition cycles alternating between high-energy wave action and low-energy reservoir siltation. In some locations in the tested portion of the site, the reservoir deposits are thin to nonexistent. In these cases the top of the eroded soil B-horizon is exposed on the site surface. In areas covered by reservoir deposits, an intact stratum of pre-reservoir forest duff mixed with charcoal marks the original forest floor. The underlying soil B-horizon displayed two recognizable substrata in test unit 2. The uppermost substratum consists of a thin, dark brown, charcoal-mottled sandy loam, with the sand fraction being dominated by very fine sand and silt. The radiocarbon dated charcoal sample (230±80 years) was recovered from the top of this stratum, a few centimeters under the forest duff above it. The lower

substratum consisted of a dark brown, gravelly sandy clay loam, with the gravel content increasing with depth to the bottom of the test unit. The gravel fraction in both test units included boulders up to 45 cm (17.73 in) in diameter. A high density of flaking debris was found within both B-horizon substrata of this site. Only a part of the depositional history of the landform can be inferred from the available evidence. In the late Pleistocene, at a time when this part of the valley was covered by a large lobe of the

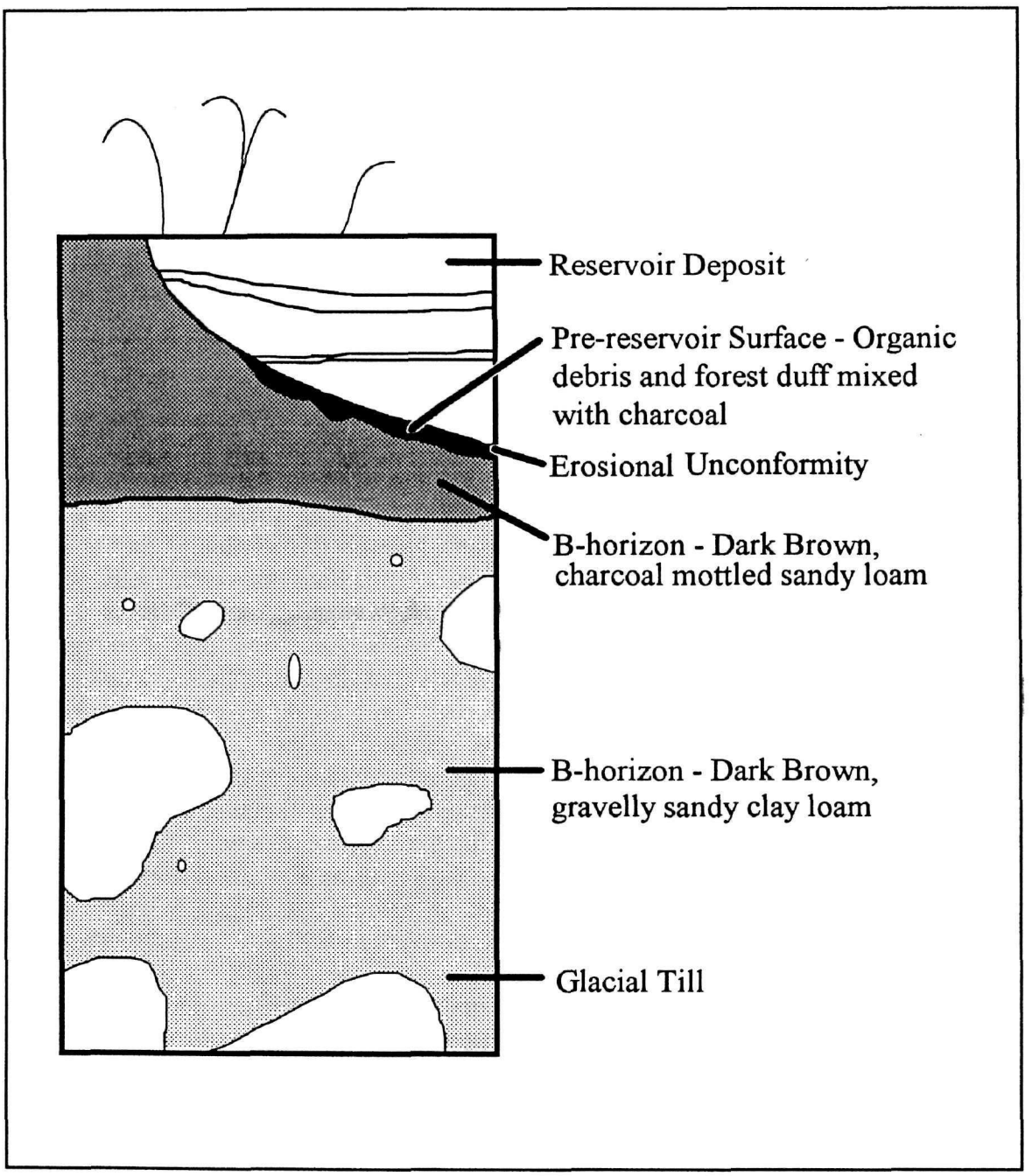


Figure 10.4 Generalized schematic of stratigraphy at Site 45WH237 (FS 57)

Cordilleran ice sheet, and during its melting and retreat, vast deposits of glacial gravels and sands filled the Skagit River valley. The terrace landform today is an eroded remnant of the formerly more extensive moraine deposits. During the Holocene, river downcutting and erosion removed many of the glacial deposits from the inner valley, leaving small uneroded remnants in areas protected by physiographic features. Also during the Holocene, the top of the landform accreted vertically through the accumulation of fine-grained flood plain loess and other sediments transported by wind and by colluvial movement of soils and sediments down the adjacent steep slope of the ridgeline. It was during the later stages in the accumulation of this fine-grained cap that humans began to use the landform as a workshop for the manufacture of stone tools.

Conclusions and Assessment

Site 45WH237 appears to have served as a lithic reduction workshop during the manufacture of early-stage bifaces made of Hozomeen chert. Unlike most other sites in the drawdown, this site represents a specialized workshop area. Although other subsistence activities may have occurred here, conclusive evidence to support such an assertion is absent.

The location of the site on a promontory just above Roland Cr. alluvial fan is likely to be related to its function. More than any other alluvial fan in the project area, Roland Creek's fan contains an abundance of high flaking quality Hozomeen chert. At least two color varieties of Hozomeen chert in the fan can be distinguished from other varieties noted within the project area. Because Roland Creek's watershed is small and restricted to the western face of Jack Mtn., somewhere on this portion of the mountain are inferred one or more outcrops of high quality chert that are the source of the gravels found incorporated into the alluvial fan matrix. It is possible that Hozomeen chert bedrock quarries, of the general type exemplified by the Desolation Chert Quarry, may exist somewhere on Jack Mtn. In addition to Hozomeen chert, lithic samples from Roland Cr. include soapstone and serpentine (see section 10.6 and G-2 for a description).

Reservoir-induced erosion and historic logging activities associated with vegetation clearing have eroded some of the artifact-bearing deposits at the site, yet undisturbed, intact deposits with artifacts remain at some depth below the reservoir bottom. These deposits occupy an area approximately 22 m (72 ft) long by 8 m (26.24 ft) wide by 60 cm (23.6 in) deep, and thus have an estimated volume of 106 m^3 (3,743 ft^3). These deposits comprise the remaining significant portion of the site.

Site 45WH237 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.4 45WH239 (FS#59) Casino Bay #3

Site Setting

The site is located along a small intermittent stream about 500 m (1,640 ft) east of Roland Cr., on the east side of the valley, near the southern end of the project area. The site is at 480 m (1,575 ft) on a remnant alluvial fan surface on the south side of the intermittent stream. The fan surface has a gentle (0-3%) slope to the southwest. The site is surrounded by low, rounded and streamlined glacial hills, except where the intermittent stream has cut a deep, narrow channel to the southwest as it drops to the surface of Roland Cr. alluvial fan and flows on to join the Skagit River. North of the site, this stream is confined to the bottom of an ancient glacial meltwater channel that was initially incised into the glacial deposits as the stream flowed along the eastern margin of the melting ice lobe. Whenever the reservoir is at full pool, the lower end of this meltwater channel forms a narrow but distinctive bay or re-entrant along the shoreline of Ross Lake. Prior to creation of the reservoir, the site occupied this shady, reclusive hollow and was nearly surrounded by dense, high forest that offered only a narrow view to the southwest, where it looked out on the Skagit River channel 1.1 km (0.7 mi) distant and 90 m (295 ft) lower in elevation. Beyond the Skagit River is the rocky and glacially-scoured valley wall which rises along the line of Sourdough Ridge to an elevation of 1,825 m (5,985 ft). North and south of the site the ground rises to gentle moraine crests. To the east the land rises steeply through the avalanche slopes to the alpine summit of Jack Mtn. at 2,763 m (9,063 ft).

The artifact scatter defining the site is oblong and conforms precisely to the eroded alluvial fan remnant that fills the bottom of the meltwater channel. The southern, western, and northern boundaries of the artifact scatter are defined by the erosional fan escarpment with the stream at its base, and it is bordered on the east by the abrupt rise in slope to higher glacial landforms deposited at the base of Jack Mtn.

Reservoir-induced wave erosion and clearing of vegetation in the drawdown have been the primary sources of disturbance to the site. Due to its location in a narrow bay of the reservoir, erosional effects are not severe and have been confined to the surface of the site. Most wave energy from the prevailing southwesterlies is dissipated at the mouth of the bay, circa 50 m (164 ft) southwest of the site. Additional erosion has taken place at the northern escarpment of the alluvial fan, where it has been incised by intermittent stream runoff during lowered reservoir levels, creating a 1-2 m (3.28-6.56 ft) high cutbank. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open canopy, mature conifer forest.

General Site Description

The site dimensions are 25 m (82 ft) north-south and 60 m (197 ft) east-west. They cover an area of 1,500 m^2 (16,140 ft^2) (Figure 10.5). Artifact depth determined during testing ranged from the surface to 40 cm (15.8 in) below surface with the volume of artifact-bearing deposits at the site estimated to be 450 m^3 (15,889 ft^3). The site is

characterized as a moderate-density lithic scatter. The types of artifacts present at the site are formed tools, river cobble tools, debitage, and cores. The lithic raw materials consist of a high proportion of locally available Hozomeen chert and metasediment and one flake of vitrophyre from an unknown source. One possible basin-shaped hearth feature was found in the intact site deposits.

The alluvial fan remnant on which the site is located exhibits a well-stratified sequence of Holocene alluvium over 1.5 m (4.9 ft) deep. This depositional sequence includes at least two primary volcanic ashes and datable organic lenses.

Testing Methods and Rationale

This site was recorded during the project survey in 1988. Two artifacts have been collected from the eroded site surface, one during initial site documentation in 1988 and one during site mapping in 1993. Testing was conducted in 1992 with the excavation of two 1 x 1 m (3.28 x 3.28 ft) test units. Site sediments were excavated in 10 cm (3.94 in) levels and screened through .63 cm (.25 in) wire mesh. At the time of its recording, the site appeared to have been spared extensive erosion by reservoir shoreline processes. Evidence to support this consisted of the protection afforded by its location and the absence of exposed roots of sawn tree stumps, still in their original position. The test unit locations were selected to determine the presence of and depth of intact artifact-bearing deposits.

As part of the testing procedure, two stratigraphic bank profiles were recorded along the northeast boundary of the site, adjacent to a small runoff channel. The bank profiles were cleaned and examined in order to document the record of Holocene alluvial history represented in the strata. These sediments were not screened and no cultural material was observed during bank facing.

Table 10.8 Inventory of Surface Collections from 45WH239

	NOCA
1 Flake, Vitrophyre	6363
1 Biface, Metasediment	10669

Description of Testing Results

Cultural remains from the site consist of flakes, shatter, flake tools, flaked river cobble tools, and cores. One buried, intact but weakly-defined hearth feature was encountered and dated. A total of 31 artifacts was recovered from the test units and 29 of these were from *in situ* deposits. No time-sensitive or diagnostic artifacts were recovered at the site. Disturbed reservoir deposits at the site surface are thin, with 25 to 45 cm (9.85 to 17.73 in) of intact subsoil beneath them. Most of this subsoil contains a low frequency of artifacts and an unidentified tephra.

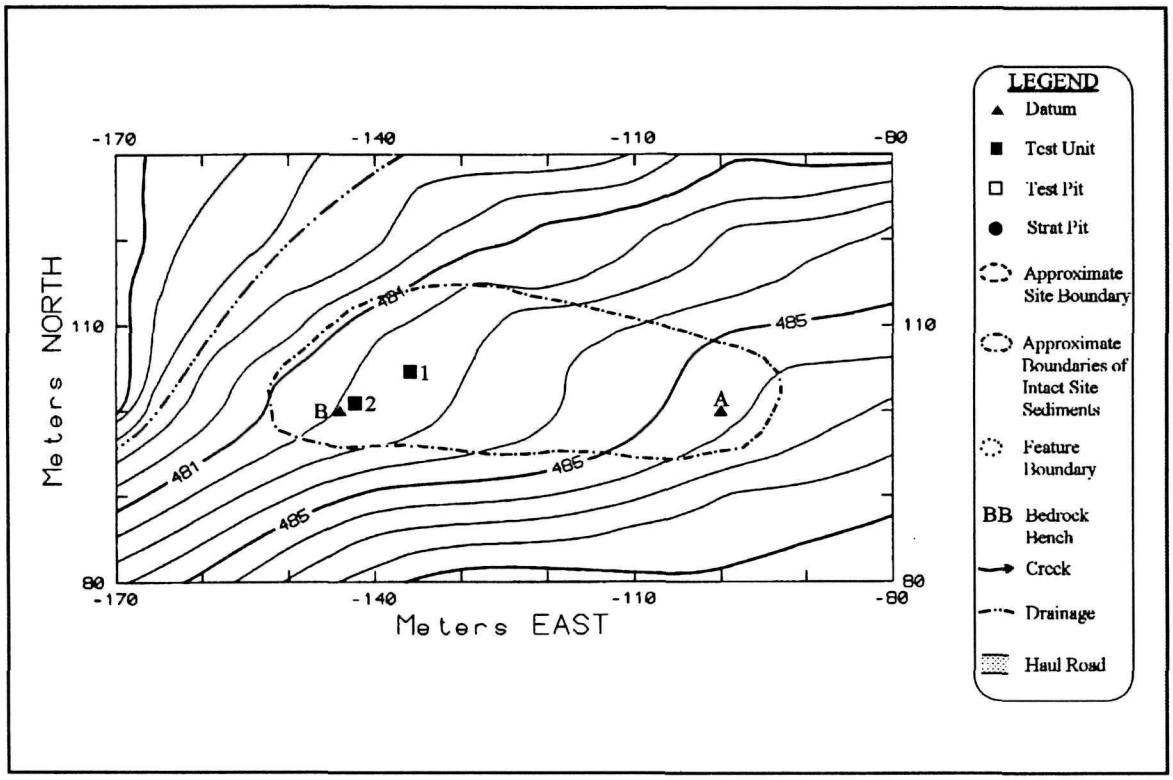


Figure 10.5 Topographic map of Site 45WH239 (FS 59)

Both artifacts collected from the eroded site surface convey information about the site. The metasediment biface (NOCA 10669) is a large and thick, blade-like flake that has one bifacially flaked lateral margin. This flake appears to have been detached from a large nodule through a bipolar reduction technique. It is uncertain whether or not the biface was used as a tool, but one segment of the bifacially flaked margin exhibits possible edge damage on one face. This suggests that it may have been an expedient tool that was manufactured, used, and discarded on-site. Based only on morphological attributes this artifact is classified as a Stage II biface. The other item collected from the site surface is a broken vitrophyre flake (NOCA 6363). This material is opaque, gray, and where it is not stained by weathering, it exhibits a vitreous luster that resembles a clear ceramic glaze. XRF analysis did not match any known source or other vitrophyre samples from the project area, so it was assigned to Unknown Source 3 (see section 10.7). The physical appearance of the specimen is nearly identical to other samples from the project area and to the one recorded vitrophyre source in North Cascades National Park. It is probable that this material is derived from a source in the northern Cascade Range.

The small assemblage of artifacts from test unit 1 consists predominately of broken flakes and shatter. The flakes tend to be thick and to have near right-angle platform angles. These resulted from flaking of Hozomeen chert and metasediment rocks (probably procured on-site or nearby) to make tool edges with no attempt to give a uniform shape to the larger object. The Hozomeen chert is not of particularly high

quality. This further suggests the manufacture, use, and discard of expediency tools to work, shape, or alter some material. Two such expedient tools were clearly manufactured from river- or glacially-rounded cobbles. The first is a unifacial tool (NOCA 10534) made on a tabular, irregular flake that was split from a large metasediment cobble. Almost the entire periphery of the flake exhibits wear consisting of short segments of the margin that have been crushed, ground, or battered. These worn tool edges suggest heavy utilization for the purpose of cutting, scraping, pounding, and possibly, prying on some moderately resistant material. The other tool (NOCA 10535) is a thin, ovate flake that had been struck from a rounded metasediment river cobble. No part of the flake exhibits use wear; it was found near NOCA 10534.

The test unit 2 artifact assemblage is similar to that from test unit 1. The core (NOCA 10539) excavated from intact deposits is peripherally flaked from one direction and is similar to what have been called "turtle-backed" cores. The core was manufactured to produce flakes, which were removed by percussion. Small flake scars below the platform are most likely the result of intentional platform preparation rather than use wear. Two flakes (NOCA 10541 and 10542) appear to have been removed from a biface margin, intentionally or otherwise. A piece of flaked metasediment (NOCA 10545) may be an exhausted flake core manufactured from a river-rolled cobble, similar to NOCA 10534. NOCA 10544 and 10546 are thin, unmodified flakes also removed from cobbles and displaying smooth, river-rolled cortex. This evidence also supports the inference for the manufacture of expedient tools and flakes from locally procured river cobbles (possibly also glacial and alluvial fan gravels).

One probable feature of cultural origin was encountered in the excavations. It appeared in test unit 2, level 2, and was visible as a roughly circular stain in the bottom of the level floor. The stain was defined by the presence of numerous charcoal fragments mixed with reddened, heat-oxidized sediments. Intact soil B-horizon sediments surrounded the feature, which appears to represent the remains of a fire on the prehistoric ground surface. No fire-modified rocks were found in the feature or the test unit. The exhausted cobble core (NOCA 10545) was recovered *in situ* 20 cm from the edge of the feature, and other flaking debris was found in levels below it. The exact function of the feature is unknown.

Table 10.9 shows all cultural material collected from excavation units, by level, from site 45WH239. It also lists the catalog numbers of significant radiocarbon and tephra samples catalogued for the site.

Table 10.9 Cultural Material From Excavation Units at 45WH239

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Flake, Metasediment	10530
L:2 (10-20 cm BS)	1 Flake, Metasediment	10531
	1 Flake, Hozomeen Chalcedony	10532

	1 Flake, Hozomeen Chert	10533
	1 Cobble Tool, Metasediment	10534
	1 Cobble Flake, Metasediment	10535
L:3 (20-30 cm BS)	1 Flake, Hozomeen Chert	10536
	1 Flake, Metasediment	10537
	1 Flake, Hozomeen Chert	10538
	1 Tephra	10551
L:4 (30-40 cm BS)	Tephra, same as sample ROLA89 229-1 Tephra A	10552
L:5 (40-50 cm BS)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Core, Metasediment	10539
	1 Flake, Hozomeen Chert	10540
	2 Flake, Hozomeen Chert	10541
L:2 (10-20 cm BS)	3 Flakes, Metasediment, Hozomeen Chalcedony	10542
	3 Flakes, Hozomeen Chert	10543
	5 Debitage, Hozomeen Chert, Metasediment	10544
	1 Flaked Cobble, Metasediment	10545
	^{14}C, 1,430±120 BP, Beta 53859	
L:3 (20-30 cm BS)	1 Flake, Metasediment	10546
	3 Debitage, Hozomeen chert	10547
L:4 (30-40 cm BS)	1 Flake, Metasediment	10571
Bank Profile 1		
Stratigraphic unit 1	Tephra, St. Helens Y	10549
Stratigraphic unit 2	Tephra, Mazama O	10550
Bank Profile 2		
Stratigraphic unit 1	1 Tephra Sample, Source Unknown	N/A

Site Chronology

One charcoal sample was submitted for radiocarbon dating. It was excavated from the possible feature in level 2 of test unit 2. The charcoal was collected *in situ* from a tight cluster of charcoal fragments along the feature edge. This sample, with the date shown below, is directly associated with the exhausted metasediment core (NOCA 10545).

Table 10.10 Table Of ^{14}C Dates from 45WH239

TU	LEVEL	LAB#	UNCORRECTED BP DATE
TU2	L-2	Beta 53859	1,430±120

Of five tephra samples collected from the site, three were submitted for electron microprobe analysis of the glass shards for source identification (Table 10.11). The first of these was collected from test unit 1, level 4, at the uneven boundary between the soil B- and BC-horizons under the excavation levels that contained *in situ* artifacts. It appeared to be an uncontaminated, primary deposit of gray silt. The analysis results indicated that the tephra is very similar to Mazama O, and therefore, provides a lower limiting date for the artifacts found above it. Thus, the test unit 1 artifacts are inferred to be younger than 6,800 radiocarbon years old.

The other two samples were collected from Bank Profile 1, located in the bank of a small erosional gully near the northeast end of the alluvial fan, not far outside of the site boundaries. Both samples were removed from a well-stratified sequence of deposits representing the accretion of sediments in the channel bottom during the Holocene. Both tephras appeared to be uncontaminated and as continuous layers of primary deposits. The lower tephra, assigned to Mazama O, appeared as a yellowish-brown silt. The upper tephra, assigned to St. Helens Y, appeared as a brown to gray, moderately well-sorted fine sand. These assignments agree with the relative stratigraphic position of the tephra layers in the geologic section, where they provide a depositional chronology for the locality extending to before circa 7,000 years ago. A description of the geologic section is provided next.

Table 10.11 Table Of Identified Tephra from 45WH239

TU	LEVEL	NOCA#	VENT	AGE YBP
TU1	L-4	10552	Mazama O	6,800
Bank 1	0.98-1.03 cm	10549	St. Helens Y	~3,500
Bank 1	1.24-1.28 cm	10550	Mazama O	6,800

Site Stratigraphy

The generalized stratigraphic sequence of the site as exposed in the test units is shown in Figure 10.6. The sequence of soil horizons here is complex due to the presence of two genetic horizon sequences in the same profile (described as a bisequum in pedological terminology). The first is an O-E-B-BC horizon sequence. The uppermost stratum is a thin, sandy and gravelly reservoir deposit. Preserved under the

reservoir deposits in test unit 2 is a dark layer of organic debris and forest duff (O-horizon) that marks the pre-reservoir ground surface. In test unit 1, erosion has stripped away this and underlying layers, creating an erosional unconformity and exposing subsoil horizons at the present ground surface (reservoir bottom). Immediately under the forest duff was observed very thin, discontinuous lenses of a gray, silty volcanic ash; this tephra has not been identified. The next lower stratum is a soil E-horizon developed in a gravelly sand mixed with volcanic ash. Below it is a weakly-developed, dark yellowish-brown gravelly silty sand soil B- and BC-horizon.

The lower boundary of the BC-horizon is marked by the presence of the next underlying layer, a discontinuous lens of light brownish-gray silt identified as primary Mazama tephra from the 6,800 years BP eruption. This tephra is in the position of a soil E-horizon, and begins the lower horizon sequence of E-B-BC. The underlying B is strongly-developed and consists of a strong-brown, gravelly fine sandy silt. Beneath is an olive-brown, gravelly silty sand. Test unit excavations did not go below this horizon. All artifacts were found within the upper soil horizon sequence. Overall, the test unit stratigraphy reflects a relatively stable landform that has accreted vertically by deposition of poorly-sorted slopewash gravels and sands and aeolian deposits consisting of tephra and flood plain loess.

As noted above, two stratigraphic bank profiles were recorded along the northeast boundary of the site, adjacent to a small runoff channel. The generalized stratigraphic sequence of Bank Profile 1 is shown in Figure 10.7. Combined with the stratigraphic information from test units 1 and 2, most of the Holocene (the last circa 10,000 years) is represented by the alluvial sequence of sedimentary deposits and soils. Referring to Figure 10.7, the pre-Mazama sands and angular gravels were not completely exposed, and the stratigraphic record below this point is unknown. Boulders up to circa 1 m (3.28 ft) diameter outcropping on the landform are probably associated with a basal unit of glacial till that underlies all of the deposits exposed in the bank profiles. Above the Mazama O and continuing above the Mt. St. Helens Y tephra is a series of well-sorted to poorly-sorted clayey silt, to sand, to gravel strata with abrupt boundaries. This generally indicates that between 6,800 years ago and for some time after 3,500 years ago, the channel was rapidly filling through the accretion of sediments during fluctuating depositional episodes. Some of these fluctuations may have been due to lateral migration of the stream channel within the larger outwash channel. The profile is capped by a thick, coarse, and poorly-sorted alluvial fan deposit. Throughout the landform few stream-rounded clasts are present. Pebbles, cobbles, and boulders are predominately subangular and angular in shape, suggesting that they have been transported short distances. The role of climate as a cause or influence in this depositional history is uncertain but has great potential significance for understanding the prehistory and paleoecology of the locality and the region. There is likely to be more meaningful stratigraphic variability at the site than has been noted here given the limited observations made of landform stratigraphy. It is clear, however, that nowhere else in the project area have we recorded such a continuous stratified record of Holocene depositional environments.

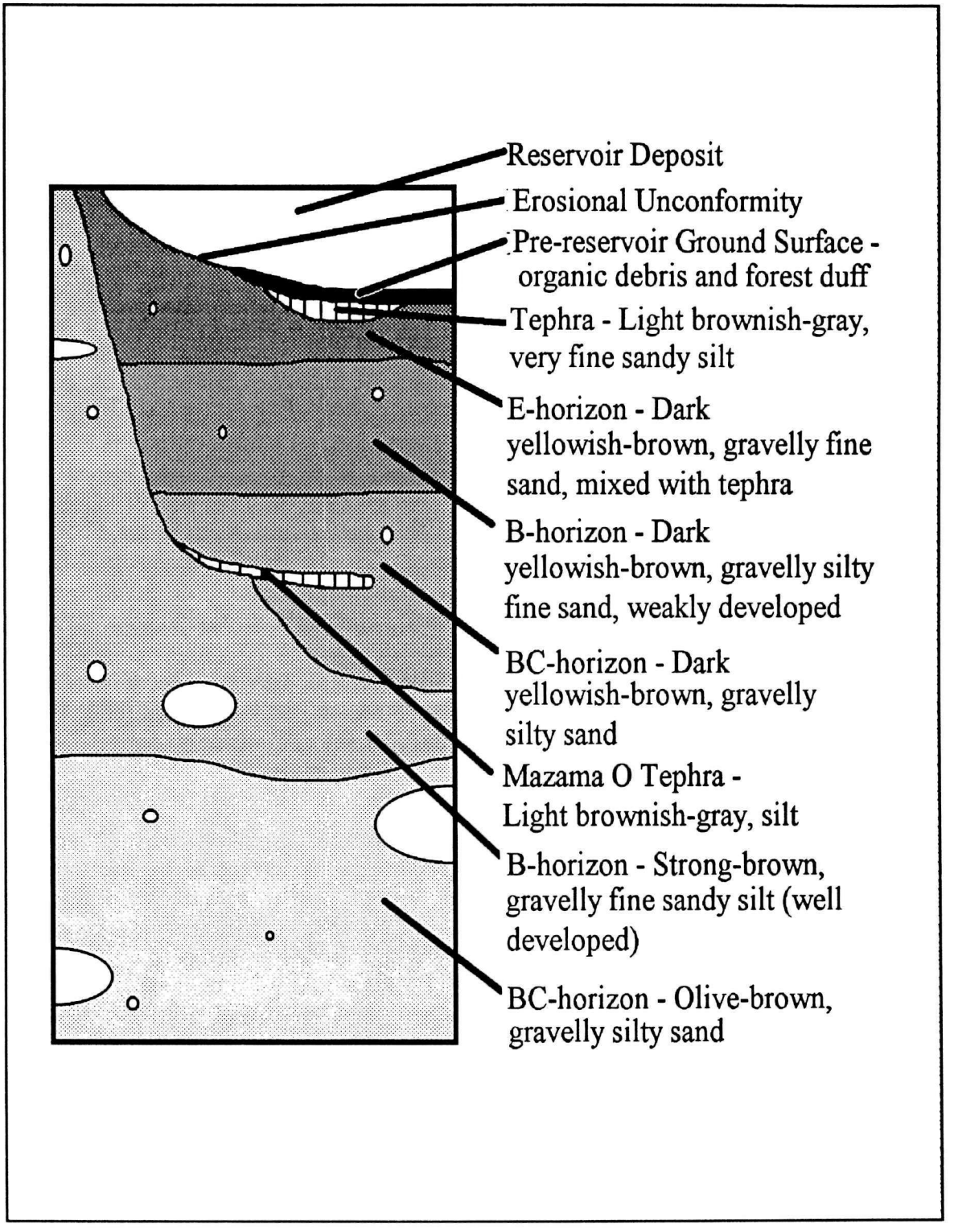


Figure 10.6 Generalized schematic of stratigraphy at Site 45WH239 (FS 59)

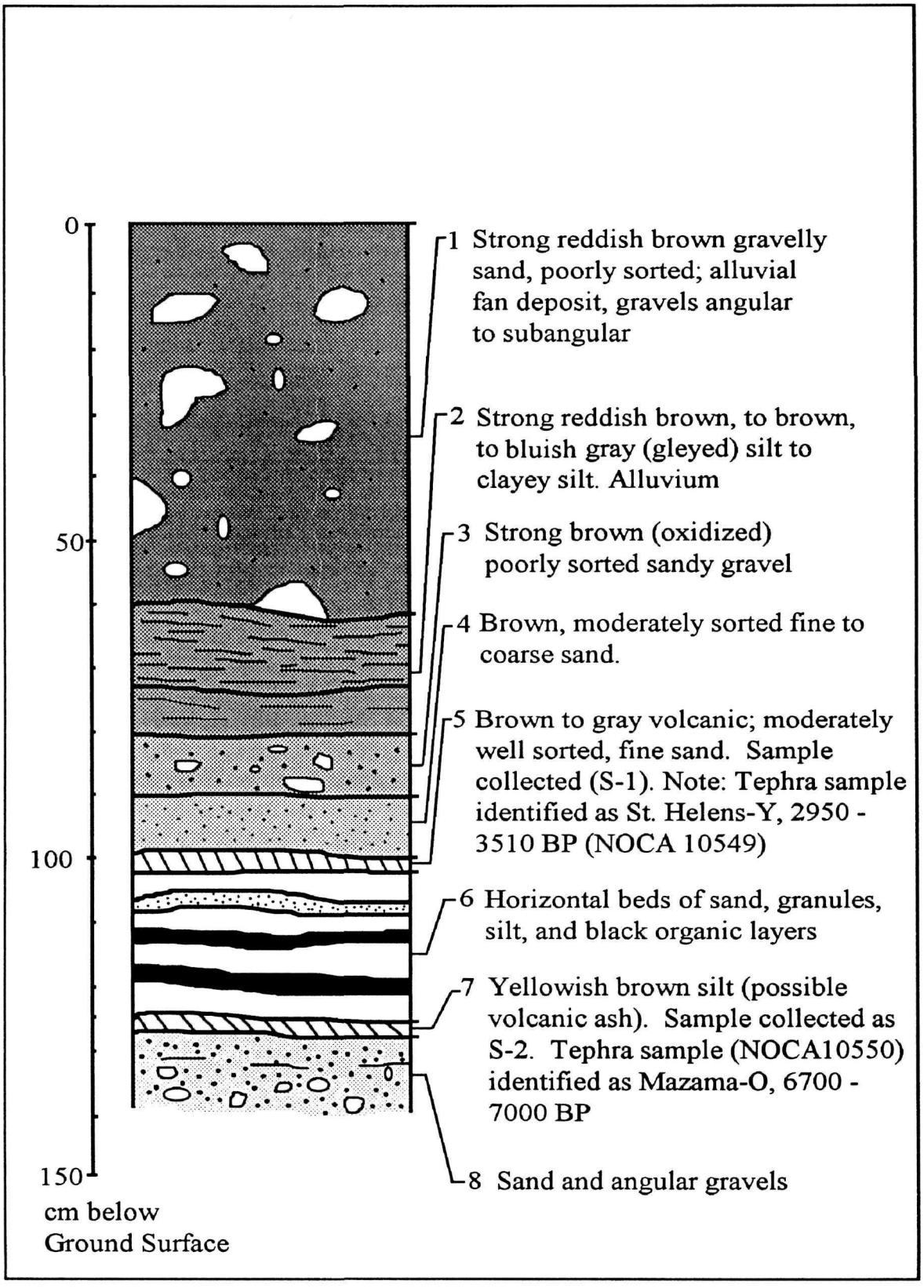


Figure 10.7 Bank profile at 45WH239 (FS 59)

Conclusions and Assessment

Site 45WH239 appears to have served as a task-specific site related to the procurement and preparation of some locally-available raw material. The tools found at the site were manufactured, used, and discarded there. Some of the tools show working edges modified by cutting, scraping, and pounding on a relatively resistant material. Use of fire or heat may also have been related to raw material processing. The location of the site in a small, shaded hollow (although the extent of forest cover at the time of occupation is unknown), combined with the expediency nature of the artifact assemblage, suggests that the site was utilized by individuals who resided at a nearby residential or base camp. Until a larger assemblage of artifacts is recovered, little more can be concluded about activities at the site. The site has been utilized by humans for at least the last 1,500 radiocarbon years BP, and possibly throughout the last 6,000 or so years.

Erosion and logging have disturbed this site, yet it has escaped severe alteration and loss of integrity due to its protected location. The two primary tephra (one from Mt. Mazama and the other from Mt. St. Helens) encased in a stratified geologic column of alluvium offers one of the best Holocene depositional records observed in the drawdown. Furthermore, a significant part of the site area appears to have *in situ* cultural material buried up to 40 cm (15.7 in) below the ground surface. These deposits have an estimated site volume of approximately 450 m^3 (1,589 ft^3). The *in situ* artifact-bearing deposits within this volume and the adjacent stratified Holocene deposits comprise the significant portions of the site.

Site 45WH239 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Intact geologic deposits at the site, including identifiable and datable tephra from Cascade volcanos, offer a record of Holocene depositional history for the locality and possibly the region. Through scientific excavation and study of these deposits the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.5 45WH241 (FS#61) Casino Bay #4

Site Setting

This site is located on the east side of the valley at the southern end of the project area. It is exposed on the surface of Roland Creek's alluvial fan, approximately 80 m (263 ft) southeast from the mouth of Roland Creek at reservoir full pool elevation. At 476 m (1,563 ft) elevation, the landform has a gentle (0-7%) gradient with a southern exposure. Prior to the reservoir, the site looked into the Skagit River gorge. Above the gorge the skyline is dominated by Ruby Mtn. at 2,258 m (7,408 ft). Somewhat to the west is the prominent ridgeline called Sourdough. To the west and north are the glacially-rounded and rolling hills of Roland Pt. and to the east are more rolling hills with nearby Jack Mtn. towering above them at 2,763 m (9,063 ft). The artifact scatter

that defines the site is located a few meters east of the present channel of Roland Cr., and 1.35 km (0.8 mi) and 86 m (283 ft) above the nearest segment of the Skagit River. This scatter has a narrow, linear, north-south distribution at the proximal end of the fan. The eastern and western boundaries defined respectively by the channel of Roland Cr. and by an abandoned channel (flood or snowmelt). The northern and southern boundaries are unclear and are defined by the distribution of artifacts.

Primary sources of disturbance to the site are historic logging of the drawdown zone and reservoir erosion. Reservoir wave erosion has winnowed away the fine-grained matrix leaving a gravel lag deposit to armor some parts of the site surface. This protects the site to some degree from excessive erosion. In other areas, the site appears to be severely eroded. The pre-reservoir vegetation, as evident from the remaining stumps, consists of a mixed conifer and hardwood forest. Roland Creek contains usable stone raw materials, mainly Hozomeen chert and metasediment varieties but also a variety of serpentine (see section 10.6).

General Site Description

The site is 145 m (476 ft) north-south and 50 m (164 ft) east-west. It covers an area of 7,250 m^2 (78,010 ft^2) (Figure 10.8). Artifact depth determined during testing ranged from the surface to 50 cm (20 in) below the surface, but this depth is not likely to be uniform across the site area. The estimated site volume is 1,812 m^3 (63,982 ft^3). The site is characterized as a moderate-density lithic scatter consisting of widely scattered, individual artifacts and small artifact concentrations or loci. In one restricted area there is a high-density calcined bone scatter. This calcined mammal bone feature contains abundant charcoal and stone artifacts within its matrix. The types of artifacts present at the site are formed tools, debitage, cores, ground soapstone, and calcined faunal remains. The lithic material types in the chipped stone assemblage consist almost entirely of locally available Hozomeen chert and metasediment; the quartz crystal may be locally available, as well.

Testing Methods and Rationale

The site was recorded during the survey portion of the project in 1988, and it was tested and surface collected in 1990. The site was tested by excavation of one 1 x 1 m (3.28 x 3.28 ft) test unit. Sediments were excavated in 10 cm (3.94 in) levels and screened through .63 cm (.24 in) and .32 cm (.125 in) wire mesh. Test excavation was limited in scope and was meant to determine the depth and nature of undisturbed cultural deposits within a concentrated scatter of calcined bone fragments and debitage. The unit was placed along the western boundary of the bone scatter in order to see if the surface distribution matched a stratigraphic boundary. Due to the dispersed distribution of artifact loci and the patchwork variability in degree of erosion, it was beyond the scope of this project to determine site boundaries through test excavations.

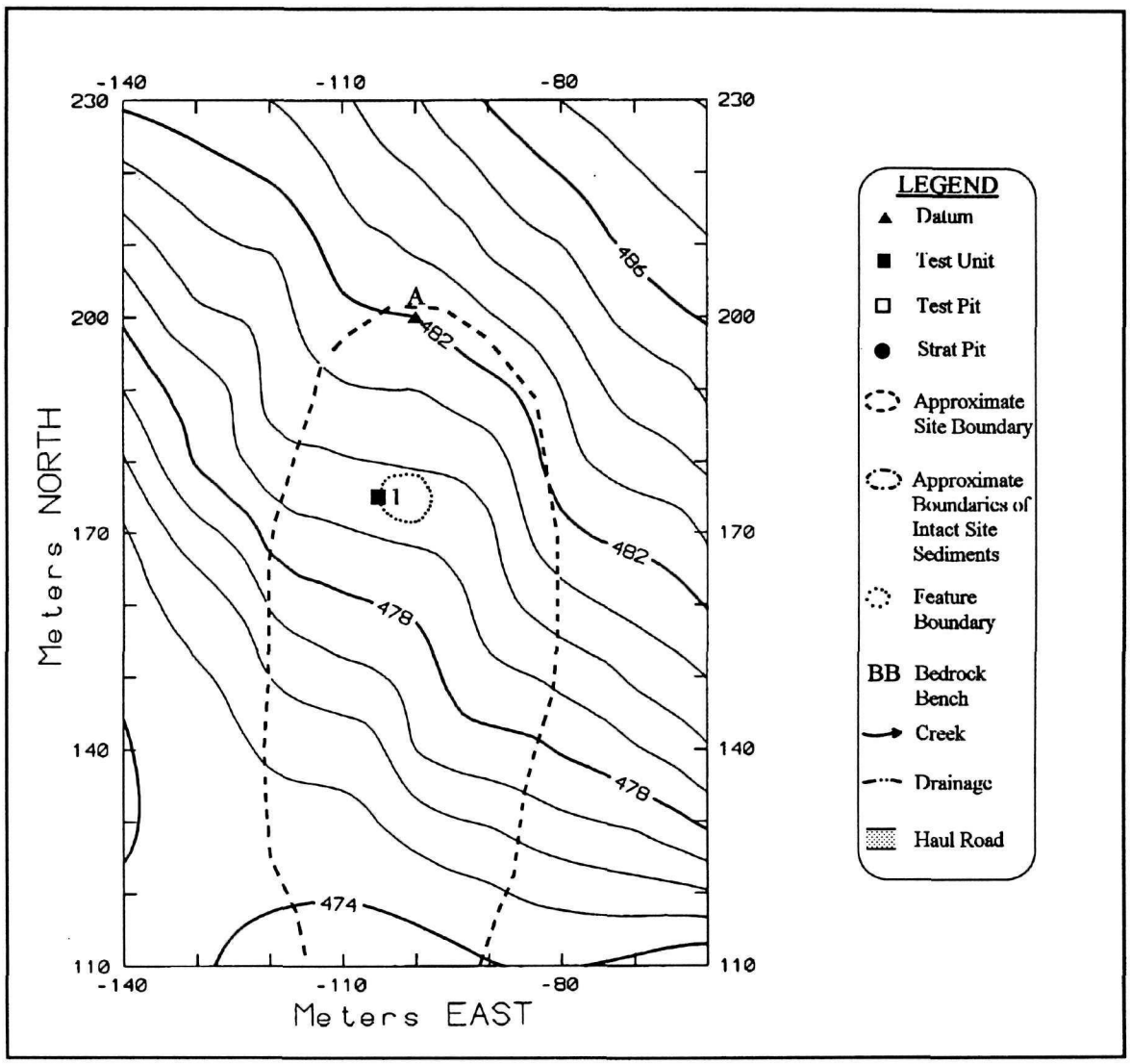


Figure 10.8 Topographic map of Site 45WH241 (FS 61)

Table 10.12 Inventory of Surface Collections from 45WH241

	NCCA
1 Quartz Crystal, Modified	7925
1 Scraper, Metasediment	7926
1 Flake, Edge Modified	7927
1 Microblade Core, Hozomeen Chert	7928

Description of Testing Results

The total artifact assemblage from the site consists of chipped stone flakes and shatter, bifaces, cores, a groundstone pipe bowl fragment, flaked quartz crystal, and calcined mammal bone fragments with abundant charcoal. Artifact number NOCA 7925 consists of a partially euhedral quartz crystal that may have been altered by heat. The scraper (NOCA 7926) is a unifacial tool exhibiting use wear along most of the lateral margins and intentional flaking of one of the these margins to create a beveled edge. On the small flake fragment (NOCA 7927), there is a steeply beveled tool edge. The microblade core (NOCA 7928) (Figure 10.9) is made of a blocky, irregular piece that was first reduced by bipolar percussion. Two different flat faces were used as platforms to remove 2 adjacent blades on one and 3 adjacent blades on the other. The blade scars are variable in width and irregular, and indicating minimally used microblade core.

From within test unit 1 a total of 119 chipped stone items, 1 groundstone, 2,896 bone fragments, and 2 tooth fragments was recovered. Disturbed reservoir deposits were, at the time of testing, 1 to 3 cm (.39 to 1.18 in) thick. It is uncertain as to precisely where the undisturbed deposits were encountered due to the gravelly nature of the sediments and irregular boundaries of the strata. For most of the test unit area, undisturbed deposits were encountered in level 2, where a thin (circa 4 cm [1.6 in] thick) cultural (anthropogenic) layer of calcined bone and charcoal was uncovered. Artifact density was highest in the first two levels and slowly decreased with depth. The bottom of this bone layer, and the artifacts in it and below it, retain integrity of location and association.

Two different technologies are represented in the chipped stone assemblage recovered from all excavated levels of test unit 1. The first is an expedient system using Hozomeen chert and metasediment alluvial fan gravels procured from the immediate vicinity. This is represented by fan gravel cortex on dorsal flake surfaces and shatter. The flaking quality of the Hozomeen chert and metasediment varies from low to high. A biface fragment of metasediment (NOCA 7976) and simple flake tools (NOCA 7926, 7927, and 7981) are representative of the expedient tools made of such materials and used for general cutting and scraping purposes. The other technology represents the sharpening of tool edges made on a high quality, translucent, caramel-colored chalcedony and a black basalt. This technology is manifested by the presence of thin, broken pressure flakes. The exotic chalcedony, along with metasediment and Hozomeen chert, was present only in the upper levels (levels 1 through 3) of the test unit. The single lithic material type in the lower levels (levels 4 through 6) was Hozomeen chert. Overall, it is inferred that tools used at the site consisted of those made on-site of local materials and those made off-site of exotic raw materials. Given their direct association with fragmented animal bone, it is inferred that the tools were used in the preparation and cooking of mammals at the site.

Although bone fragments from test unit 1 were recovered from the ground surface to the lowest excavated level, the vast majority came from the cultural bone feature located in level 2 (2,328 or 80% by number). The feature consisted of a very dark gray

to black lens of bone fragments mixed with charcoal, and having a maximum thickness of 5 cm (2 in). The layer covered most of the test unit floor, but pinched out at the SW corner, marking the western edge of the feature and correlating with a stratigraphic boundary. The top of the bone layer was eroded by wave action, which also mixed bone fragments into the overlying reservoir deposits. The character of the bone layer, along with the absence of any evidence for heat-oxidation of the sediments underneath it, leads us to conclude that the bones were intentionally discarded (scattered, thrown, or dumped) on a charcoal-rich ground surface, perhaps representing a cooking area.

None of the bone fragments were identifiable to a specific taxonomic level. Only a few fragments were assignable to the order Artiodactyla or to the general size group of "medium mammal" (the approximate size of deer, mountain goat, or mountain sheep). The bone fragments are uniformly small with an approximate mean (visual estimate) size of 1 cm (2.5 in). They consist predominately of compact bone from leg elements. This degree and uniformity of fragmentation is greater than the breakage pattern characteristic of bone that is split for marrow extraction, and it suggests that additional processing has taken place. A bulk sample of bone from this feature was submitted for radiocarbon dating (Beta 40694) but was found to contain no collagen and a date could not be obtained. Based on these data, we suspect that the bone was intentionally fragmented and boiled in mass quantities for the extraction of bone grease. In the process of heating the bone, the collagen (a protein) may have been destroyed. However, more data are required before a firm conclusion is warranted.

The groundstone pipe bowl fragment (NOCA 7984) (Figure 10.9) was recovered from level 2 of the test unit. It consists of one part of the side of a round bowl, from the rounded lip on top to where the bottom of the bowl begins to flare slightly into the stem. The stem is entirely missing. Although it is too fragmentary to determine, the bowl shape is characteristic of elbow pipes rather than straight-stemmed, trumpet-shaped pipes. The material is a very dark gray talc (soapstone) that may be from a local source. Numerous soapstone sources are present in the northern Cascades. The closest known source to site 45WH241 is located about a mile north, but our reference sample of this material exhibits a different color pattern than exhibited by the pipe bowl. Prehistoric pipes are rare artifacts in the Pacific Northwest, and one other occurs in the drawdown, where it was also found in association with a dense cluster of burned animal bone fragments (see site 45WH303 description). Based on two radiocarbon dates, the bone feature and the pipe fragment date sometime after 1,500 BP.

Table 10.13 Cultural Material From Excavation Units at 45WH241

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	15 Debitage, Hozomeen Chert	7975
	1 Debitage, Hozomeen Chert	7977
	2 Debitage, Chalcedony	7978
	1 Biface, Metasediment	7976

	344 Bone Fragments: 343 Unidentifiable; 1 proximal metapodial, Artiodactyla	10096
	12 Long Bone Fragments, Medium Mammal	10097
	16 Long Bone Fragments, Medium Mammal	10098
	39 Long Bone Fragments, Medium Mammal	10099
	1 Bulk Sample, Soil/Bone	10179
	1 Fine Screen Sample	10180
	1 Fine Screen Sample	10181
L:2 (20-30 cm BD)	26 Debitage, Hozomeen Chert, Chalcedony	7979
	11 Debitage, Hozomeen Chert	7980
	23 Debitage, Hozomeen Chert, Chalcedony, Metasediment	7982
	6 Debitage, Hozomeen Chert, Chalcedony, Metasediment	7983
	1 Pipe Fragment, Soapstone	7984
	1 Flake, Edge Modified, Hozomeen Chert	7981
	1163 Long Bone Fragments, Medium Mammal	10100
	201 Long Bone Fragments, Medium Mammal	10101
	587 Long Bone Fragments, Medium Mammal	10102
	377 Long Bone Fragments, Medium Mammal	10103
	1 Bulk Sample, Soil/Bone	10182
	1 Fine Screen Sample	10183
	1 Fine Screen Sample	10184
L:3 (30-40 cm BD)	4 Debitage, Hozomeen Chert	7985
	9 Debitage, Hozomeen Chert, Chalcedony	7986
	3 Debitage,Hozomeen Chert, Chalcedony	7987
	5 Debitage, Hozomeen Chert	7988
	10 Long Bone Fragments, Medium Mammal	10104
	28 Long Bone Fragments, Medium Mammal	10105
	11 Long Bone Fragments, Medium Mammal	10106
	7 Long Bone Fragments, Medium Mammal	10107
	1 Fine Screen Sample	10185
	1 Fine Screen Sample	10186
L:4 (40-50 cm BD)	1 Debitage, Hozomeen Chert	7989
	9 Debitage, Hozomeen Chert	7990
	7 Long Bone Fragments, Medium Mammal	10108
	75 Long Bone Fragments, Medium Mammal, 1 fragment, distal metapodial, Artiodactyla	10109
	2 Tooth Fragments (enamel), Selenodont, Artiodactyla	10110
	1 Fine Screen Sample	10187
	1 Fine Screen Sample	10188
	^{14}C, 1,890±90 BP, Beta 40695	
	^{14}C, 1,430±90 BP, Beta 40696	
L:5 (50-60 cm BD)	3 Debitage, Hozomeen Chert	7991
	1 Long Bone Fragment, Medium Mammal	10111
	9 Long Bone Fragments, Medium Mammal	10112
L:6 (60-70 cm BD)	6 Long Bone Fragments, Medium Mammal	10113
No Provenience	6 Rock Samples, Hozomeen Chert	10149

Site Chronology

Two charcoal samples and one bone sample were submitted for radiocarbon dating and the results are shown Table 10.14. Both charcoal samples were excavated from level 4 of the test unit. The first, dated 1,430±90 BP, was removed *in situ* from the western edge of the feature. The other sample is combined from two matrix samples from level 4, one from the NW corner and the other from the NE corner. It is dated 1,890±90 BP. These dates provide acceptable age estimates for the feature and associated artifacts. A third radiocarbon sample consisted of 550 g of fragmented bone from levels 3-6. Due to lack of collagen, no datable carbon was extracted.

Table 10.14 Table Of ^{14}C Dates from 45WH241

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU1	L-4	Beta 40695	1,890±90
TU1	L-4	Beta 40696	1,430±90
TU1	L-3 thru 6	Beta 40694	Bone, No Date, No Collagen

Site Stratigraphy

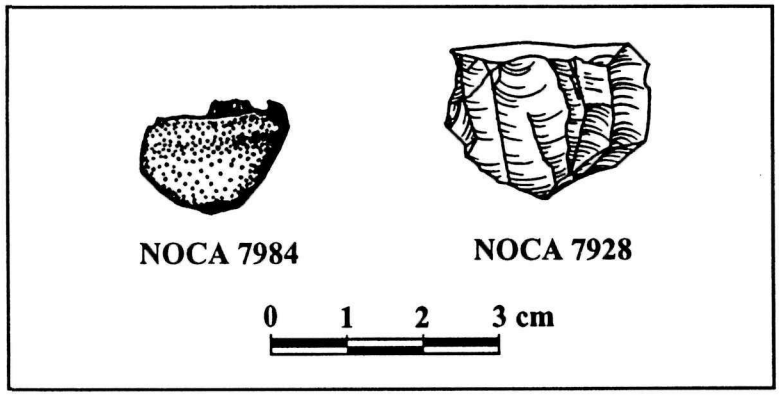


Figure 10.9 Pipe fragment and core from Site 45WH241 (FS 61)

A detailed description and diagram of the strata shown in the north and east walls of test unit 1 is provided in Appendix E. The general sequence consists of a thin, brown reservoir deposit overlying the bone feature. This feature matrix is a very dark gray to black, poorly sorted, carbon-rich layer. This layer is clearly anthropogenic in origin. Underlying it is brown B-horizon, followed by a BC-horizon. The entire sedimentary sequence is moderately to poorly sorted and contains abundant gravels of granule, pebble, cobble, and boulder sizes. With the exception of the two upper anthropogenic strata (the historic reservoir deposit and the prehistoric bone feature), the depositional sequence reflects the accretion of coarse sediments at the proximal end of the alluvial fan and the development of soil horizons. This landform was inhabited for at least the last approximately 2,000 radiocarbon years during the accretion of the upper fan deposits.

Conclusions and Assessment

Site 45WH241 appears to have served as a short-term base camp used by a small group of people to butcher and process ungulates. These ungulates were procured nearby, and whole or partial carcasses were brought to the site (only cranial elements represented by teeth and leg elements were identified). Mountain goat and deer are the likely game animals. The carcasses were processed using simple expedient cutting and scraping tools made of Hozomeen chert and metasediment from the alluvial fan on which the site is located. Other tools were used or sharpened that were made of materials brought to the site, such as chalcedony, quartz crystal, and basalt. The bones of the animals were split open, probably for the extraction of marrow, and they appear to have been pulverized, possibly to boil out and collect the bone grease. The pipe fragment is the only artifact representative of activity not directly tied to subsistence, and may relate to ceremonial or leisure activities at the site.

Although logging and reservoir-induced erosion have altered the integrity of some portions of the site sediments and artifacts, other portions retain integrity of setting, and the artifacts in them retain integrity of location and association. An intact anthropogenic stratum was discovered at the site. This feature consists of a layer of burned animal bone fragments and other artifacts radiocarbon dated between about 1,900 and 1,400 years BP. The feature, and the intact artifact-bearing deposits below it, occupy an area approximately 7 m (23 ft) long by 6 m (20 ft) wide by 50 cm (19.7 in) deep, and thus has an estimated volume of 21 m^3 (742 ft^3). This is the only bone layer encountered in the project area or reported in the northern Cascade Range. However, the feature and its immediately adjacent deposits are not necessarily the only ones to contribute to the site's significance. Other intact, artifact-bearing deposits are likely to be preserved in isolated patches across the site surface that have been "armored" (protected) from excessive erosion by a layer of alluvial fan gravels. These deposits also contribute to the site's significance. Scientific excavation and study of the site deposits is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

Site 45WH241 is assessed as eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. The site has integrity of setting, and the artifacts and cultural deposits have integrity of location and association.

10.2.6 45WH253 (FS#73) North Tenmile Island #2

Site Setting

This site is located in the middle of the project area on the east side of the valley. At full pool it is circa 200 m (656 ft) north of the northern end of Tenmile Island. It is situated on a flat (0-3% slope) glacial terrace that has been incised by Dry Cr. and unnamed, intermittent snowmelt creeks). The landform has a western-northern-eastern solar exposure. From it, one sees the Skagit River flood plain to the west and beyond

to the steep cliffs of the western valley wall where a canyon is cut by the Skymo Cr. waterfall. To the north the land drops to Dry Cr. then rises to other terrace remnants and glacially scoured hills. In the distance is Desolation Pk. 1,860 m (6,100 ft). To the east is a broad flats comprised of glacial terraces abutting the steep, eastern valley wall that rises to Spratt Mtn. at 2,213 m (7,258 ft) elevation. To the south is the low, rounded rise of a glacially scoured bedrock knob that became Tenmile Island following creation of the reservoir pool. At 482 m (1,580 ft) elevation, the site landform is one in a complex of terrace segments that were once connected but have been separated in post-glacial times by stream incision, especially from Dry Cr. 250 m (820 ft) to the north. The main channel of the Skagit River flows 0.2 km (0.1 mi) to the southwest, where it is 46 m (150 ft) lower in elevation than the site. The artifact scatter that defines the site is roughly oblong and corresponds with the landform boundaries on the south, west, and north. The eastern boundary is defined by the surface distribution of lithic artifacts.

Historic logging, logging haul road construction, and reservoir erosion have been the primary sources of disturbance to the site. Due to the fine-grained nature of the soils capping the terrace, the landform surface and the site are especially susceptible to wave-induced erosion. A haul road used for reservoir clearing was built adjacent to the back (south end) of the site and in places it is still visible. Burrowing rodents and tree root penetration are also agents of site disturbance. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open canopy coniferous forest.

General Site Description

The site is 93 m (305 ft) north-south and 50 m (164 ft) east-west, covering an area of 4,650 m^2 (50,034 ft^2) (Figure 10.10). Artifact depth determined during testing ranged from the surface to 50 cm (20 in) below the surface. The estimated volume of artifact-bearing deposits in the is site 2,325 m^3 (82,096 ft^3). The site is characterized as a low to moderate-density lithic scatter, but at least one high-density lithic artifact cluster was identified. The types of artifacts present at the site are formed tools, bifaces, debitage, and cores. Lithic material types in the artifact assemblage are mostly locally available Hozomeen chert and metasediment along with a small amount of exotic jasper and obsidian. It appears that the reduction of locally available lithic materials into preforms and/or completed tools was conducted at the site. No features or stratigraphic layers of cultural origin were encountered.

Testing Methods and Rationale

The site was recorded during the survey portion of the project in 1988, and it was tested by excavation of two 1 x 1 m (3.28 x 3.28 ft) units in 1990. Site sediments were excavated in 10 cm (3.94 in) levels and screened through .63 cm (.24 in) wire mesh. The testing was limited in scope and designed to locate any undisturbed cultural deposits and features. One artifact was surface collected during the testing in 1990.

Table 10.15 Inventory of Surface Collections from 45WH253

	NCCA
1 Projectile Point Fragment, Basalt	7931

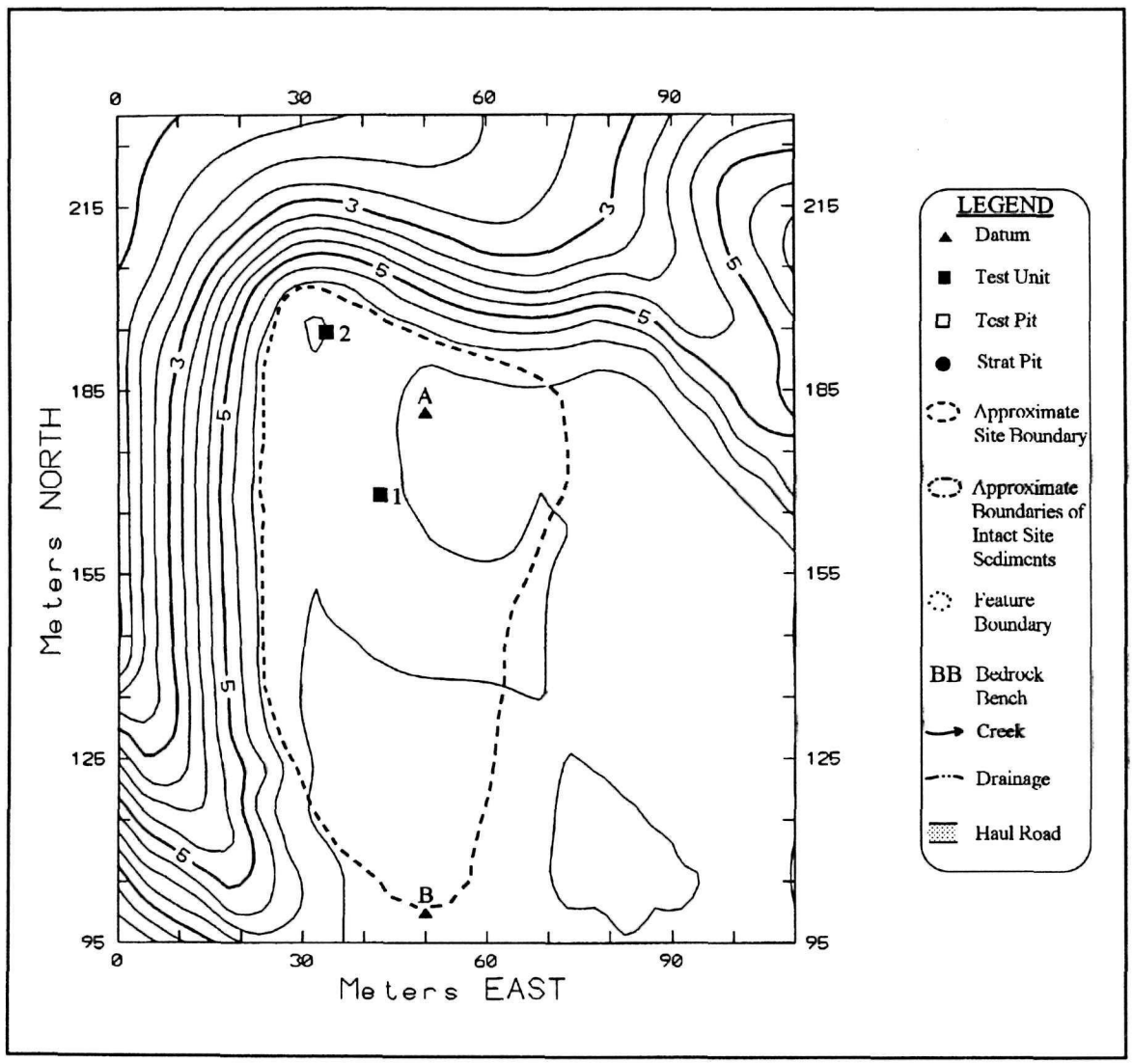


Figure 10.10 Topographic map of Site 45WH253 (FS 73)

Description of Testing Results

The total artifact assemblage from the two excavation units consists of chipped stone flakes and shatter, biface fragments, biface thinning flakes, a core-abrader tool, and microblades (Table 10.16). A total of 442 chipped stone artifacts was recovered from the test units, most of these from within an uneroded portion of a well-developed soil B-

horizon. One broken basalt projectile point (NOCA 7931), classified as Type 4A (Early Nesikep), was collected from the site surface (Figure 10.11).

Similar assemblages of chipped stone were recovered from both test units. They indicate the on-site reduction of locally available Hozomeen chert and metasediment cobbles as well as the final manufacturing stages of tools made of exotic (nonlocal) lithic materials. In test unit 1 the flaking debris is dominated by shatter and broken flakes of Hozomeen chert and metasediments. Some of these have cortex surfaces and early reduction stage morphology. Many of the latter can be further broken down into percussion and pressure biface thinning flakes. Two of the biface fragments (NOCA 10008 and NOCA 10009) are too fragmented for certain classification, but appear to be Stage II or III bifaces. Another biface (NOCA 10002) is made of a high quality, exotic red jasper and appears to have functioned as a knife. The lowest, most deeply buried biface fragment (NOCA 10005) represents reduction Stage IV. It may be the base of a Type 3 (Cascade/Olcott) projectile point. Finally, two microblades from the unit suggest that this technology was used by the site's inhabitants.

The test unit 2 assemblage is dominated by shatter and relatively large primary and secondary reduction flakes. Broken and biface thinning flakes also occur, but in lower proportion than in test unit 1. One well-formed microblade (NOCA 7999) confirms the presence of this technology. Metasediment comprises a lower proportion of the raw material assemblage in this unit. The total lithic assemblage from the site indicates the reduction of local stone raw materials into biface tool blanks or into finished tools. In addition, tools made of higher quality, exotic raw materials were sharpened or repaired at the site.

The exotic (nonlocal) lithic material types represented in the artifact assemblage include obsidian, Allenby chert, chalcedony, and basalt. The obsidian flake (NOCA 10003) recovered from level 2 in test unit 1 was sent for XRF analysis in order to determine its source location and produced a chemical signature that matched a source from Glass Buttes, Oregon (see section 10.7). Two biface thinning flakes from test unit 1 are identified by visual inspection as Allenby chert. This material is derived from quarries in the upper Similkameen River valley located to the northeast of the site (Vivian 1989a). The sources of the basalt and chalcedony used at the site are unknown, but numerous sources of both are present on the Columbia Plateau to the east and north. The closest known source of chalcedony outside of the project area is a translucent chalcedony outcrop found in the Princeton Basin of British Columbia, Canada (Vivian 1989a). This source has not been chemically identified and may not be distinguishable from other translucent types of chalcedonies. The occurrence of exotic lithic raw materials reveals that the site inhabitants participated in an extensive exchange network that provided access to high quality raw materials from distant sources.

Table 10.16 Cultural Material From Excavation Units at 45WH253

test unit: 1 (1x1 m)	NOCA

L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	31 Debitage, Hozomeen Chert, Metasediment, 1 Hozomeen chert microblade	10001
	1 Unspecified Tool, Metasediment	8000
	1 Biface, Red Jasper	10002
	1 Biface, Hozomeen Chert	10008
	1 Biface, Hozomeen Chert	10009
L:2 (20-30 cm BD)	73 Debitage, Hozomeen Chert, Obsidian, Chalcedony	10003
	^{14}C, 580±80 BP, Beta 40697	
	1 Tephra Sample, Source Unknown	10192
L:3 (30-40 cm BD)	63 Debitage, Hozomeen Chert, Chalcedony, Metasediment, Allenby Chert	10004
L:4 (40-50 cm BD)	1 Biface, Hozomeen Chert	10005
	23 Debitage, Hozomeen Chert, Metasediment	10007
L:5 (50-60 cm BD)	7 Debitage, Hozomeen Chert, Metasediment	10006
L:6 (60-70 cm BD)	0 Collections	
West & South Walls	1 Tephra Sample, Source Unknown	10191
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	92 Debitage, Hozomeen Chert	7995
L:2 (20-30 cm BD)	78 Debitage, Hozomeen Chert	7996
	1 Microblade, Hozomeen Chert	7999
L:3 (30-40 cm BD)	45 Debitage, Hozomeen Chert	7997
L:4 (40-50 cm BD)	24 Debitage, Hozomeen Chert	7998
	1 Bulk Sample, Soil	10178
L:5 (50-60 cm BD)	0 Collections	

Site Chronology

The age of the site is estimated by the use of typological and radiocarbon dating. Two possibly time-sensitive artifact types were found at the site. The first (NOCA 7931) is a Type 4A projectile point Figure 10.11). It is very thin, relative to width, with straight margins and small, prominent barbs, exhibits well-controlled flaking, and is made of a material that appears identical to samples of basalt or trachydacite from Cache Cr. (see section 10.6). Unfortunately this point is broken at both ends. The typological assignment is provisional unless adjoining pieces are found. Type 4A points have been found only in the mid-Fraser/Thompson River area of British Columbia where they have been assigned to the Nesikep Tradition, dated between about 5,000 and 7,000 years ago (Stryd and Rousseau 1996). The other typological date is from the small proximal fragment (NOCA 10005) of a Type 3 (Cascade/Olcott) point, dated between 4,000 and 9,000 years ago.

The only other age estimate for the site is from a charcoal sample from test unit 1 that was submitted for radiocarbon dating (Table 10.17). It was collected *in situ* from

a discrete cluster, but its cultural origin cannot be demonstrated with any confidence. The sample is associated with debitage in the same level and with bifaces and debitage in levels above and below. It provides an approximate age for cultural material in the upper part of the artifact-bearing soil B-horizon.

Table 10.17 Table Of ^{14}C Dates at 45WH253

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU1	L-2	Beta 40697	580±80

Based on the above chronological data, site occupation may span the last 7,000 or more years. If this is correct, it suggests that this approximate timespan is compressed within the circa 50 cm (20 in) depth of the soil B- and BC-horizons that contain artifacts. This is not inconsistent with our present knowledge of the formation and age of soil B-horizons within the project area and other areas under the control of similar soil forming factors (Mierendorf 1993a and 1993b).

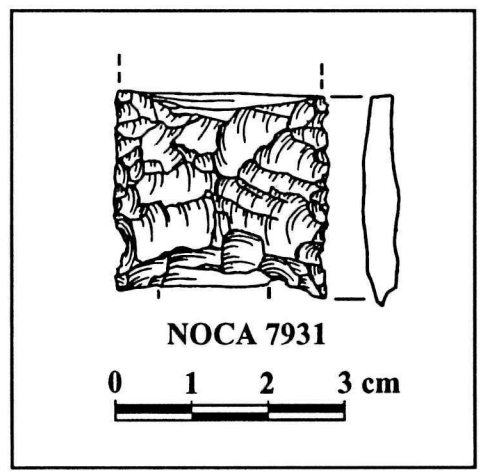


Figure 10.11 Artifact illustrations from Site 45WH253 (FS 73)

Site Stratigraphy

A generalized diagram of the site stratigraphic sequence is shown in Figure 10.12. The site is covered by a thin, loamy reservoir deposit consisting of redeposited soil material. Underneath it is a very thin, discontinuous unit consisting of lenses of scattered charcoal and decayed organic matter marking the lower remnant of the forest duff layer. The underlying stratum is a well developed soil B-horizon formed in a pebbly sandy silt parent material and exhibiting reddish-brown color and weak, blocky soil structure. The underlying BC-horizon is a yellowish-brown, pebbly silty clay loam, underlain by a brown, silty clayey gravel C-horizon. The prehistoric artifacts are found throughout the B- and BC-horizons, with the highest density occurring in the B.

The terrace remanent on which the site is located was laid down by the Cordilleran Ice Sheet sometime around 14,500 years ago. After glacial retreat, the terrace surface became exposed to weathering and erosion. The Skagit River, tributary streams such as Dry Cr., and local snow meltwater channels incised the terrace surface and eroded its edges, creating a series of terrace segments. During the Holocene (the last 10,000 or so years) the terrace remnants built a fine-grained cap of silts and sands

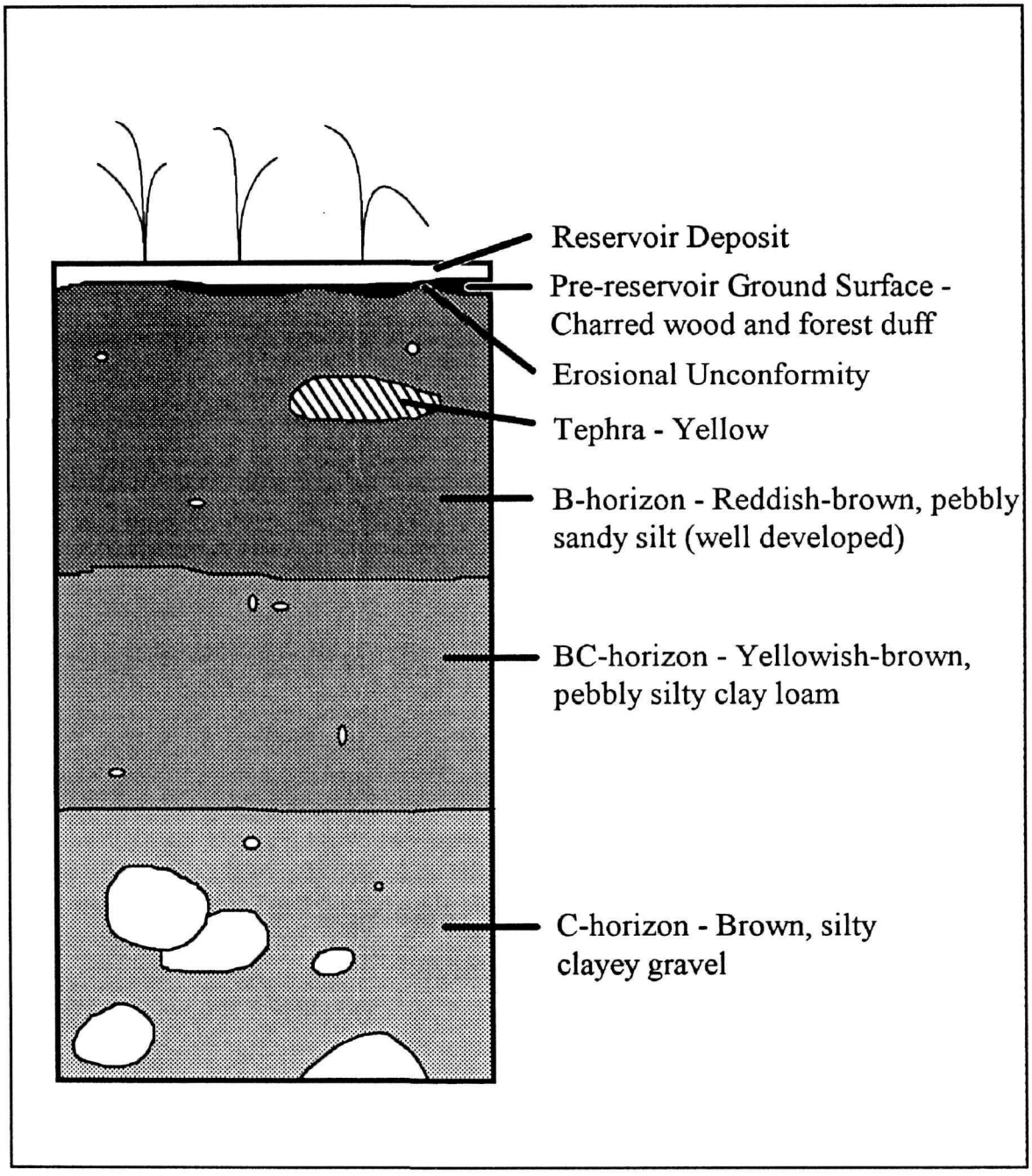


Figure 10.12 Generalized schematic of stratigraphy at Site 45WH253 (FS 73)

blown in from the adjacent flood plain and Cascade volcanos. The soil B- and BC-horizons developed as weathering zones within this loess cap. Bioturbation (mixing by living organisms) through the action of burrowing rodents, root penetration associated with tree growth, and burning of tree roots are evident in this soil cap, as are the flaking debris and stone tools of the prehistoric people who inhabited the landform during the Holocene.

Conclusions and Assessment

Site 45WH253 appears to have served as a lithic reduction workshop for the manufacture of early to late-stage bifaces made of Hozomeen chert and metasediment. Although no evidence for their production was found on-site, microblades were used here and bifacial tools made of high quality, exotic cherts, basalts, chalcedonies, and obsidians were repaired or sharpened. Two of the exotic materials (Cache Cr. basalt and Allenby chert) possibly have sources to the north and northeast in today's British Columbia and a third is derived from Glass Buttes, Oregon. This suggests that the site inhabitants were connected with groups along the lower Fraser River and that they participated in a large inter-regional exchange network.

Reservoir-induced erosion and historic logging activities associated with vegetation clearing have removed some of the artifact-bearing deposits at the site; however, undisturbed, intact deposits remain at some depth below the reservoir bottom. The exact area occupied by these deposits is uncertain, but it may be as large as 93 m (305 ft) long by 50 m (164 ft) wide by 50 cm (20 in) deep, and have an estimated volume of 2,325 m^3 (82,096 ft^3). This estimated volume comprises the significant portion of the site. Artifacts within this volume relate to local and exotic stone reduction technologies and tool use spanning perhaps the Early-Middle (8,000 to 5,000 years BP) to Late prehistoric (circa 600 years ago) time periods.

Site 45WH253 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits are *in situ* and retain integrity of setting. The artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.7 45WH255 (FS#75) North Tenmile Island #3

Site Setting

This site is located in the middle of the project area on the east side of the valley. At full pool, it is about 400 m (1,312 ft) north of the northern end of Tenmile Island. It is situated on a flat (0-3% slope) glacial terrace that has been incised by Dry Cr. to the north and an unnamed, intermittent snowmelt creek to the south. The landform has full solar exposure and view in all directions. To the west one sees the steep cliffs of the western valley wall, where a narrow canyon is cut by the Skymo Cr. waterfall. In the foreground is the Skagit River flood plain. To the north the terrace edge drops to Dry Cr. and other terrace remnants and glacially-scoured hills. In the distance is Desolation Pk. (1,860 m [6,102 ft] elevation). To the northeast and east is a broad flat comprised of glacial terraces abutting the steep, eastern valley wall that rises to Spratt Mtn. at 2,213 m (7,258 ft) elevation; to the south is the low, rounded rise of a glacially-scoured bedrock knob that became Tenmile Island following creation of the reservoir pool. At 477 m (1,565 ft) elevation, the landform is one member of a complex of

terrace remnants that were once connected but have been separated in post-glacial times by stream incision, especially from Dry Cr. 50 m (164 ft) to the north. The main channel of the Skagit River flows 0.7 km (0.4 mi) to the southwest and 41 m (135 ft) lower in elevation than the site. The artifact scatter that defines the site is roughly rectangular and corresponds with the prominent landform boundaries on the south, west, and north. The eastern boundary is defined by the surface distribution of lithic artifacts.

Historic logging of the drawdown area and reservoir erosion have been the primary sources of disturbance to the site. The landform on which the site is located is unprotected by physiography from wind and wave erosion, which at times is severe. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of a sparse open-canopy coniferous forest.

General Site Description

Site dimensions are 120 m (394 ft) north-south and 140 m (459 ft) east-west covering an area of 16,800 m^2 (180,768 ft^2) (Figure 10.13). Artifact depth determined during testing extended to 30 cm (12 in) below the surface and the estimated volume of artifact-bearing deposits at the site is 5,040 m^3 (177,962 ft^3). The site is characterized as a low-density lithic scatter with at least two circular FMR features. Flaked stone is scattered across the eroded site surface as isolates and in six small clusters. The types of artifacts present at the site are formed tools, flaked stone debitage, incised stone, and fire-modified rocks. The lithic material types in the chipped stone assemblage consist of locally available Hozomeen chert and metasediment. Quartz crystal and vitrophyre were also observed. It is suspected that quartz crystal is available in the local bedrock formations, but this is not yet confirmed. The vitrophyre is believed to have a source or sources in the adjacent Cascades. One large Hozomeen chert boulder in association with flaked shatter indicates quarrying activity of on-site material in order to procure tool stone.

Testing Methods and Rationale

The site was recorded during the survey portion of the project in 1988. At that time one artifact was collected from the site surface. The site was tested and additional surface collections were made in 1990 by the excavation of two 1 x 1 m (3.28 x 3.28 ft) test units designed to locate undisturbed cultural deposits and to determine the origin and integrity of the rock-cluster features. Two circular fire-modified rock (FMR) features were exposed on the surface of the site. Feature 1 was to the south, and feature 2 to the north (Figure 10.13). Feature 2 was the least exposed of the two, having more reservoir deposits covering it. If feature 1, being the most exposed to erosion, could be shown to have intact cultural deposits, then feature 2 also would likely be intact. Sediments from feature 1 in test unit 1 were screened with .32 cm (.125 in) wire mesh and those from test unit 2 were screened through .63 cm (.25 in) wire mesh. Excavated levels were 10 cm (3.94 in) thick. About one quarter of Feature 1 was test excavated.

Table 10.18 Inventory of Surface Collections from 45WH255

	NOCA
1 Flake, Vitrophyre	6368
1 Tool, Schist	7932
1 Biface, Hozomeen Chert	7933
1 Quartz Crystal, Modified	7934
1 Knife, Hozomeen Chert	7935
1 Biface, Metasediment	7936

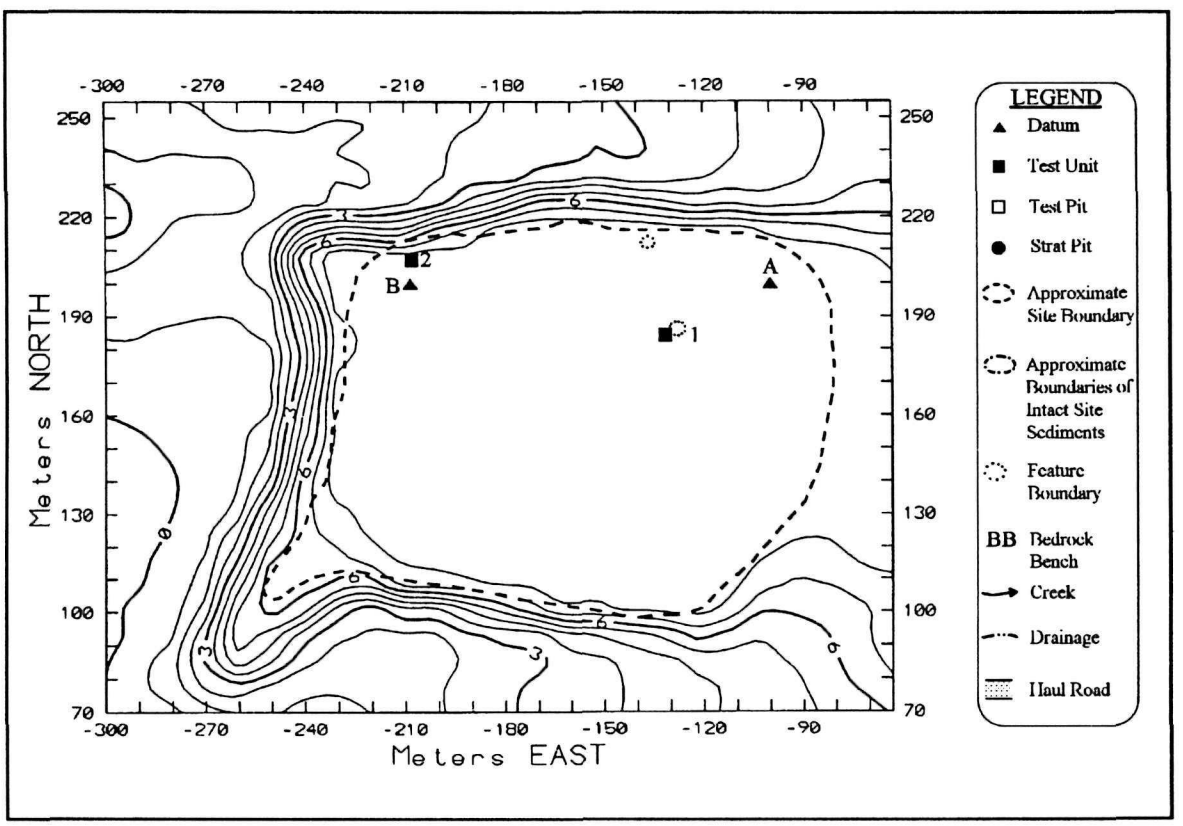


Figure 10.13 Topographic map of Site 45WH255 (FS 75)

Description of Testing Results

The total artifact assemblage collected from the site consists of 13 items, not counting the FMR that define the excavated portion of feature 1. Of the 13 items, 7 were excavated from the test units. The remaining 6 items were collected from the site surface from disturbed reservoir deposits.

No culturally or temporally diagnostic artifacts were recovered from the site; however, the small artifact assemblage reflects a diversity of tool types. One large tool

(NOCA 7932) is made from a rod-shaped, river-rounded schist rock 36 cm (14.2 in) long. The only visible cultural modification consists of two small areas of abrasion, one at each extremity. Three of the items are bifaces (NOCA 7933 and 7936 classified as reduction Stage III, NOCA 7935 classified as Stage V) (Figure 10.14) that appear to have functioned as knives. Two are roughly lanceolate in shape and the third has a triangular blade, large corner-notches forming prominent barbs, and a wide, straight-sided stem with a convex base. At the time of its use, this tool was probably hafted in a handle. The other tool from the surface is made on an unsymmetrical fragment of a quartz crystal (NOCA 7934). One margin of this crystal is unifacially-flaked and exhibits numerous stacked step-fractures and crushing from contact with a hard material.

A vitrophyre flake (NOCA 6368) collected from the site surface was submitted for XRF analysis to determine its source location. This vitrophyre artifact produced a chemical signature that does not match any presently known source. It does, however, match other samples from the project area assigned to Unknown Source 1 (see Section 10.7). Based on visual comparison of macroscopic characteristics with other vitrophyre debitage collected from archeological sites in North Cascades National Park (unpublished site records and collections), and with the mapped distribution of volcanic rock types in the North Cascades, it is possible that the unknown source is west of the Ross Lake area within the Hannegan Volcanics or Skagit Volcanics mapping units (Staatz et al. 1972; Mierendorf 1987b).

Test unit 1 was positioned to section feature 1 from near the center, through the outer edge, and beyond into the sediments immediately outside of the feature boundary. The feature consisted of a tight, nearly circular cluster of very fractured, cobble-sized, metamorphic and granitic rocks. The top of feature 1 was eroded by reservoir wave action, with loose, dry reservoir deposits covering the fire-modified rocks and filling the spaces between them. Immediately under the rocks was a thin, discontinuous, black charcoal-rich lens and reddish, heat-oxidized sediments. The sediments outside of the feature consisted of mottles of charcoal and heat-oxidized sediments within a soil B-horizon matrix (a strat diagram and profile description of test unit 1 is in Appendix E). Although the top of the feature has been altered by erosion, the rocks defining the bottom of the feature are in their original, unaltered position and retain integrity of location and association. No chipped stone or bone artifacts were recovered from within the feature, but two flaked metasediment pieces were recovered from outside of it. One of these is a river-rounded pebble that was split using a bipolar reduction technique, and the other is a small flake from this pebble. Feature 1 is estimated to be about 180 ± 50 years old. Although the function of the feature is uncertain, it may have been a cooking hearth or it could have been used to dry meat or some other material suspended above it on a rack.

Test unit 2 was positioned at the northwest part of the site in the vicinity of a cluster of flaked stone. One artifact (NOCA 10012) was found on the test unit surface in reservoir deposits. It is a thin (5 mm thick [.2 in]), tabular piece of dark gray slate with a roughly triangular outline. On one face of this piece is a prominent, V-shaped, incised groove circa 2 mm (.08 in) deep, aligned along the long axis of the piece. Although a few faint striations are visible on this face, this is the only groove on the

object, and it was incised for the purpose of snapping the object into two nearly equal-size pieces. We fitted this groove against the acute-angled margins of the quartz crystal tool (NOCA 7934), noted earlier, and found that two of them approximated the V-shaped sectional dimensions of the groove, suggesting the possibility that the quartz crystal tool had been used to incise the tabular slate. These artifacts were found in disturbed surface contexts about 60 m (197 ft) apart. Four broken, and technologically nondiagnostic, Hozomeen chert flakes were excavated from this test unit. Three were recovered from the lower, remaining portion of the soil B-horizon, indicating that some undisturbed artifact-bearing deposits remain; however, 30 cm (12 in) or more of the B-horizon was removed from above this level by reservoir-induced erosion. Glacial till parent material (C-horizon) was encountered at 10 to 20 cm (3.9 to 7.8 in) below the surface, at which point the excavations were discontinued.

The flaking debris from both test units suggests the opportunistic use of Hozomeen chert and metasediment nodules procured on-site. The nodules were probably flaked to produce expedient tools, used briefly and then discarded.

Table 10.19 Cultural Material From Excavation Units at 45WH255

test unit: 1 (1x1 m) Feature 1		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	^{14}C, 180±50 BP, Beta 40698	
L:2 (20-30 cm BD)	2 Debitage, Metasediment	10010
	1 Bulk Sample, Soil	10176
L:3 (30-40 cm BD)	1 Bulk Sample, Soil, ^{14}C, 500±90 BP, Beta 40699	10177
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Debitage, Hozomeen Chert	10011
	1 Incised Stone, Slate	10012
L:2 (20-30 cm BD)	3 Debitage, Hozomeen Chert	10013

Site Chronology

The site age is estimated on the basis of two radiocarbon dates from charcoal associated with feature 1. The first sample was collected from screened sediments excavated from within the feature boundaries and dated at 180 radiocarbon years. The second charcoal sample was collected from sediments below feature 1 and dated at 500 radiocarbon years (see Table 10.20 below). The earlier of the two dates provides a lower age limit to the feature and agrees stratigraphically with the younger date above it. It is concluded that feature 1 is about 180 radiocarbon years old, and that the site has been occupied during perhaps the last 500 years. Perhaps not coincidentally, this age estimate agrees well with the estimated age of occupation at 45WH253, located on a separate, but nearby, erosional remnant of the same glacial landform.

Table 10.20 Table Of ^{14}C Dates from 45WH255

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU1	L-1	Beta 40698	180±50
TU1	L-3	Beta 40699	500±90

Site Stratigraphy

A detailed strat diagram and description of test unit 1 and feature 1 are provided in Appendix E. The overall site stratigraphic sequence as recorded in test units is as follows. A reservoir deposit of wave and wind eroded soil B-horizon particles and other sediments has been redeposited as a thin sheet across the landform surface. The bottom boundary of this unit is an erosional unconformity. Under this deposit are at least two rock cluster features resting on the weathered, reddish-brown gravelly sandy soil B-horizon. Much of the top of this soil horizon has been removed by erosion. Underlying the B-horizon is a dark brown loamy BC-horizon which is underlain by a dark yellowish-brown, poorly sorted loamy gravel marking the top of glacial till. Artifacts (other than the FMR's defining the cultural features) were recovered from the soil B- and BC-horizons.

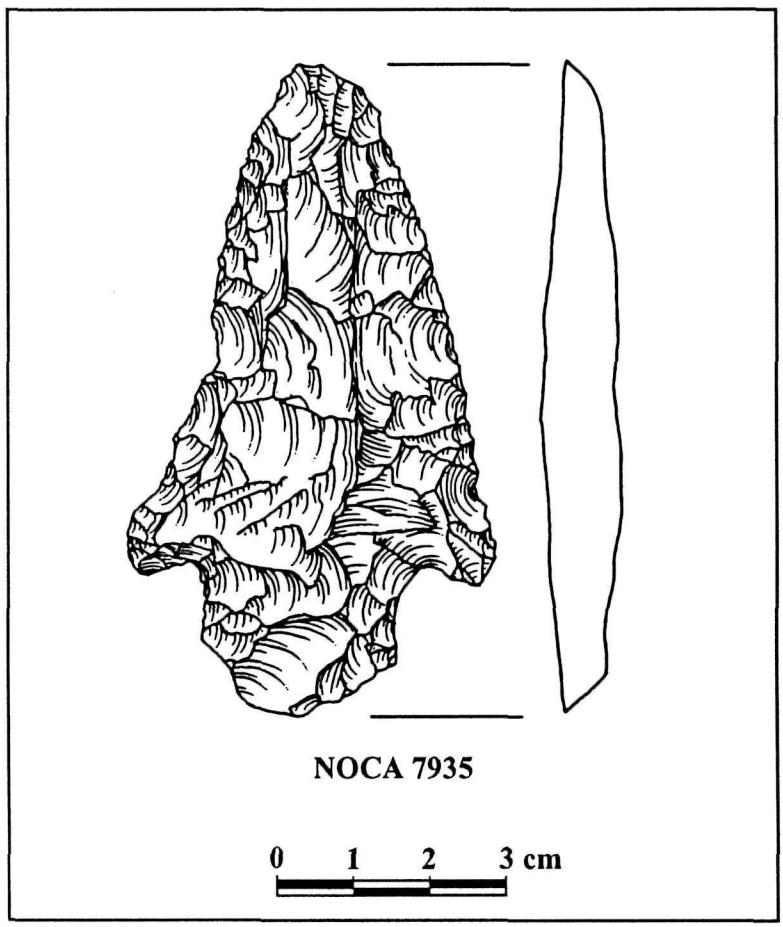


Figure 10.14 Artifact illustrations from Site 45WH255 (FS 75)

Because the site is located on an eroded segment of the same glacial terrace as site 45WH253, the glacial and post-glacial histories of the sites are the same. Site 45WH255 is much less protected from wave-induced erosion, however, so that soils have been stripped off to a greater depth than at 45WH253.

Conclusions and Assessment

Site 45WH255 appears to have been used by small groups of people as a task site for the processing of resources. The presence of hearths suggests preparation of foods for consumption or for storage, through drying and smoking. The assemblage of formed tools includes mostly knives. The flaking debris suggests expedient use of locally-procured chert and metasediment for cutting. Another locally derived stone material, slate, was worked at the site, but no finished tools were found.

Reservoir-induced erosion and historic logging activities associated with vegetation clearing have eroded artifact-bearing deposits at the site; however, undisturbed, intact deposits with artifacts remain below the reservoir bottom. The exact volume of intact deposits is uncertain, but it is not likely to exceed 1,000 m^3 (35,310 ft^3). The significant portions of the site are embodied within the intact rock cluster features (as yet unrecorded clusters may be buried at the site), the intact soil matrix surrounding them, and in other intact remnants of artifact-bearing soils that have survived reservoir erosion. Due to excessive erosion, it is probable that intact soil remnants are few and scattered within the larger site boundaries. Artifacts within the intact deposits relate to local stone tool-manufacturing technologies associated with the processing of resources within the last 500 years or less.

Site 45WH255 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits and cultural features are *in situ* and retain integrity of setting. The artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.8 45WH262 (FS#82) Devil's Junction Creek #2

Site Setting

This site is located on the east side of the valley at the mid-portion of the project area. It is circa 300 m (984 ft) north of Devil's Junction Campground, where it is situated on a flat (0-3% slope) terrace between two bedrock outcrops. At 479 m (1,570 ft) elevation, the landform has a southwest-to-west solar exposure. There are views of the Skagit River flood plain to the southwest, west, and northwest, and beyond to the steep western valley wall rising to Mt. Prophet at 2,384 m (7,820 ft) elevation. Immediately to the north is the steep face of a glacially scoured bedrock bench composed of poor quality Hozomeen chert and other metamorphic rock types; to the east is a small stream gully that emerges from a rock-walled canyon, and beyond this, the valley wall rises steeply to an unnamed ridgeline at 1,965 m (6,444 ft) elevation. To the south the land drops intermittently to lower terrace levels incised by snowmelt gullies, and then rises to steep slopes and glacially-scoured mountain shoulders above the mouth of Devil's Cr. At its closest approach, the main channel of the Skagit River is .36 mi (.6 km) to

the northwest. The closest stream is a small, unnamed, but permanent, mountainside stream that heads below bedrock walls of a high elevation ridgeline. The artifact scatter defining the site is roughly triangular. It is bounded on the north and east by the abrupt rise of the bedrock face, on the southeast by the unnamed stream channel, and on the south and west by the escarpment that forms the terrace edge.

Historic logging of the drawdown area and reservoir erosion have been the primary sources of disturbance to the site. Due to its southwest orientation, the site is particularly vulnerable to a large surf, created by the long fetch for the predominant southwesterlies. These waves impact the landform surface during lowered reservoir levels. Portions of the site, however, are spared excessive erosion by the self-armoring effect of the coarse gravels within the landform's sedimentary matrix. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open-canopy conifer forest.

General Site Description

The site dimensions are circa 100 m (328 ft) north-south and circa 60 m (197 ft) east-west, covering an area of circa 6,000 m^2 (64,550 ft^2) (Figure 10.15). Artifact depth, determined during testing extended to 110 cm (43 in) below surface. Due to the variability in artifact depth among test units, an average depth of 40 cm (17 in) was used to derive an estimated site volume of 640 m^3 (22,585 ft^3). The site is characterized as a high-density lithic scatter with the primary site function having been lithic reduction and biface manufacturing using Hozomeen chert. The types of artifacts present at the site include formed tools, projectile points, and debitage. The lithic material types in the chipped stone assemblage consists primarily of Hozomeen chert and chalcedony.

This site is distinctive for the quantity and density of Hozomeen chert bifaces and biface reduction flakes. Nowhere else in the drawdown to date has a site been recorded with such a high density of bifaces and biface fragments. The source of the Hozomeen chert worked at the site is unknown. Although the bedrock cliffs that form the northern and eastern site boundaries are composed of this material, it is poor in quality and unsuitable for tool use.

The excavations exposed complex and highly variable stratigraphy. Intact deposits and artifacts were found below the reservoir deposits in two different parts of the site. Other parts of the site lack buried artifacts. The high degree of stratigraphic variability makes it difficult to correlate excavation units.

Testing Methods and Rationale

The site was recorded and surface collected during the survey portion of the project in 1988. It was tested in 1991, at which time an extensive surface collection of bifaces was made. Subsurface testing was accomplished through the excavation of four 1 x 1 m (3.28 x 3.28 ft) test units and one 50 x 50 cm (20 x 20 in) test pit. Sediments were excavated in 5 cm (2 in) and 10 cm (3.94 in) levels and screened through .32 cm

(.125 in) and .63 cm (.25 in) wire mesh. Additional surface collection and mapping was conducted in 1993.

The testing was designed to determine the vertical and horizontal extent of undisturbed cultural deposits. Test unit 1 was positioned in the approximate center of a large scatter of Hozomeen chert biface fragments. It was excavated in 5 cm (2 in) increments, and the different sedimentary matrices within each level were screened separately through .32 cm (.125 in) mesh. Test unit 3 was located on a small flat bench near the northern site boundary, and matrix was screened through .32 cm (.125 in) mesh. Other test units were positioned for correlation with test unit 1 strata and for subsurface exposure of strata in parts of the site that exhibited geomorphic or surficial differences from other parts of the site.

Table 10.21 Inventory of Surface Collections from 45WH262

	NOCA
1 Projectile Point, Obsidian	7121
1 Projectile Point, Metasediment	7122
1 Projectile Point, Hozomeen Chalcedony	7123
1 Biface, Hozomeen Chalcedony	7124
1 Biface, Metasediment	10202
1 Biface, Hozomeen Chert	10203
1 Biface, Hozomeen Chert	10204
1 Biface, Hozomeen Chert	10205
1 Biface, Hozomeen Chert	10206
1 Biface, Hozomeen Chert	10207
1 Biface, Hozomeen Chert	10208
1 Biface, Hozomeen Chert	10209
1 Biface, Hozomeen Chert	10210
1 Biface, Hozomeen Chert	10211
1 Biface, Hozomeen Chert	10212
1 Projectile Point, Hozomeen Chert	10213
1 Biface, Hozomeen Chert	10214
1 Biface, Hozomeen Chert	10215
1 Biface, Hozomeen Chert	10216
1 Biface, Hozomeen Chert	10217
1 Biface, Hozomeen Chert	10218
1 Biface, Hozomeen Chert	10219
1 Biface, Hozomeen Chert	10220
1 Biface, Hozomeen Chert	10221
1 Biface, Hozomeen Chert	10222
1 Biface, Hozomeen Chert	10223
1 Biface, Hozomeen Chert	10224
1 Biface, Hozomeen Chert	10225
1 Biface, Hozomeen Chert	10226

1 Biface, Hozomeen Chert	10227
1 Biface, Hozomeen Chert	10228
1 Biface, Hozomeen Chert	10229
1 Biface, Hozomeen Chert	10230
1 Biface, Hozomeen Chert	10231
1 Biface, Hozomeen Chert	10232
1 Biface, Hozomeen Chert	10233
1 Biface, Hozomeen Chert	10234
1 Projectile Point, Hozomeen Chert	10235
1 Biface, Hozomeen Chert	10236
1 Biface, Hozomeen Chert	10237
1 Biface, Hozomeen Chert	10238
1 Biface, Hozomeen Chert	10239
1 Biface, Hozomeen Chert	10240
1 Biface, Hozomeen Chert	10241
1 Biface, Hozomeen Chert	10242
1 Biface, Hozomeen Chert	10243
1 Biface, Hozomeen Chert	10244
1 Biface, Hozomeen Chert	10245
1 Biface, Hozomeen Chert	10248
1 Biface, Hozomeen Chert	10249
1 Projectile Point, Metasediment	10250
1 Flake, Edge Modified, Hozomeen Chert	10251
1 Biface, Hozomeen Chert	10252
1 Biface, Hozomeen Chert	10253
1 Flake, Edge Modified, Quartz Crystal	10254
1 Projectile Point, Metasediment	10255
1 Projectile Point, Metasediment	10256
1 Unspecified Tool, Metasediment	10257
1 Biface, Hozomeen Chert	10258
1 Flake, Edge Modified, Metasediment	10259
1 Projectile Point, Hozomeen Chert	10319
1 Hammerstone, Andesite	10322
1 Biface, Hozomeen Chert	10674
1 Biface, Hozomeen Chert	10675
1 Biface, Hozomeen Chert	10676
1 Biface, Hozomeen Chert	10677
1 Biface, Hozomeen Chert	10678
1 Flake, Basalt or Metasediment	10679

Description of Testing Results

Cultural remains from the site consist predominately of chipped stone flaking debris, unfinished bifaces, edge-modified flakes, diagnostic projectile points, cores, and FMR. A total of 68 artifacts was collected from the site surface, consisting of biface

fragments (76%), projectile points (15%), and minor percentages of edge-modified flakes and other tools (table 10.21). The 52 bifaces, mostly fragments, are the largest biface assemblage from a single site in the drawdown. A total of 4,911 artifacts was collected from excavation units, 98% from test unit 1. They consisted predominately of biface-thinning and reduction flakes.

The great majority of artifacts recovered from the site are made of Hozomeen chert or chalcedony. Metasediment comprises only a small proportion of the total lithic assemblage. Quartz crystal is also present and was probably procured from local bedrock formations, although this cannot yet be confirmed. Two hammerstones were made of andesite, which is locally available in river and glacial gravels throughout the valley. One exotic (non-local) obsidian artifact was recovered from the site.

The cultural remains were found scattered across the surface of the site and incorporated within reservoir deposits consisting of deflated soil B-horizon sands and silts mixed with gravels. Artifacts were recovered throughout the intact soil B-horizon to the depth of 1 m (3.28 ft) below the surface in test unit 1 and to 25 cm (9.8 in) below the surface in test unit 3. The remaining test units contained no cultural material below the surficial reservoir deposit. No features or deposits of cultural origin were found at the site.

Seven chronologically diagnostic artifacts were recovered from the site surface, all dating to the Early-Middle period, circa 4,000-8,000 years ago. Three are classified as Type 3A, two as Type 3B, and two as Type 5 (Appendix D). Three are made of the locally available Hozomeen chert or chalcedony, three of locally available metasediment, and one of an exotic obsidian. The last of these (NOCA 7121) was submitted for XRF analysis to determine its source location. It produced a chemical signature that matched a source from Three Sisters, Oregon. More detailed results of the XRF analysis are reported in section 10.7 and Appendix G of this report.

Two unifacial flake tools found on the site surface (NOCA 10257 and 10259) have steeply beveled lateral and distal margins that appear to have been used for scraping and cutting of an unknown material. One of these (NOCA 10257) is manufactured of a high quality, exotic basalt that visually resembles raw materials from Cache Cr. in southern British Columbia (see section 10.6).

From test unit 1 was excavated the highest density of lithic flaking debris and bifaces of any site in the drawdown zone. A total of circa 4,900 artifacts was recovered with frequencies per level comparable only to those recorded at the Desolation Chert Quarry (Mierendorf 1993a:48-49), located 6.5 km (3.9 mi) north. This assemblage was recovered from two depositional strata. The upper circa 65 cm (26 in) consists of a poorly sorted, gravelly deposit with boulder-sized clasts suggesting an origin related to colluvial, mass wasting, glacial processes, or some combination of all three. The highest density of artifacts occurred in this deposit. Underlying the upper deposit, and separated from it by an unconformity, is a fine-grained loess circa 65-100 cm (26-39 in) below surface, in which a strong-brown soil B- and a brown BC-horizon have developed. A

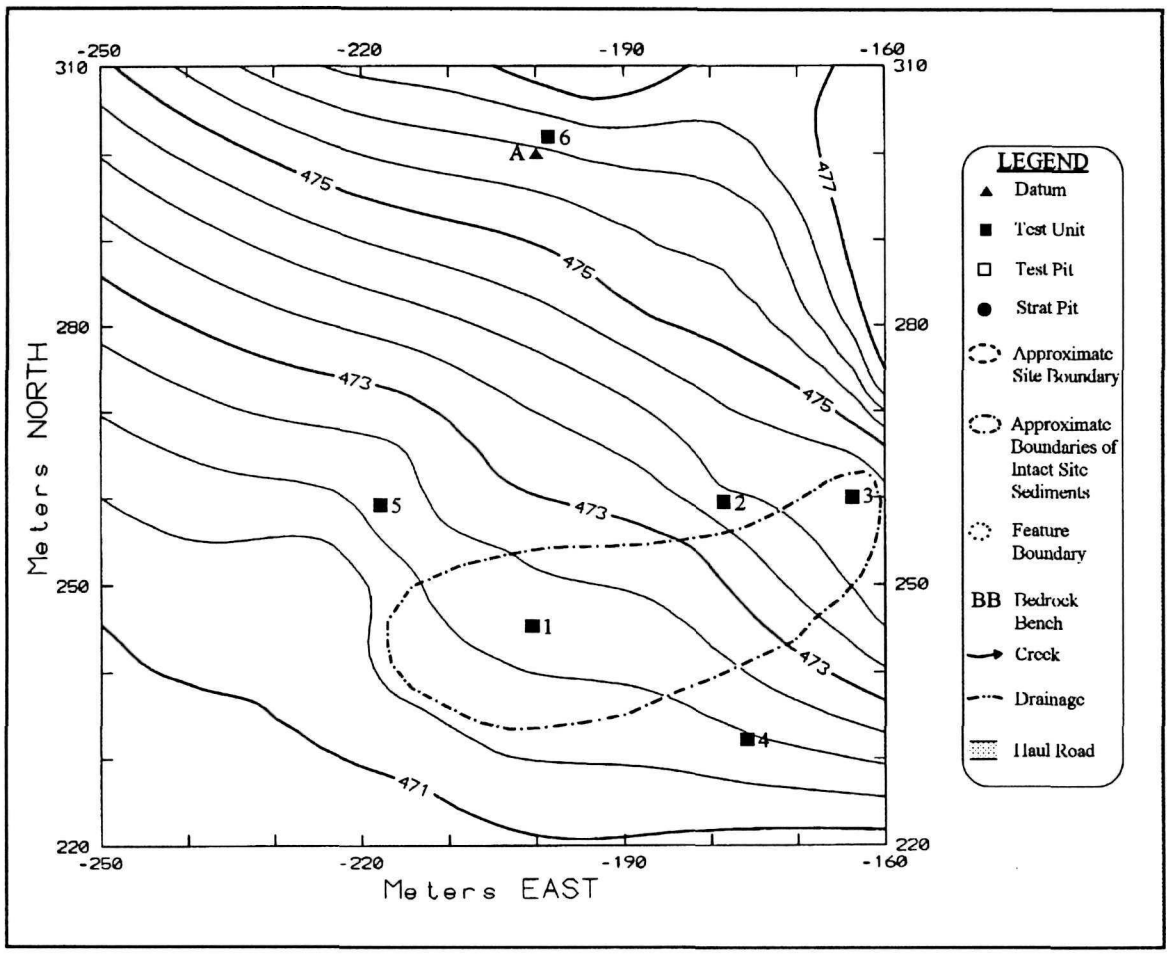


Figure 10.15 Topographic map of site 45WH262 (FS 82)

much lower density of artifacts was excavated from these lower levels. The upper deposit included strongly mottled sediments consisting of a mixture of yellowish-brown silty sand, red heat-oxidized sediments, brown silty loess, black charcoal fragments and charred bark. Supported within this finer matrix are angular rock fragments from nearby bedrock and some subrounded rocks of exotic origin. The exact cause and nature of the burned earth and mixed sediment is uncertain. Test units were excavated in quadrants and by different matrices to determine the distribution of cultural material horizontally within the same matrix and vertically between different matrices.

Table 10.22 and Figure 10.16 show the results of a descriptive technological/morphological analysis of the flaked stone debitage from test unit 1 at site 45WH262. The number of flaked stone items excavated from the unit is listed by level (which is broken down into matrix type and quarter- or half-unit, reflecting how the level was excavated) and flaked stone classification. The classification consists of 5 biface categories and 9 flaking debris categories. These are defined in detail in Appendix A. Nine bifaces were recovered from test unit 1 with the majority classified as reduction Stage III. Most of the flaked stone debris from the test unit (70%) is so fragmented that

it is categorized as unclassified. However, relationships expressed in these data are meaningful for characterizing the site's lithic assemblage and its technological function relative to other sites in the project area. First, shatter comprises a minor component of the chipped stone debris (1.8%). Second, the total absence of cores and near absence of blades (0.4%) suggest that flake production from prepared cores was not practiced. Third, although flakes exhibiting unambiguous biface thinning morphology account for only 6.5% of the assemblage, this resulted from the high degree of flake fragmentation (59% of the debitage was too small to be assigned to a technological category). However, the morphology of all the thick and thin flake categories (18%), whether they were classified as biface thinning flake or not, suggests that they are the product of biface shaping. Considered together, these proportions of technological classes are considered evidence that the site was used predominately for the manufacture of bifaces. The extremely low percentage of shatter indicates that the bifaces were initially shaped elsewhere, most likely at the source of the lithic material. This source is currently unknown, although some of the raw material could have come from the Desolation Chert Quarry.

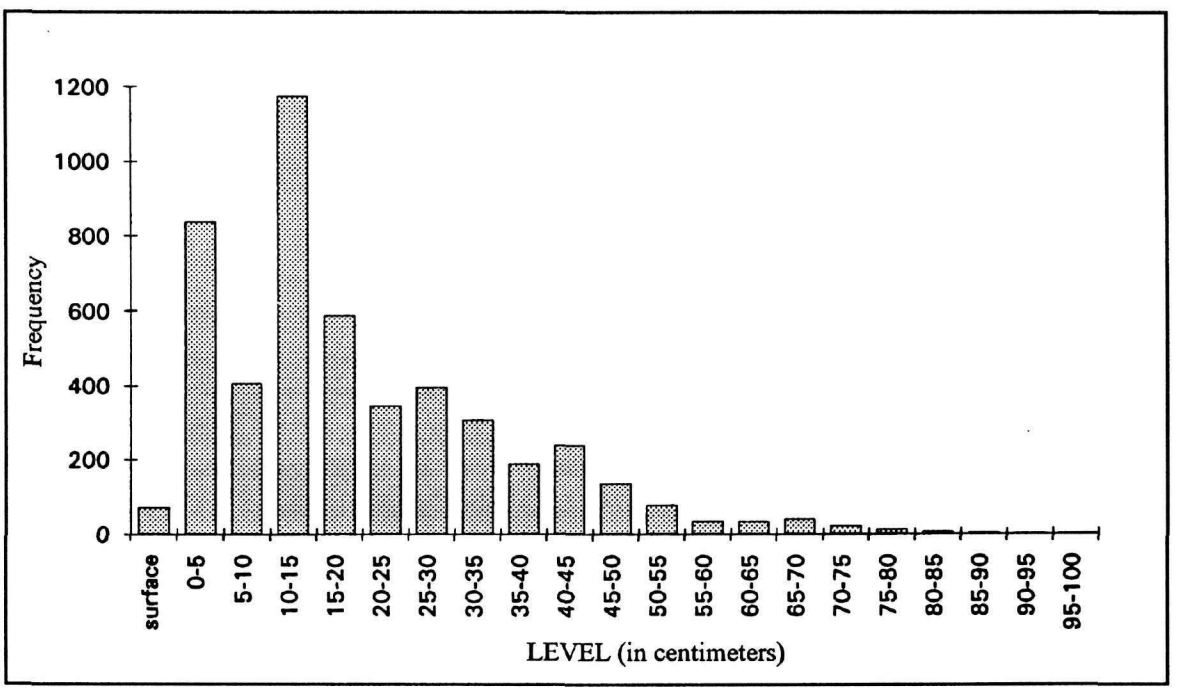


Figure 10.16 Artifact distribution by level for Site 45Wh262 (FS 82)

These data from test unit 1 support the conclusion that this part of site 45WH262, and presumably most other parts of the site, functioned as a biface production workshop. These data can be compared to Desolation Chert Quarry (45WH224) (Table 10.23). Test unit 1 from 45WH262 has a higher proportion of biface thinning flakes and a lower proportion of shatter than any test unit at the quarry. The unexpectedly low proportion of flakes at 45WH262 is due to the large number of unclassifiable fragments in the assemblage.

Table 10.22 Quantitative analysis of TU 1, 45WH262

	Reduction Stage					Tk		Tn		Pr		Sm		Unc
Level	I	II	III	IV	V	Bi	Un	Bi	Un	Fl	Bld	PC	Sh	1cm
Surface	0	0	0	1	0	2	15	20	8	0	0	5	2	19
1 0-5cm	0	0	2	0	0	19	62	84	76	74	6	48	8	462
2 5-10cm	0	0	0	0	0	12	1	17	18	45	1	48	0	264
3 10-15cm	0	1	0	0	0	13	30	43	65	118	4	102	23	776
4 15-20cm	0	1	0	0	0	2	20	21	27	52	1	79	15	371
5 20-25cm	0	0	0	0	0	0	12	15	18	22	3	45	13	216
6 25-30cm	0	0	1	0	0	5	15	18	16	33	2	60	15	231
7 30-35cm	0	0	1	0	0	6	10	10	23	40	2	51	3	160
8 35-40cm	0	0	0	0	0	0	17	7	19	8	1	18	2	117
9 40-45cm	0	0	0	0	0	0	12	12	9	19	2	45	3	137
10 45-50cm	0	0	0	0	0	1	54	3	4	9	0	16	1	48
11 50-55cm	0	0	1	0	0	1	7	2	8	3	0	11	4	42
12 55-60cm	0	0	0	0	0	0	0	0	0	5	0	3	2	25
13 60-65cm	0	0	0	0	0	1	4	2	1	3	0	10	0	12
14 65-70cm	0	0	0	0	0	0	1	2	1	3	0	12	1	20
15 70-75cm	0	0	0	0	0	1	3	1	0	4	0	5	0	8
16 75-80cm	0	0	0	0	0	1	3	0	1	0	0	5	0	3
17 80-85cm	0	0	0	0	0	0	0	0	0	0	0	3	0	4
18 85-90cm	0	0	0	0	0	0	0	0	0	0	0	1	0	4
19 90-95cm	0	0	0	0	0	0	0	0	0	1	0	0	0	1
20 95-1m	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Sum	0	2	6	1	0	64	267	257	294	439	22	568	92	2919

Table 10.23 Comparison of Lithic Debitage Category Ratios for Sites 45WH224 and 45WH262

45WH224	All Flakes:Total Debitage	Shatter:Total Debitage	Biface Thin: All Flakes
TU 2	0.88	0.09	0.02
TU 3	0.51	0.48	0.001
TU 6	0.81	0.16	0.02
TU 7	0.93	0.05	0.01
TU 19	0.81	0.16	0.03
45WH262			
TU 1	0.39	0.02	0.17

A metric analysis of all bifaces from 45WH262, including surface collections and excavations, and their classification by stage reduction categories (defined in Appendix A) is shown in Table 10.24. The averages of length, width, and thickness show a regular decrease in successive stages of manufacture. Most bifaces are classified as Stage III, with approximately equal but lesser proportions of Stage II, IV, and V (Table 10.25). This supports an inference of reduction of roughed-out bifaces (Stage II) brought to the site, with only limited manufacture of bifaces into final tool forms (pressure flakes, a product of tool finishing, constitute 8.9% of the lithic debitage).

Table 10.24 Metric Attributes of Bifaces from Site 45WH262 (FS 82)(mm)

Reduction Stage 2					Reduction Stage 3				
NOCA #	Length	Width	Thick	W/T	NOCA #	Length	Width	Thick	W/T
10203	48.35	72.70	20.25	3.6	10202	52.10	34.60	9.90	3.5
10209	53.90	39.80	13.70	2.9	10204	43.85	41.40	12.95	3.2
10218	50.25	36.20	13.10	2.8	10205	64.75	38.60	15.55	2.5
10219	77.40	37.30	15.00	2.5	10208	25.20	25.10	7.70	3.3
10224	61.40	42.50	17.65	2.4	10210	48.50	33.00	9.40	3.5
10228	92.40	38.90	23.60	1.6	10213	69.75	32.85	14.90	2.2
10240	53.45	39.10	17.20	2.3	10214	43.75	37.10	10.15	3.7
10252	40.00	42.55	14.25	3.0	10215	49.25	41.05	12.90	3.2
10253	74.90	38.85	17.90	2.2	10217	61.50	27.15	10.00	2.7
Count:	9				10220	59.20	32.45	12.70	2.6
Average:	61.34	43.10	16.96	2.6	10222	66.55	52.50	16.80	3.1
Stdev:	16.85	11.30	3.41	0.6	10223	61.50	26.40	10.55	2.5
					10226	65.80	28.80	11.40	2.5
					10227	49.10	34.80	9.00	3.9
					10231	38.30	36.55	10.80	3.4
					10233	40.65	34.15	10.00	3.4
					10234	29.25	35.80	7.70	4.6
					10236	19.15	25.50	7.50	3.4
					10237	38.00	30.00	10.20	2.9
					10238	31.20	33.60	8.10	4.1
					10239	21.60	36.30	7.45	4.9
					10242	28.25	36.95	9.25	4.0
					10243	63.10	27.80	11.45	2.4
					10244	37.65	36.35	11.05	3.3
					10245	40.45	48.30	12.00	4.0

Reduction Stage 4				
NOCA #	Length	Width	Thick	W/T
10206	56.40	36.30	10.10	3.6
10207	51.50	29.10	9.70	3.0
10210	42.60	26.80	7.95	3.4
10211	63.25	36.85	8.35	4.4
10212	66.90	34.85	8.60	4.1
10221	50.10	35.00	10.30	3.4
10230	42.40	36.05	9.75	3.7
10232	42.50	42.90	9.15	4.7
10241	31.35	31.10	8.35	3.7
Count:	9			
Average:	49.67	34.33	9.14	3.8
Stdev:	11.29	4.77	0.86	0.53

10248	43.35	26.00	10.40	2.5
10249	35.35	50.75	11.30	4.5
Count:	27			
Average:	45.45	34.96	10.78	3.3
Stdev:	14.78	7.27	2.40	0.7

Reduction Stage 5				
NOCA #	Length	Width	Thick	W/T
7121	38.4	1.78	0.71	2.5
7122	51.7	2.17	0.69	3.1
7123	41.4	1.88	1.12	1.7
7124	66.3	2.71	0.83	3.3
10235	38.8	20.80	6.00	3.5
10250	30.6	24.00	6.45	3.7
10255	42.8	18.85	5.20	3.6
10256	38.1	25.50	5.15	5.0
10258	57.1	28.70	7.05	4.1
10319	69.7	27.50	8.60	3.2
Count:	10			
Average:	47.49	15.34	4.18	3.37
Stdev:	13.11	11.76	3.04	.88

Reduction Indescript				
NOCA #	Length	Width	Thick	W/T
10225		35.00	7.85	4.5
10229		32.40	9.20	3.5
10251		24.85	9.70	2.6
Count:	3			
Average:		30.75	8.92	3.51
Stdev:		5.27	0.96	0.95

Chipped stone debitage category ratios and biface production stages appear to serve as useful quantitative measures of technological differences in lithic workshop areas. These separate data sets corroborate one another, and in comparison with

45WH224, they support the conclusion that 45WH262 was a lithic workshop where intermediate stage bifaces were manufactured. This means that, in the lithic-rich project area at least, lithic tool production was spatially segregated into workshop sites characterized by different stages of tool manufacturing. Spatial segregation of lithic workshops may reflect a highly organized system of bulk processing wherein the production stages were located along the transportation route that brought the product to consumer groups. This was distinct from an organizational strategy wherein the consumer groups exploited lithic raw materials on an encounter basis and where tool manufacturing was embedded in a wider range of other subsistence pursuits (Mierendorf 1993a:88-91). The prehistoric organization of lithic technology in the project area may, therefore, provide a way to investigate hunter-gatherer land-use systems in the upper Skagit River Valley.

Table 10.25 Comparison of Biface Reduction Stage Categories, Sites 45WH224 and 45WH262

	I	II	III	IV	V	Ind.	Total
45WH224	4	25	14	0	0	4	47
45WH262	0	9	27	9	10	3	58

Fifty-nine chipped stone artifacts from within 25 cm (9.8 in) of the ground surface were recovered from test unit 3. Most of these artifacts were from undisturbed deposits. Although small compared with test unit 1, the assemblage reflects a different lithic technology, one based on use of local river and glacially-rounded metasediment cobbles. No finished tools were found, but three flake cores were recovered. Use of this workshop area appears to have been contemporary with use of the biface reduction workshop, at least during the late prehistoric time period.

Only a handful of chipped stone debris pieces was excavated from other test units and pits. All pieces were recovered from disturbed reservoir deposits (Table 10.26). This debris represents both Hozomeen chert biface and metasediment cobble reduction.

Table 10.26 Cultural Material From Excavation Units at 45WH262

test unit 1 (1x1 m)		NOCA
L:S (surface)	76 Debitage, Hozomeen Chert, Chalcedony	10262
L:1 (0-5 cm BS)	1 Biface, Hozomeen Chert	10263
	1 Flake, Outre passe, Hozomeen Chert	10266
	829 Debitage, Hozomeen Chert	10265
L:2 (5-10 cm BS)	Matrix #1: 115 Debitage, Hozomeen Chert	10264
	Matrix #2: 283 Debitage, Hozomeen Chert	10285

L:3 (10-15 cm BS)	Matrix #1: 231 Debitage, Hozomeen Chert	10276
	Matrix #2: 1 Biface, Hozomeen Chert	10273
	923 Debitage, Hozomeen Chert	10272
	^{14}C, 310±70 BP, Beta 65229	
	1 Bone Fragment, Unidentifiable	10396
L:4 (15-20 cm BS)	Matrix #1: 1 Biface, Hozomeen Chert	10247
	137 Debitage, Hozomeen Chert	10284
	Matrix #2: 1 Biface, Hozomeen Chert	10246
	364 Debitage, Hozomeen Chert	10275
L:5 (20-25 cm BS)	Matrix #1: 94 Debitage, Hozomeen Chert	10271
	Matrix #2: 314 Debitage, Hozomeen Chert	10270
L:6 (25-30 cm BS)	Matrix #1: 134 Debitage, Hozomeen Chert	10282
	Matrix #2: 1 Biface Fragment, Hozomeen Chert	10278
	1 Biface Fragment, Hozomeen Chert	10279
	254 Debitage, Hozomeen Chert	10277
L:7 (30-35 cm BS)	Matrix #1: 1 Biface, Hozomeen Chert	10268
	121 Debitage, Hozomeen Chert	10267
	Matrix #2: 178 Debitage, Hozomeen Chert	10281
L:8 (35-40 cm BS)	199 Debitage, Hozomeen Chert	10283
L:9 (40-45 cm BS)	North 1/2: 160 Debitage, Hozomeen Chert	10274
	SW Quad: 41 Debitage, Hozomeen Chert	10280
	SE Quad: 31 Debitage, Hozomeen Chert	10288
L:10 (45-50 cm BS)	North 1/2: 43 Debitage, Hozomeen Chert	10290
	SW Quad: 13 Debitage, Hozomeen Chert, Metasediment	10286
	SE Quad: 29 Debitage, Hozomeen Chert	10292
L:11 (50-55 cm BS)	North 1/2: 1 Biface Fragment, Hozomeen Chert	10299
	72 Debitage, Hozomeen Chert	10298
	SW Quad: 13 Debitage, Hozomeen Chert	10294
	SE Quad: 5 Debitage, Hozomeen Chert	10293
L:12 (55-60 cm BS)	North 1/2: 38 Debitage, Hozomeen Chert	10301
	SE Quad: 4 Debitage, Hozomeen Chert	10295
L:13 (60-65 cm BS)	North 1/2: 15 Debitage, Hozomeen Chert	10310
	SW Quad: 13 Debitage, Hozomeen Chert	10291
	SE Quad: 7 Debitage, Hozomeen Chert	10309
L:14 (65-70 cm BS)	North 1/2: 39 Debitage, Hozomeen Chert	10321
	SW Quad: 7 Debitage, Hozomeen Chert	10312
	SE Quad: 2 Debitage, Hozomeen Chert	10311
L:15 (70-75 cm BS)	Matrix #1, North 1/2: 13 Debitage, Hozomeen Chert	10305
	SW Quad: 1 Debitage, Hozomeen Chert	10303
	SE Quad: 1 Debitage, Hozomeen Chert	10304
	Matrix #2, North 1/2: 5 Debitage, Hozomeen Chert	10300
	1 Debitage, Hozomeen Chert	10296
L:16 (75-80 cm BS)	North 1/2: 7 Debitage, Hozomeen Chert	10289
	SW Quad: 6 Debitage, Hozomeen Chert	10307

L:17 (80-85 cm BS)	North 1/2: 8 Debitage, Hozomeen Chert	10308
L:18 (85-90 cm BS)	North 1/2: 2 Debitage, Hozomeen Chert	10320
	SW Quad: 2 Debitage, Hozomeen Chert	10297
L:19 (90-95 cm BS)	2 Debitage, Hozomeen Chert	10287
L:20 (95-100 cm BS)	2 Debitage, Hozomeen Chert	10302
L:21 (100-110 cm BS)	0 Collections	
No Provenience:	Strat Unit 3: 1 Tephra, Source Unknown	10419
	Strat Unit 3 and 4: 1 Tephra, Source Unknown	10420

test unit 2 (1x1 m)

L:S (surface)	3 Debitage, Hozomeen Chert, Metasediment, Quartz	10269
L:1-3 (0-30 cm BS)	0 Collections	

test unit 3 (L:S-L:6 1x1 m, L:6-L:7 60x60 cm)

L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	1 Core, Metasediment	10260
	1 Debitage, Hozomeen Chert	10331
	1 Debitage, Metasediment	10306
L:2 (5-10 cm BS)	1 Core, Metasediment	10261
	1 Hammerstone, Andesite	10323
	28 Debitage, Metasediment	10314
L:3 (10-15 cm BS)	SW Quad: 10 Debitage, Metasediment, Hozomeen Chert	10332
	NW Quad: 1 Debitage, Hozomeen Chert	10330
	SE Quad: 4 Debitage, Metasediment	10315
	NE Quad: 4 Debitage, Metasediment	10313
	^{14}C, 1,120±80 BP, Beta 64821	
L:4 (15-20 cm BS)	East 1/2: 1 Core, Metasediment	10317
	1 Core, Metasediment	10316
	2 Debitage, Metasediment	10318
	West 1/2: 2 Debitage, Metasediment	10328
	^{14}C, 1,020±80 BP, Beta 64822	
L:5 (20-25 cm BS)	1 Debitage, Hozomeen Chert	10329
L:6 (25-35 cm BS)	0 Collections	
L:7 (35-67 cm BS)	14C, Too Small	
No Provenience:	Strat Unit 2A: Tephra, ROLA89 229-1, ROLA89 229-2, Mazama O	10421

test unit 4 (L:S-L:7 1x1 m, L:8-L:10 1x0.5 m)

L:S (surface)	0 Collections
L:1-10 (0-92 cm BS)	0 Collections

test pit 5 (50x50 cm)

L:S (surface)	0 Collections
L:1-2 (0-17 cm BS)	0 Collections

L:3 (17-27 cm BS)	1 Debitage, Hozomeen Chert	
L:1-7 (0-77 cm BS)	0 Collections	
test pit 6 (50x50 cm)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Biface Fragment, Hozomeen Chert	10326
	2 Debitage, Hozomeen Chert	10325
L:2 (10-16 cm BS)	6 Debitage, Hozomeen Chert	10327
L:3-8 (16-66 cm BS)	0 Collections	

Site Chronology

Three dating techniques were used to estimate the age of the site and the periods of its use. The first technique utilizes chronologically sensitive projectile points (Figure 10.17). Three were classified as Type 3A and two as Type 3B (Cascade/Olcott) points, all with an assigned age range of 9,000-4,000 years BP. Two are classified as Type 5 (Cold Springs Side-Notched) with an assigned age range of circa 7,000-3,500 years BP (Appendix D). The former type is believed to have tipped spears, and the latter, to have tipped atlatl darts. In the upper Skagit River Valley, both types generally mark the Early-Middle prehistoric period. On this basis, site use is estimated from 3,500 to 7,000 years ago.

Four charcoal samples were submitted for radiocarbon dating (Table 10.27). One of these (from test unit 3) was too small after pretreatment for dating purposes. The sample from test unit 1 (310 ± 70) was collected from a matrix mixed with charcoal, discontinuous tephra lenses, soil B- and BC-horizon material, and boulders. The sample is not likely to be of cultural origin. Two samples collected from test unit 3 ($1,120\pm80$ and $1,020\pm80$) were taken from a part of the unit that was excavated separately because it appeared initially to be a rock feature. The first of these from level 3 (12 cm [4.7 in] below the unit surface) consisted of a solid chunk of charcoal removed from a well-developed B-horizon in what appeared to be loess mixed with colluvium. The lower sample consisted of charcoal from level 4 (16 cm [6.3 in] below the unit surface). The samples were not clearly of cultural origin. The lower of the two may have been disturbed by the activity of burrowing rodents.

Table 10.27 Table Of ^{14}C Dates from 45WH262

TU	LEVEL	LAB #	UNCORRECTED DATE YBP
TU1	L-3	Beta 65229	310±70
TU3	L-3	Beta 64821	1,120±80
TU3	L-4	Beta 64822	1,020±80

A tephra sample from test unit 3 was submitted for analysis, but it is from a disturbed context and is of little value for estimating the age of the site. It contained a mixture of glass shards, most of them from a tephra source that chemically resembles Mt. Mazama O but is of uncertain origin. This tephra has been found in other sites in the project area.

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 10.18 and a detailed strat diagram and description of test unit 1 are recorded in Appendix E. Stratigraphic units showed much variability in thickness and appearance across the landform, yet the general sequence was expressed in most parts of the site.

Table 10.28 Table Of Identified Tephra from 45WH262

TU	LEVEL	NOCA#	BULK GLASS	GLASS1	GLASS2	GLASS3
TU3	SU2A	10421	ROLA 89 229-1	ROLA 89 229-1	Mazama O	ROLA 89 229-2
Number of shards analyzed			19	17	1	1

A thin reservoir deposit composed of reworked local soils and organic debris covers parts of the site, while in other parts intact sediments are exposed by erosion. The reservoir deposit varies from a few cm thick in test unit 1 to over 60 cm in test unit 4. Under this stratum are discontinuous lenses of decayed and charred woody debris; in some instances this appeared to represent the pre-reservoir ground surface, and in others, it appeared to be from recent burning, perhaps of brush during clearing of the drawdown. Under this organic stratum, in some profiles were gray and brown lenses of redeposited volcanic ashes, and a dark, yellowish-brown B-horizon weakly developed in the top of a thick gravelly sand. This thick stratum is characterized by a silty and sandy matrix which supports angular gravels of local lithology, which range from boulder to granule in size. In some excavations, particularly in test unit 1, massive disturbance of some parts of the stratum by tree root growth and burning are evident. This unit is

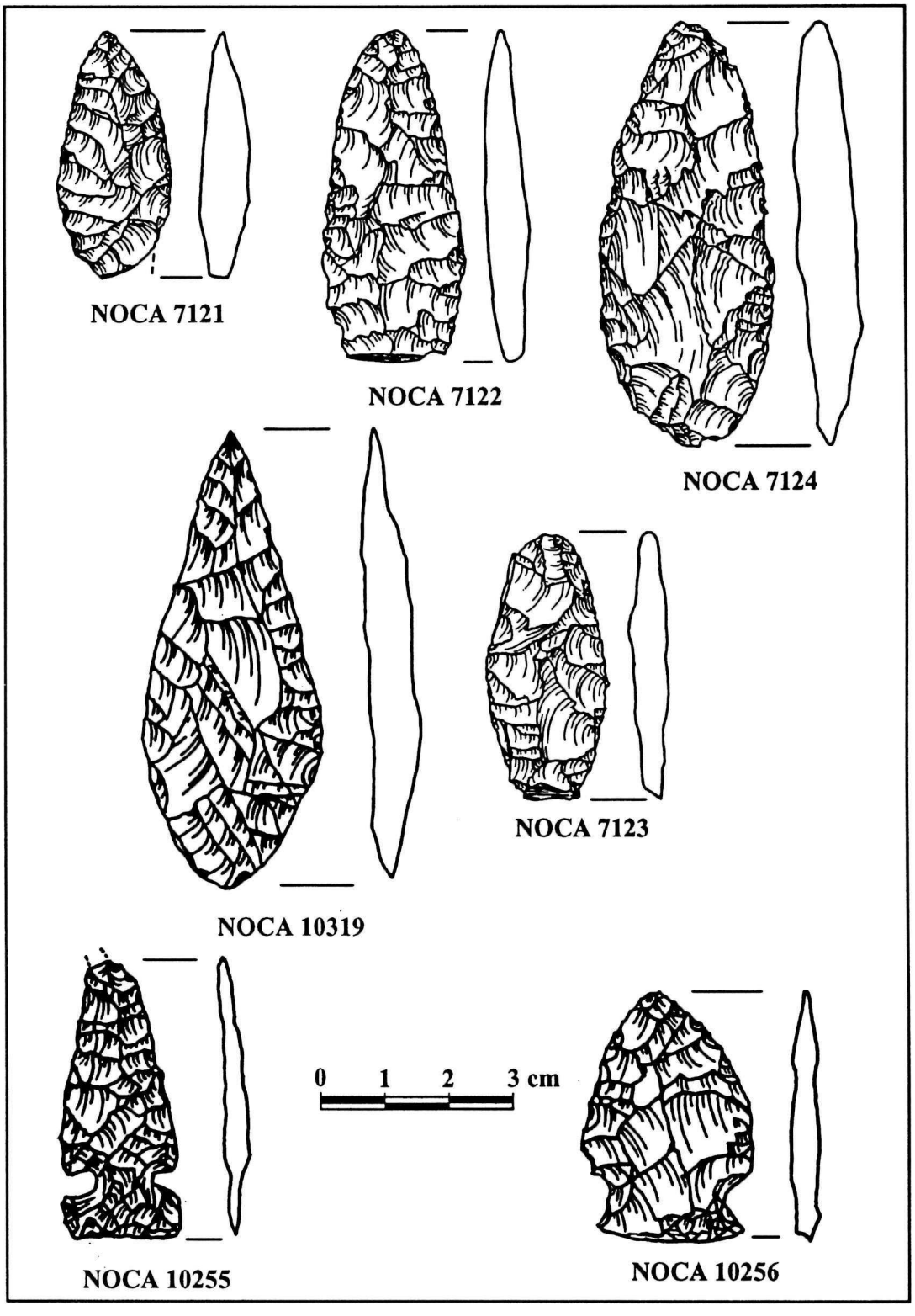


Figure 10.17 Artifact illustrations from Site 45WH262

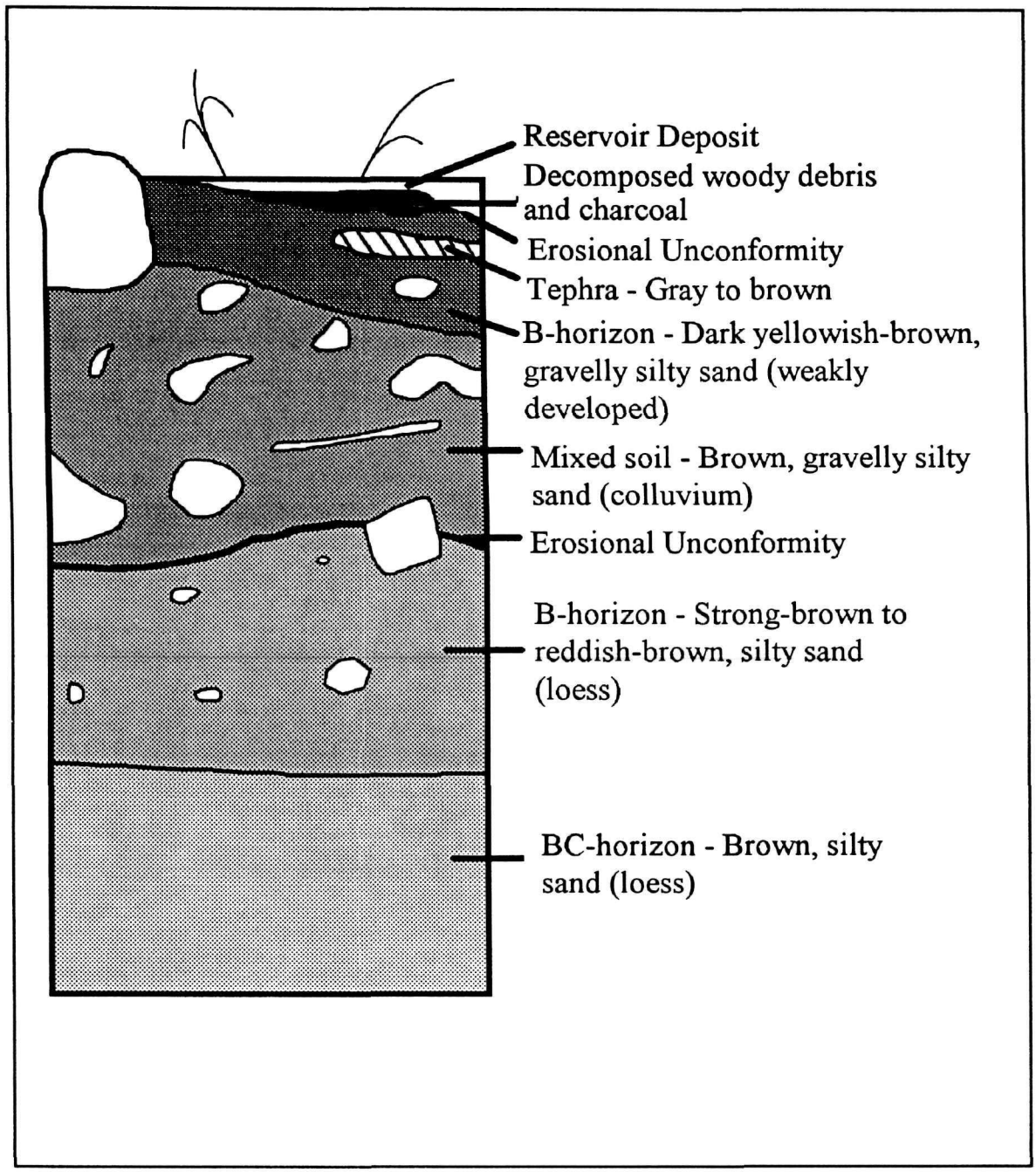


Figure 10.18 Generalized schematic of stratigraphy at Site 45WH262 (FS 82)

tentatively considered to be a colluvial deposit. The bottom of this gravelly stratum is defined by an erosional unconformity which is underlain by a fine-grained, silty sand. Within this sand a strong-brown to reddish-brown B-horizon has developed. Under this stratum is a brown BC-horizon developed in the same parent material, which is presumed to be loess (wind-blown silt and fine sand). Prehistoric chipped stone debris occurs

throughout all strata described here but it occurs in very high densities in the thick, gravelly sand stratum.

The glacial and post-glacial history of the landform is not well understood. The core of the landform was probably laid down by the Cordilleran Ice Sheet sometime around 14,500 years ago and was preserved in this location, which is in the lee of the glacially scoured bedrock outcrop that forms its northern boundary. This core is likely to consist of poorly sorted, bouldery till, but this was not observed in excavation units. Rounded gravels that appeared to represent glacio-fluvial outwash (deposits of glacial meltwater streams left during the retreating phases of the ice sheet) were found only in the bottom of test unit 6. Above this gravel, and across most of the tested portion of the site, is a fine-grained deposit inferred to be loess of unknown age. The source of the loess could be glacial outwash streams that filled the valley or the Skagit River flood plain in early to mid-Holocene times. This loess is old enough for a well developed soil B-horizon to have formed in it.

The top of the loess is eroded, and it was buried by the poorly sorted gravelly sand colluvium. The gravel fraction of this stratum was angular boulders and smaller clasts of local lithology supported in a fine-grained matrix. Because the deposit is Holocene in age, a glacial origin can be eliminated. Mass-wasting from the bedrock formation above the landform is not likely because there are no fine-grained sediments adhering to the steep face. The surface expression of the stratum is relatively flat, and the landform gently slopes to the southwest; hummocky and uneven topography is absent. It is possible that fine-grained sediments have been added to this stratum by overbank deposition from the ephemeral stream that emerges from a small bedrock canyon northeast of the site, but no evidence was found to support this conclusion. Based on the one radiocarbon date that may be reliable, the B-horizon that developed in the top of this deposit at test unit 3 is older than circa 1,100 years. This provides an upper limiting age for the stratum.

Conclusions and Assessment

Site 45WH262 served as a lithic reduction workshop for the manufacture of middle to late-stage bifaces made of Hozomeen chert, and to a lesser extent, for the production of metasediment flakes. The relatively great abundance of biface fragments and biface flaking debris reflects use of the site, more than any other in the drawdown, as a major biface production workshop. The source of the Hozomeen chert used at the site is unknown, but may exist as an undiscovered quarry on the adjacent mountain slopes. The exotic "basalt" may have a source to the north in British Columbia (Cache Cr.) and the obsidian is from the Three Sisters, Oregon. These materials suggest the site inhabitants participated in a large inter-regional exchange network extending from central Oregon to the Fraser River.

Reservoir-induced erosion and historic logging activities associated with vegetation clearing have eroded extensive areas of the artifact-bearing deposits at the site; however, undisturbed, intact deposits with artifacts remain buried from 0.25-1.0 m (.8-3.28 ft) below the reservoir bottom. Tree root growth, possibly tree root tipping, and root burning constitute a significant disturbance in some parts of the site deposits. The exact area occupied by the intact site deposits is difficult to ascertain, but may cover roughly an area 45 m (148 ft) by 20 m (66 ft) by 0.5 m (1.6 ft) deep with an estimated volume of 450 m^3 (15,889 ft^3).

Site 45WH262 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.9 45WH268 (FS#88) North Lightning Cr. #4

Site Setting

This site is located near the center of the project area, on the east side of the valley, approximately 1.35 km (0.8 mi) northwest of the mouth of Lightning Cr. and circa 700 m (2,297 ft) north of the Lightning Cr. campground boat dock. The site is situated on a small rocky bench at 473 m (1,550 ft) elevation near the base of the steeply sloping valley wall and is elevated ca. 9 m (30 ft) above the top of Lightning Cr.'s alluvial fan. The bedrock bench is the only level terrain that interrupts the otherwise continuous slope of this part of the valley wall. The bench has south and western exposures offering clear views of the broad flats of Lightning Creek's alluvial fan, the Skagit River valley, and the north face of Jack Mtn. 2,763 m (9,063 ft) elevation, showing a part of Nahokameen Glacier. West, across the valley, and beyond the Skagit River channel which is .6 km (.36 mi) away and 33 m (110 ft) lower in elevation, are the steep cliffs of the western valley wall. To the north and east, the valley wall rises, at first in a series of glacially scoured bench levels, and then continuously and steeply to the ridgeline that leads to the summit of Desolation Pk. at 1,860 m (6,102 ft).

Historic logging of the drawdown zone and reservoir-induced erosion have been the primary sources of disturbance to the site. The east side of the site has been buried by gravels eroded from the steep slope above by the reservoir. Artifacts and gravels from the site also have moved down the slope. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open, dry, Ponderosa pine and Douglas fir forest. Glacial till in this area contains good quality lithic materials, primarily Hozomeen chert.

General Site Description

Site 45WH268 is 22 m (72 ft) north-south and 21 m (69 ft) east-west. It covers an area of circa 462 m^2 (4,971 ft^2) (Figure 10.19). Artifact depth determined during testing of the bench is 70 cm (28 in) below the surface. The estimated volume of artifact-bearing deposits is circa 100 m^3 (3,529 ft^3). The site is characterized as a high-density lithic scatter of locally available Hozomeen chert and metasediment raw materials. The types of artifacts present at the site are bifaces, flake tools, cobble tools, hammerstones, and flaking debris.

The artifact scatter that defines the site is roughly circular in shape and is bounded on the north and east by the steep slopes above. Most of the scatter is located on the bench, but reservoir-eroded artifacts have slid down the steep slope below.

Testing Methods and Rationale

The site was recorded and two artifacts collected from the surface during the 1988 survey. It was tested in 1990 by excavation of one 1 x 1 m (3.28 x 3.28 ft) test unit. The unit was excavated in 10 cm (3.94 in) levels and screened through .63 cm (.24 in) wire mesh. The purpose of the test unit was to determine the presence, depth, and nature of any undisturbed cultural deposits.

Table 10.29 Inventory of Surface Collections from 45WH268

	NOCA
1 Biface, Exotic Chert	7938
1 Projectile Point, Basalt	7939

Description of Testing Results

Artifact categories represented at site 45WH268 include projectile point, edge-modified tool, biface, cobble tool, hammerstone, shatter, and flake. A total of 53 artifacts was recovered from the site, 51 of these from test unit 1. Forty-six of the artifacts were excavated from intact site deposits.

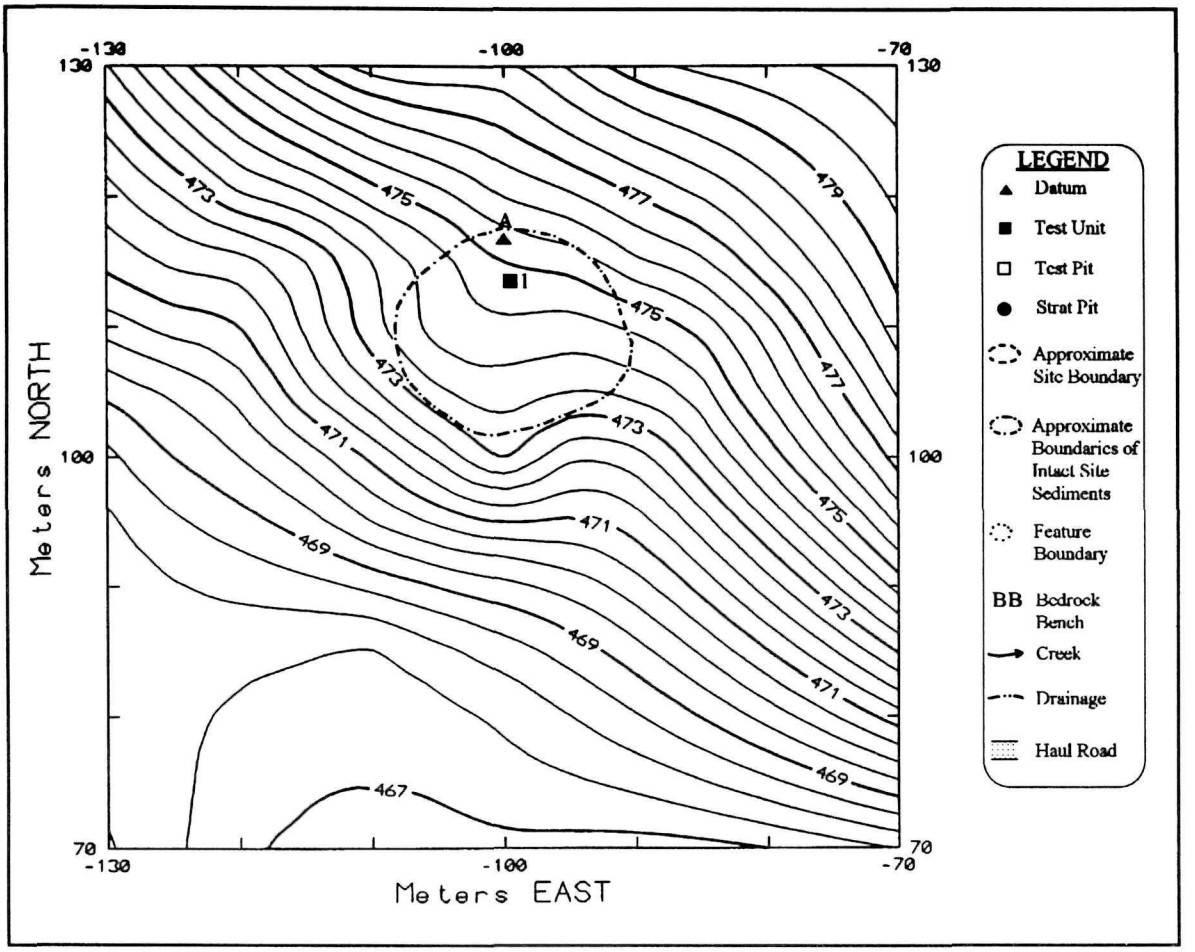


Figure 10.19 Topographic map of Site 45WH268 (FS88)

Artifacts collected from the site surface include a projectile point (NOCA 7939) and a large (ca. 7.5 cm [3 in] long) scraper. The point is classified as Type 3C (Cascade/Olcott) and is manufactured of a fine-grained black basalt. The scraper (NOCA 7938) is roughly ovate in outline with steep, bifacially-flaked edges. This tool was made from a finely banded, gray and brown, opaque chert and could have functioned also as a knife. Both of these tools are made of exotic materials that were imported into the valley.

In test unit 1, artifacts were found incorporated into a surficial reservoir deposit ca. 15 cm (6 in) thick and below this within intact soils to a depth of 70 cm (28 in). The assemblage from the intact deposits consists of Hozomeen chert and metasediment flakes, shatter, flake tools, flaked cobbles, and a hammerstone. The flakes and shatter reflect reduction of locally procured nodules and cobbles to produce expedient cutting and scraping tools. One Hozomeen chert flake (NOCA 10030) has a unifacially beveled and sharpened edge, and another flake (NOCA 10028) appears to be an end scraper (the

specimen is incomplete). One of the cobble tools exhibits a bifacially flaked margin (NOCA 10027), and the other is unifacially flaked (NOCA 10029). The hammerstone (NOCA 10021) is a dense, spherical andesite cobble with a small area of pecking that has formed a pit. Overall, the unit assemblage reflects short term occupation of the bench and opportunistic, expedient use of local stone materials to prepare cutting and scraping tools, perhaps for working animal hides or other animal parts.

Table 10.30 Cultural Material From Excavation Units at 45WH268

test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Debitage, Hozomeen Chert	10022
L:2 (20-30 cm BD)	4 Debitage, Hozomeen Chert	10023
L:3 (30-40 cm BD)	SW Quad: 5 Debitage, Hozomeen Chert, Metasediment	10024
	SE,NE,NW Quads: 3 Debitage, Hozomeen Chert	10025
L:4 (40-50 cm BD)	10 Debitage, Hozomeen Chert	10026
	2 Debitage, Metasediment	
L:5 (50-60 cm BD)	1 Cobble Tool, Metasediment	10027
	1 Cobble Tool, Metasediment	10029
	1 Flake, Edge Modified, Hozomeen Chert	10030
	18 Debitage, Hozomeen Chert, Metasediment,	10028
	1 End Scraper, Hozomeen Chert	
	^{14}C, 1,760±80 BP, Beta 40701	
L:6 (60-70 cm BD)	3 Debitage, Hozomeen Chert	10031
L:7 (70-80 cm BD)	1 Debitage, Hozomeen Chert	10032
From Wall (18 cm BS)	1 Hammerstone, Andesite	10021

Site Chronology

The site age is estimated with one time-sensitive projectile point (NOCA 7939) (Figure 10.20) and one radiocarbon date. The point is classified as Type 3C (Cascade/Olcott) which is assigned to the Early-Middle prehistoric period, 8,000-4,000 years BP. The point may date to the recent end of this time range. A charcoal sample was collected from a concentration in the SW quad of level 5 and submitted for radiocarbon dating (Table 10.31). The sample was removed from the intact soil BC-horizon matrix, between 50 and 56 cm (20 to 22 in) below the ground surface. It is not clearly of cultural origin and was not associated with a recognizable feature. Artifacts were found within this level, one level below, and in all levels above. The date is consistent with the relatively youthful appearance of the soil horizons that have developed in the sedimentary matrix. Based on these data, the site could date between 9,000 and <1,700 years ago. A more likely range is between 4,000 and 1,000 years BP.

Table 10.31 Table Of ^{14}C Dates from 45WH268

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU1	L-5	Beta 40701	1,760±80

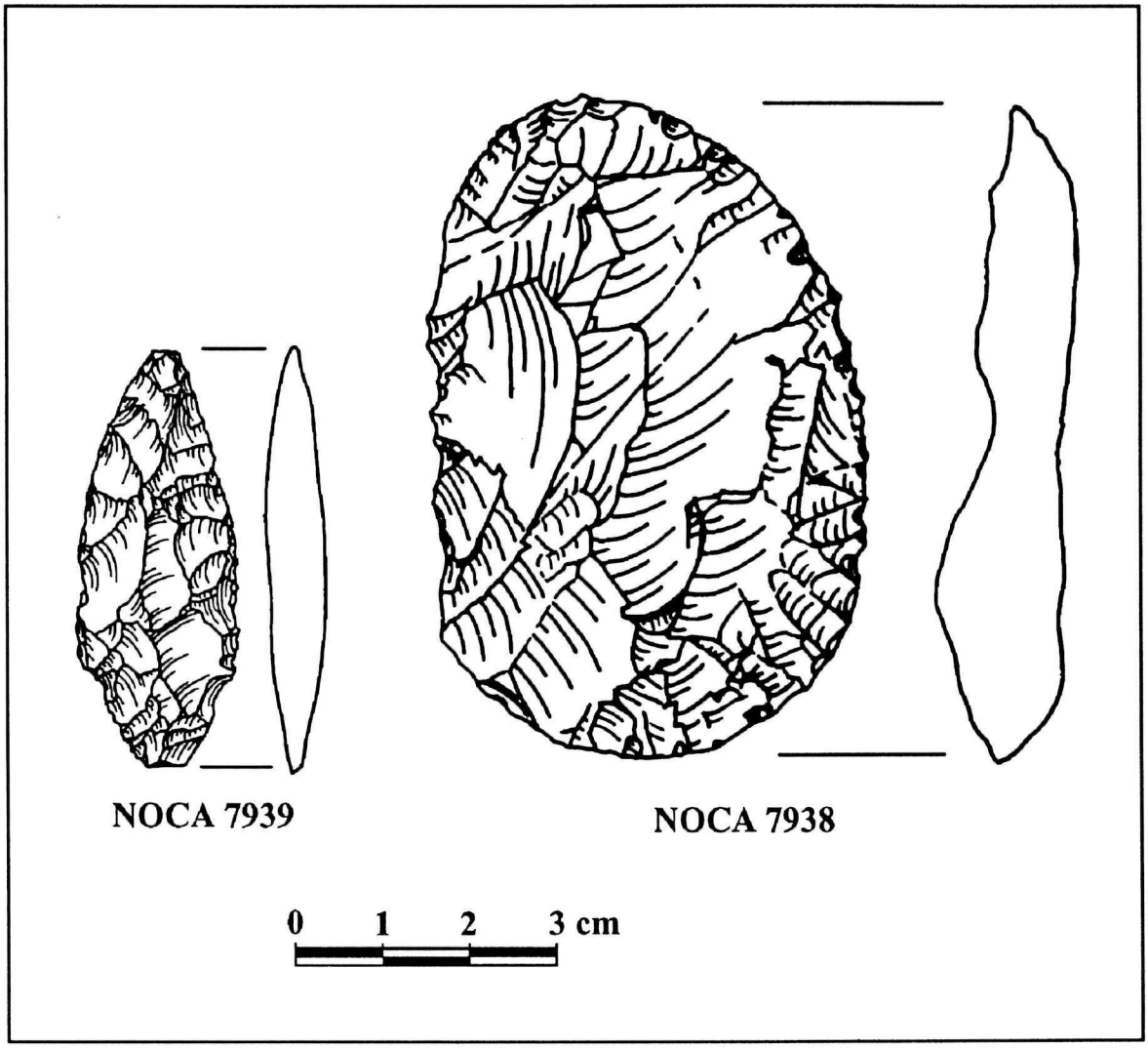


Figure 10.20 Artifact illustrations from Site 45WH268 (FS 88)

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence, as revealed in the walls of test unit 1, is shown in Figure 10.21. The surface of the bench here is

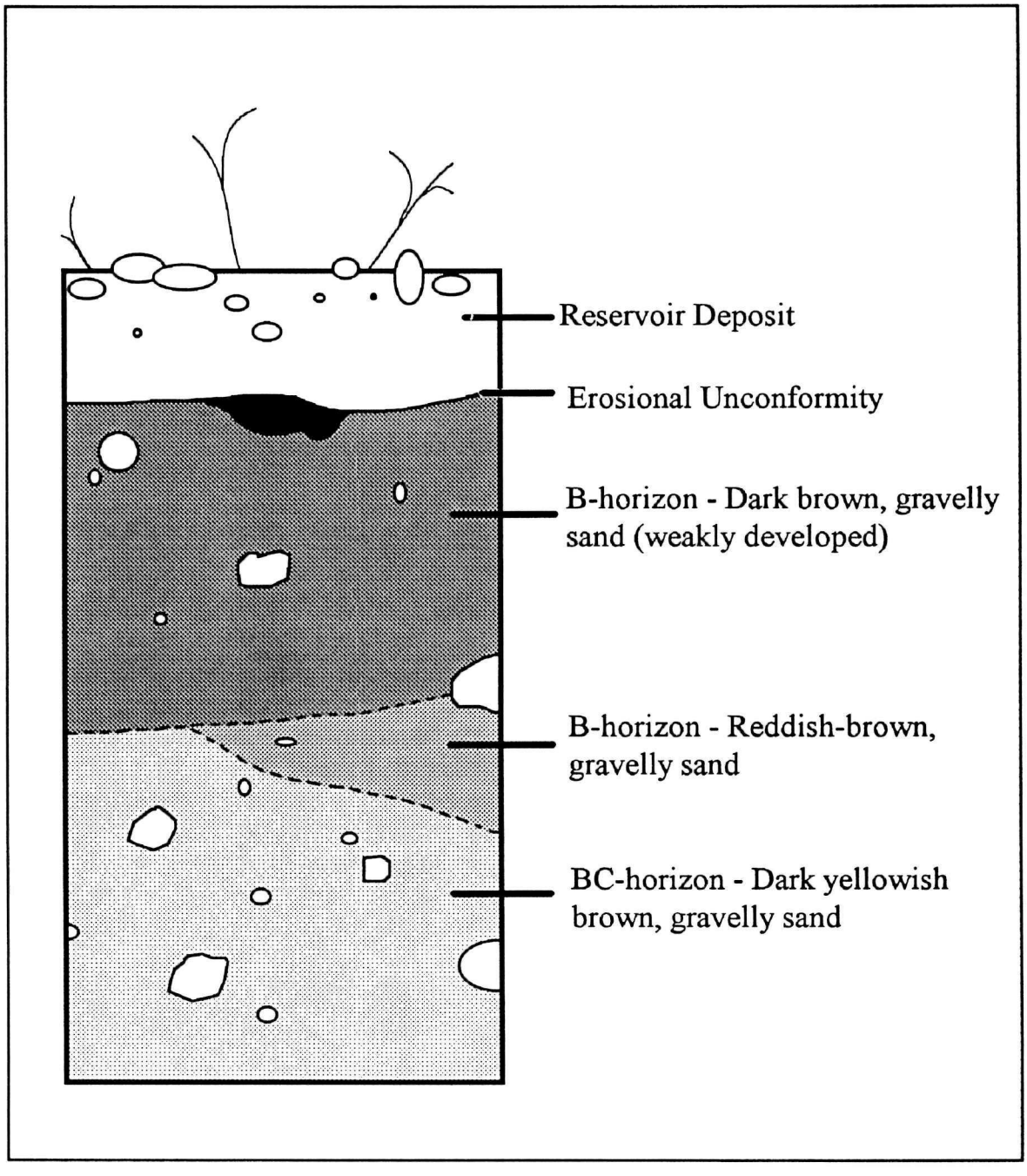


Figure 10.21 Generalized schematic of stratigraphy at Site 45WH268 (FS 88)

covered with a gravelly reservoir deposit eroded by reservoir waves from the glacial terrace slopes above and redeposited on the bench. Marking the bottom of the pre-reservoir forest duff layer, and unconformably underlying the reservoir deposit, are pockets containing charcoal and burned roots. This layer is at the top of, and within, a dark brown, gravelly sand matrix that shows weakly expressed soil B-horizon

development. Underlying it is a lens of a more strongly expressed, buried, reddish-brown, soil B-horizon. The basal unit is a dark, yellowish-brown, gravelly sand BC-horizon. The 1,760±80 years BP date on charcoal is from the top of this stratum. Artifacts were found throughout this geologic section.

Glacial scouring by the Cordilleran Ice Sheet circa 14,500 years ago leveled the bedrock bench on which site 45WH268 is located; however, the immediately following late-glacial and early Holocene history of the landform is unknown. The gravelly sands that cap the bench were deposited as the glacial ice melted or accreted by the downslope movement of sediments from the glacial terrace escarpment immediately above the site, or by both processes. Based on the weakly expressed soil horizons developed in the sedimentary matrix and the radiocarbon date of circa 1,700 years BP, it is likely that the upper 70 cm (28 in) of bench deposits were laid down by mass-wasting of coarse sediments from the adjacent slope in the last few thousand years.

Conclusions and Assessment

Site 45WH268 appears to have served as a task-specific site related to the processing or preparation of some locally-available resource. The tool assemblage from the site reflects piercing, cutting, and scraping functions, possibly related to skinning and butchering an animal or initially preparing an animal hide. Most tools at the site are "expedient tools," meaning they were manufactured, used, and discarded there. The two tools made of exotic lithic materials were probably "curated," meaning they were brought to the site and were probably not intentionally discarded there. The small extent of the landform and the relatively low assemblage diversity suggests that the site was utilized intermittently by one or a few individuals who resided at a nearby residential or base camp. It is estimated that the landform has been used over the last few thousand years or so.

Reservoir-induced wave erosion has destroyed the integrity of the upper site deposits, but an undisturbed and intact sedimentary matrix exists below this. Artifact-bearing deposits on the eastern half of 45WH268 appear to be protected under hillslope colluvium while cultural deposits on the west side of the site have been almost completely destroyed by erosion. A portion of the site appears to have *in situ* cultural material buried up to 70 cm (28 in) below the ground surface. These deposits have an estimated volume of approximately 100 m^3 (3,529 ft^3) and they comprise the significant portion of the site.

Site 45WH268 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits, the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.10 45WH275 (FS#95) North Lightning Creek #7

Site Setting

Site 45WH275 is located on the east side of the valley in the central portion of the project area. It is ca. 250 m (820 ft) southwest of Lightning Cr. Campground. At 485 m (1,590 ft) elevation, it is positioned on a massive Pleistocene alluvial fan where it overlooks the point at which Lightning Cr. leaves the lower end of its canyon and enters the east side of the broad Skagit River valley. The landform here is nearly level (0-3% slope) and has southern and western solar exposure. Looking south from the site, one sees Lightning Cr. flowing ca. 18 m (60 ft) below, the steep northern slopes of Jack Mtn. (2,763 m [9,063 ft]) showing a small part of Nahokameen Glacier, and in the far distance, the Skagit River valley. To the southwest and west is the lower 1.5 km (0.9 mi) of Lightning Cr. before it enters the Skagit River (43 m [140 ft] below the site) and the broad flats of the alluvial fan and the steep rock walls that form the western valley wall beyond. To the north is the steep valley wall and a ridgeline rising to Desolation Pk. at 1,860 m (6,102 ft); and to the east is the V-shaped gorge of Lightning Cr. During the Holocene, Lightning Cr. cut through its own alluvial fan, and in doing so created a steep erosional escarpment between the top of the fan and the stream channel. The artifact scatter that defines the site has a linear orientation that follows the edge of the fan escarpment.

Logging of the drawdown zone, construction of a haul road, and reservoir erosion have been the primary sources of historic disturbance to the site. The prevailing southwesterlies have a long fetch up the Skagit River valley, which has resulted in excessive wave erosion to the southern edge of the landform during lowered reservoir levels. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open canopy forest comprised of mixed deciduous and conifer species and shrubs. At the time that the drawdown was cleared, none of these trees had attained a large diameter.

General Site Description

The site measures about 40 m (131 ft) north-south and 140 m (459 ft) east-west. It covers an area of 5,600 m^2 (60,256 ft^2) (Figure 10.22). Artifact depth determined during testing ranged from the surface to 30 cm (12 in) below surface. The estimated volume of artifact-bearing deposits at the site is 1,680 m^3 (59,321 ft^3). The site is characterized as a moderate-density lithic scatter. Artifact types from the site include bifaces, microblade cores, edge-modified flakes, and flaking debris. Lithic raw material types in the artifact assemblage include the locally available Hozomeen chert, chalcedony, and metasediment. One specimen made of an igneous material (probably basalt) is considered of exotic origin. A rock ring was noted at the time the site was recorded and was determined to be modern.

Testing Methods and Rationale

The site was recorded during the 1988 project survey. Artifacts were collected from the site surface in 1988 and again in 1990. In 1990 the site was tested through excavation of two 1 x 1 m (3.28 x 3.28 ft) test units and six shovel-dug stratigraphy pits. Test units were excavated in 10 cm (3.94 in) levels and the sediments screened through .63 cm (.24 in) wire mesh. Test unit locations were selected to determine the extent of reservoir-related disturbance, and the nature and depth of artifact-bearing deposits. Test unit 1 was located about 16 m (52 ft) north of the edge of the alluvial fan escarpment in an area lacking evidence of erosion. Test unit 2 was positioned about 12 m north of the escarpment, on top of a 20 cm (7.9 in) thick, linear,

Table 10.32 Inventory of Surface Collections from 45WH275

	NOCA
1 Biface, Metasediment	7940
1 Flake, Edge Modified, Hozomeen chert	7941
1 Scraper, Basalt	7942
1 Biface, Hozomeen Chert	7943
1 Microblade Core, Hozomeen Chert	7944
1 Shatter, Edge Modified, Hozomeen Chalcedony	7945
1 Biface, Hozomeen Chert	7946
1 Core, Hozomeen Chert	7947

gravel beach ridge. This is a ubiquitous reservoir shoreline feature created whenever heavy surf breaks along the downwind edge of a landform. The unit was placed to determine if the beach ridge covered intact cultural deposits. A stratigraphy pit and the shovel pits were dug to further determine the extent of disturbance to the landform surface.

Description of Testing Results

The assemblage of artifact categories from site 45WH275 includes biface, microblade core, microblade, unifacially edge-modified flake, scraper, flake, and shatter. A total of 124 artifacts was recovered from the site, 116 of these from test units. Eighty-four artifacts came from intact deposits (Tables 10.31, 10.32).

Artifacts collected from the site surface include 3 bifaces (NOCA 7946 is Stage II; NOCA 7940 and 7943 are Stage III). In addition, NOCA 7940 may have functioned as a knife. Two unifacially edge-modified tools (NOCA 7942 and 7945) appear to have functioned as scrapers. The microblade core (NOCA 7944) (Figure 10.23) is made on a small, irregular, block-shaped chunk of Hozomeen chert. It exhibits bi-directional

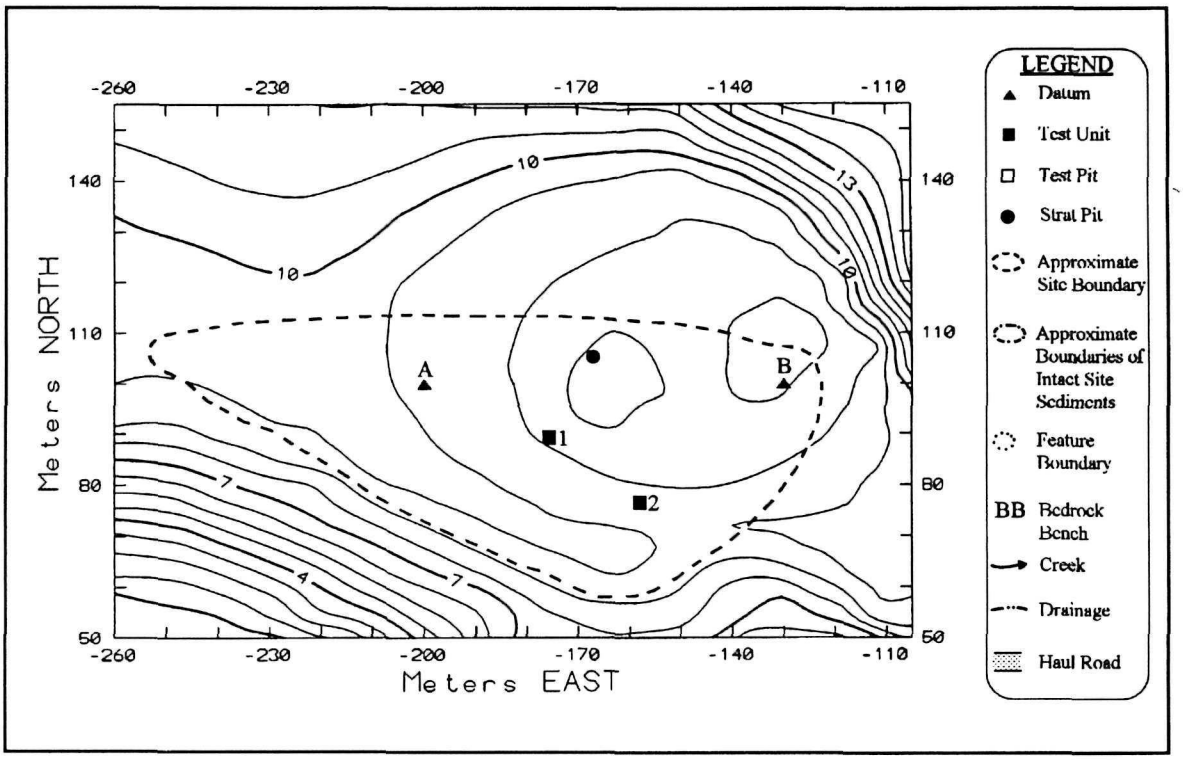


Figure 10.22 Topographic map of Site 45WH275 (FS 95)

blade scars that were removed from two separate platforms. An irregular core (NOCA 7947) appears to have been a biface fragment. Both NOCA 7946 and 7947 are manufactured from the same material, a waxy, gray, opaque variety of Hozomeen chert that is informally named "Little Beaver Gray," for its geographic location.

Artifacts were incorporated in the beach ridge formed by shore erosion and redeposition along the terrace edge. The ridge is formed of loose, poorly sorted lag gravels mixed with soil B-horizon material. Behind (downwind, to the north) the beach ridge landform is capped with a fine-grained reservoir deposit in low-lying areas. Most of the cultural material exposed on the site surface is visible on and around the beach ridge and in slightly elevated areas (such as around stumps).

In test unit 1 artifacts were found in the reservoir deposit and in the intact soil beneath. The biface (NOCA 10047) reflects a Stage II level of reduction. Debitage from the unit consists of broken flakes and shatter characteristic of secondary reduction of Hozomeen chert. Cortex on these items is absent, as are biface-thinning flakes, so that the reduction sequence is uncertain. Artifacts from intact deposits (levels 2 and 3) were excavated from the soil B-horizon.

In test unit 2, artifacts were found in the reservoir deposit that formed a beach ridge (levels 1-3) and in the intact soil horizons underneath. Because the beach ridge formed in a high energy depositional environment, the original location of the artifacts within it is inferred to have been in the ca. 12 m (39 ft) span to the south between the beach ridge and the landform edge. The artifacts here reflect microblade production, and include 4 microblades and 1 microblade core. All 4 microblades are made of Hozomeen chert, are trapezoidal in cross-section, and are fragmentary. One small pressure flake (NOCA 10038) retains the acute margin and the convex dorsal surface of the biface it was removed from. The quartz crystal artifact (NOCA 10036) is small flake fragment. The few pieces of flaking debris from the intact unit soil reflect secondary reduction of chert and metasediment. A weakly-expressed pit feature may have been encountered in the south one-third of test unit 2. The pit fill consisted of charcoal flecks and A-horizon material. Overall, the site assemblage reflects the use, and possibly the production, of microblades and unifacial cutting and scraping tools. Intermediate stage bifaces were probably used as tools as there is no clear evidence that they were manufactured on site. The resources processed by this assemblage of tools is unknown.

A series of stratigraphy pits was dug in the mud-filled shallow basin located north of the site. A well-stratified sequence of deposits that contained two primary tephra layers was observed. An upper, gray ash just below the pre-reservoir duff layer may be Mt. St. Helens tephra Wn, from an eruption 500 years ago. The lower ash may be St. Helens Y (a sample of this tephra was collected). One strat pit was excavated about 30 m (98 ft) northwest of test unit 2 to a depth 90 cm (35 in). Within the well-stratified sequence of fine-grained deposits was the fine, yellowish-brown, sand that closely matches tephra samples identified from the 3,500 year-old eruption of Mt. St. Helens (tephra Y). This ash was between 35 and 40 cm (14 and 16 in) below the top of the reservoir deposit.

Table 10.33 lists, by level, all cultural material collected from the test units from site 45WH275.

Table 10.33 Cultural Material From Excavation Units at 45WH275

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Biface, Hozomeen Chert	10047
	12 Debitage, Hozomeen Chert	10048
L:2 (20-30 cm BD)	51 Debitage, Hozomeen Chert, Metasediment	10049
	1 Biface, Hozomeen Chert	10051
L:3 (30-40 cm BD)	24 Debitage, Hozomeen Chert, Metasediment	10050
test unit: 2 (L:S-L:5 1x1 m, L:6 1x.50 m)		
L:S (surface)	0 Collections	

L:1 (10-20 cm BD)	1 Microblade Core, Hozomeen Chert	10034
	1 Microblade, Hozomeen Chert	10035
	1 Quartz Crystal, Modified	10036
	8 Debitage, Hozomeen Chert	10037
	1 Microblade, Hozomeen Chert	
L:2 (20-30 cm BD)	6 Debitage, Hozomeen Chert, Metasediment	10038
	1 Microblade, Hozomeen Chert	
	1 Microblade, Hozomeen Chert	10039
L:3 (30-40 cm BD)	1 Flake, Edge Modified, Hozomeen Chert	10040
	3 Flakes, Metasediment, Hozomeen Chert	10041
L:4 (40-50 cm BD)	3 Debitage, Metasediment	10042
L:5 (50-60 cm BD)	2 Debitage, Metasediment	10043
L:6 (60-80 cm BD)	1 Bulk Sample, Soil	10175
	feature 1, South Wall: 1 Bulk Sample, Soil	10174
Stratigraphy Pit (50x50 cm, 0-90 cm deep)		
35-40 cm BS	1 Tephra Sample, Source Unknown	10196

Site Chronology

No chronologically diagnostic artifacts or radiocarbon samples were collected from the site. One tephra sample was collected but was not submitted for identification. Although the site is prehistoric in age, a more refined estimate is not possible with present data. Microblades and microblade cores, once thought to date to the Middle prehistoric time period, are now known from Early, Middle, and Late period sites, and, thus, are unreliable for estimating site age.

Site Stratigraphy

A schematic diagram of the site stratigraphic sequence in the test units is shown in Figure 10.24. The site surface is capped with a thick to thin, gravelly to sandy reservoir deposit. The thick, gravelly deposit is built of redeposited sediments in a high energy shoreline zone. Unconformably underlying this stratum is an organic-rich soil A-horizon containing charcoal chunks and stains. This stratum was the dark grayish-brown, sandy clay loam topsoil prior to reservoir inundation of the landform. At the top of this stratum are discontinuous lenses of a gray, redeposited volcanic ash. The next underlying stratum is a dark brown, sandy loam mixed with another volcanic ash that resembles Mt. St. Helens tephra Y. The next lower stratum is a reddish-brown B-horizon developed in a sandy gravel. Intrusive into this and the next lower stratum is a weakly-defined pit feature that may be cultural in origin. The lowermost stratum observed is the soil BC or C-horizon consisting of a brown to dark yellowish-brown sandy gravel. The possible pit feature is intrusive into this also.

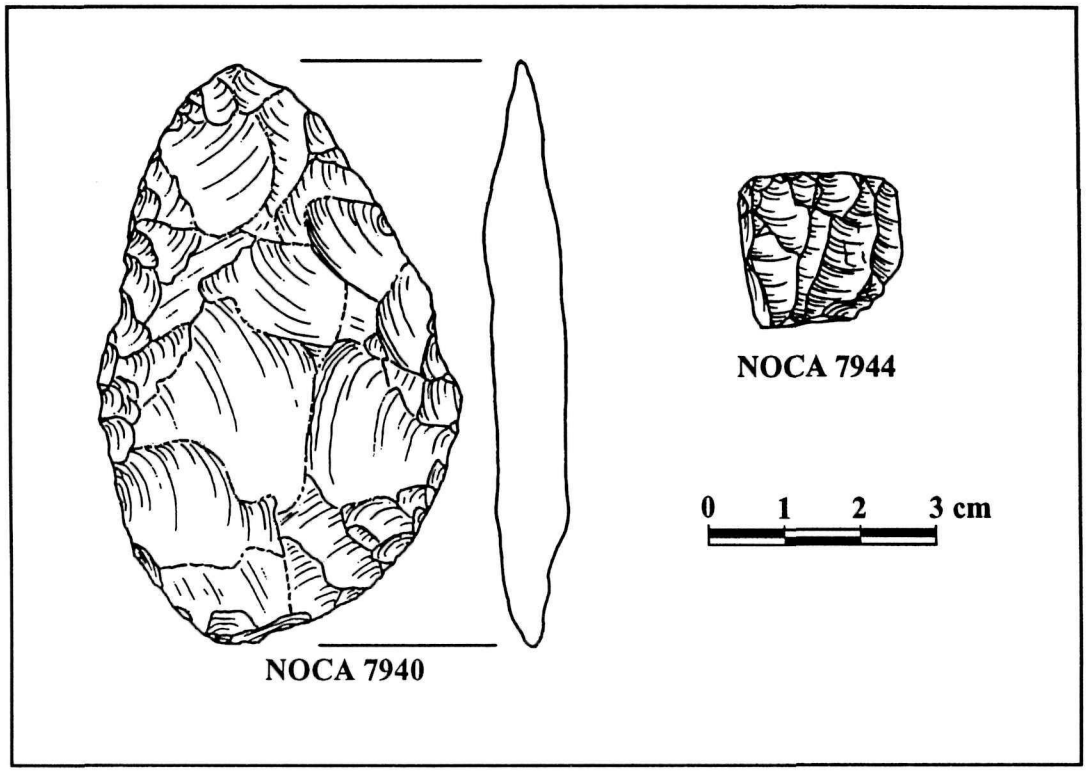


Figure 10.23 Artifact illustrations from Site 45WH275 (FS 95)

The depositional history of the landform can be inferred from surficial and morphological characteristics, from the weathering profile of the soil that caps it at sites 45WH232, 45WH275, and at other sites, and from its geomorphic position in the Skagit River valley. The alluvial fan was formed by sudden and rapid discharge of glacial meltwater from the canyon mouth of Lightning Cr. Aerial photographs clearly show a complex pattern of braiding streams emanating from the fan apex. All of the stream channels exhibit a uniform degree of weathering and incision into the fan surface. Boulders resting on the fan surface near the canyon mouth measure upwards of 1 m (3.28 ft) in diameter, indicating a high discharge. As the fan rapidly accreted, it pushed the Skagit River channel against the western valley wall. The fan extends for 1.6 km (1 mi) on either side of the mouth of Lightning Cr. and for 1.9 km (1.2 mi) across the Skagit River Valley. A large, prominent kettle (and possibly a smaller one) on the fan surface marks where a large block of glacial ice stagnated and was engulfed by the fan deposits. Aerial photographs clearly show stream channels braiding around the sides of the kettle hole; a series of nested terraces within the kettle mark the stages of ice block melting. The presence of the kettle dates the alluvial fan formation to the period of late-glacial melting and retreat of the Cordilleran Ice Sheet, approximately 11,000 or so years ago.

With continued melting of the ice sheet in Canada, the Skagit River incised its channel into the distal end of the fan while Lightning Cr. incised its channel through the

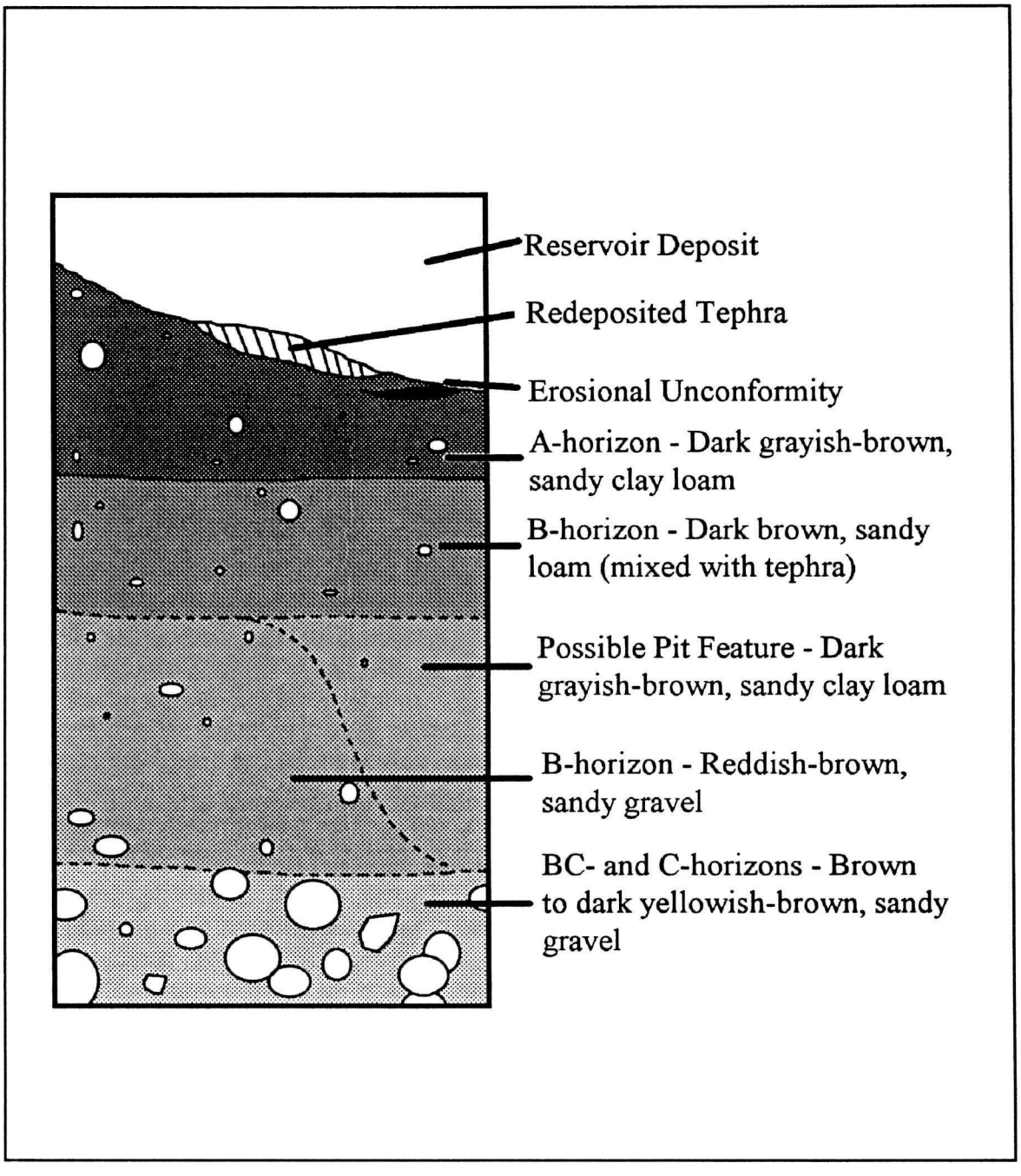


Figure 10.24 Generalized schematic of stratigraphy at Site 45WH275 (FS 95)

deepest (proximal) part of the fan deposits where it emanates from its bedrock canyon. This erosional escarpment forms the southern boundary of site 45WH275. This incision continued to the southwest through the distal portion of the fan deposits to join the Skagit River. After abandonment of the fan surface by meltwater emanating from Lightning Cr. canyon, the fan became relatively stable and slowly accreted through the deposition of

fine, wind-blown deposits (including volcanic ashes) and gravelly sands washed down the adjacent, steep, eastern valley walls. Soils began to form at the fan surface in the early Holocene, and somewhat later the landform was first visited and utilized by prehistoric hunters.

Conclusions and Assessment

Site 45WH275 appears to have served as a task-specific site related to processing or preparation of some local resource. The artifact assemblage from the site includes bifacial and unifacial scraping and cutting tools. Microblades may have had a variety of uses; however, microblade tools are rare and little is known about them. Most tools at the site were expediently manufactured, used, and discarded there. Basalt constitutes the only exotic lithic raw material observed at the site. It appears the site was utilized intermittently by few individuals.

Reservoir-induced wave erosion has destroyed the integrity of some of the upper site deposits while at the same time reservoir deposition has buried others. The site is used as an informal camp and recreation spot during times when the reservoir does not reach full pool as shown by contemporary fire rings. Such recreational uses of the site have adverse effects through the removal of artifacts from the surface and loss of integrity of artifacts in the intact artifact-bearing deposits. *In situ* artifact-bearing deposits at 45WH275 appear to be preserved under a beach ridge and in shallow basin areas to depths of about 20 cm (8 in). The extent of the deposits are estimated at 140 m (459 ft) long by 40 m (131 ft) wide by 20 cm (8 in) deep, with an estimated volume of 1,100 m^3 (38,841 ft^3). The intact deposits comprise the significant portion of the site.

Site 45WH275 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits, the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.11 45WH283 (FS#103) Boundary Bay #4

Site Setting

Site 45WH283 is located on the east side of the valley in the northern portion of the project area. At 473 m (1,550 ft) elevation it is situated on a glacially scoured bedrock point of land at the south end of today's Boundary Bay. The site artifacts are scattered across a series of bedrock benches (between 465 and 488 m [1,525 and 1,600 ft] elevation) that rises above the level flood plain. The Skagit River channel approaches the landform, and at its closest, is 250 m (0.1 mi) to the southeast and 21 m (70 ft) below the average site elevation. The series of small, level bedrock benches is

interrupted by low cliffs and steeply sloping bedrock masses. The landform provides southern, western, and northern exposures. It affords views of the Skagit River valley to the south, with Jack Mtn. (2,763 m [9,063 ft]), Ruby Mtn. (2,258 m [7,408 ft]), and Sourdough Mtn. (1,862 m [6,107 ft]) in the distance. To the west, below the site, is the Skagit River flood plain and the mouth of Little Beaver Cr., and the steep, western valley wall, broken by the U-shaped valleys of Arctic Cr. and Little Beaver Cr. with the sharp-crested summits of the northern Pickett Range at their headwaters lies beyond. To the north is the broad flood plain of the valley with the glacially rounded top of Little Jackass Mtn. (1,338 m [4,387 ft]) and behind it, the knife-like rocky summit of Hozomeen Mtn. (2,459 m [8,066 ft]); to the east the valley wall rises steeply to the summit of Desolation Mtn. (1,860 m [6,102 ft]). The artifact scatter that defines the site is nearly rectangular and generally conforms with the grouping of level benches.

Haul road construction and logging related to reservoir clearing initially disturbed the site. The road was evidently built across the bedrock bench (through the site) to avoid some obstruction. North and south of the site, the road drops back down onto the flood plain. Road construction across the site required stump removal and grading. Following impoundment of water behind Ross Dam, the landform sustained excessive erosion from wind-generated waves, and this, today, constitutes the primary source of disturbance to the site deposits. The main factors controlling the high degree of erosion are the thinness of the soil capping the bedrock and the exposure of the point of land to long northern and southern fetches. Shoreline processes affecting the landform are analogous to those extant along a coastal headland. The pre-reservoir vegetation, as evident from the remaining tree stumps, consisted of an open-canopy conifer forest.

General Site Description

Site 45WH283 extends circa 140 m (439 ft) north-south and 80 m (262 ft) east-west. It covers an area of 11,200 m^2 (120,512 ft^2) (Figure 10.25). Artifact depth varies between 0 and 60 cm (24 in) below the surface. The estimated volume of artifact-bearing deposits at the site 3,300 m^3 (116,457 ft^3). Due to the uneven topography of the bedrock and the dispersed location of intact soils, the estimated volume is only an approximate measure. Considering the substantial extent of bedrock exposures within the site boundaries, the true volume of site deposits is more likely to be measured in hundreds of cubic meters.

The site is characterized as a high-density lithic scatter with some calcined and burned bone. The types of artifacts observed at the site include projectile points, bifaces, microblades, microblade cores, edge-modified flakes, debitage, cores, abraded stone, and bone. The lithic raw material types in the assemblage consist of a high percentage of locally available Hozomeen chert and metasediment, along with exotic jasper, chalcedony, Allenby chert, and quartz crystal. The site is bounded on the south, west, and north by steeply descending bedrock slopes. On the east the scatter ends along the rise of the hillslope and into the forest above the reservoir high pool elevation of 488 m

(1,602.5 ft). The highest density artifact scatters are on the nearly level benches. Lower density scatters are on moderate slopes.

Testing Methods and Rationale

The site was recorded during the project survey in 1988. Artifact collections were made from the eroded site surface in 1988, 1990, and 1993. The site was tested in 1990 with the excavation of one 1 x 1 m (3.28 x 3.28 ft) test unit. Site sediments were excavated in 10 cm (3.94 in) levels and screened through .63 cm (.24 in) wire mesh. The extensive exposures of bedrock, combined with excessive erosion of the thin soils, made it unlikely that intact deposits remained. The testing strategy was therefore designed to determine if any intact artifact-bearing deposits remained at the site. Test unit 1 was located on one of the flat benches in an area protected from reservoir erosion by a low bedrock face to the west. Immediately east is the edge of the haul road that had been built across the site. Once it was determined that intact deposits remained, no attempt was made to explore all of the many isolated and dispersed locations where additional intact deposits might be found.

Table 10.34 Inventory of Surface Collections from 45WH283

	NOCA
1 Biface, Hozomeen Chert	6356
1 Graver, Chalcedony	6362
1 Scraper, Allenby Chert	6371
1 Microblade Core, Quartz Crystal	6380
1 Microblade Core, Hozomeen Chalcedony	6382
1 Microblade, Quartz Crystal	6383
1 Microblade, Chalcedony	6384
1 Flake, Quartz Crystal	7948
1 Flake, Quartz Crystal	7949
1 Cobble Tool, Metasediment	7950
1 Biface, Hozomeen Chert	7951
1 Unspecified Tool, Sandstone	7952
1 Biface, Metasediment	7953
1 Biface, Hozomeen Chert	7954
1 Biface, Hozomeen Chert	7955
1 Cobble Tool, Metasediment	7956
1 Microblade, Chalcedony	7957
1 Scraper, Hozomeen Chert	7958
1 Biface, Hozomeen Chert	7959
1 Microblade, Hozomeen Chert	7960
1 Microblade Core, Hozomeen Chalcedony	7961
1 Microblade, Hozomeen Chert	7962

2 Debitage, Chert	7963
1 Bone Fragment, Medium Mammal	10117
1 Biface, Unknown	10682
1 Biface, Hozomeen Chert	10683
1 Biface, Hozomeen Chert	10684

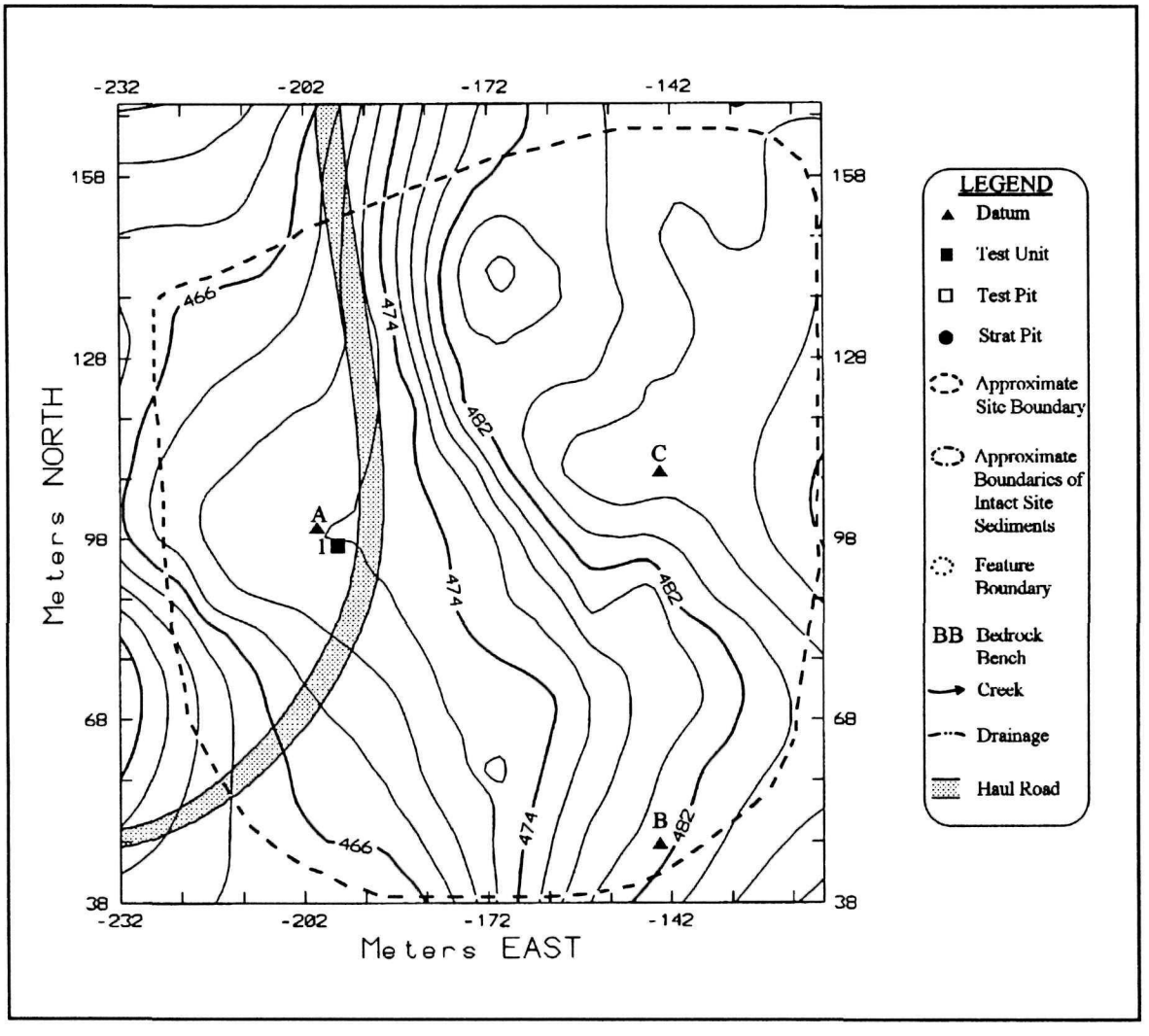


Figure 10.25 Topographic map of Site 45WH283 (FS 103)

Description of Testing Results

Artifact categories represented at the site include biface, microblade, microblade core, core, hammerstone, graver, modified quartz crystal, edge-modified flake, cobble tool, flake, shatter, unspecified tool, bone, and antler. A total of 566 artifacts was recovered from the site, 538 of these from test unit 1, 520 of which are from intact deposits which retain integrity of location and association. The intact deposits in the test unit extended to a depth of 60 cm (24 in) below the ground surface to the top of the bedrock surface that underlay the soil cap. No evidence of features or layers of cultural origin were found in the test unit.

Artifacts collected from the site surface consist mostly of bifaces (9), microblades (5), microblade cores (3), edge-modified flakes that probably functioned as scrapers (3), a graver, a piece of tabular sandstone, a calcined bone fragment, and a few flakes collected for lithic material reference samples. The bifaces are small and not evenly formed (morphologically they represent reduction Stages II and III). Some margin segments on these bifaces display edge wear that appears to be from cutting or rubbing against a resistant material. It does not appear that these bifaces were further reduced into tool preforms or hafted tools. Most of the microblades are broken (Figure 10.26). Three are triangular in cross-section (NOCA 6383, 6384, 7960) and two are trapezoidal (NOCA 7957 and 7962). The three cores are all elongated (the outline of the platform in planview is oval). The graver (NOCA 6362) was intentionally flaked to a curved, beak shape. The surface collection is noteworthy for the relatively large number of tools that are not well-formed or carefully shaped; the tools appear to be mostly expedient and are manufactured of locally available stone materials. Whether by design or accident, four of the artifacts exhibited tapering, wedge-shaped ends with crushing or other evidence of use wear. These include a quartz crystal flake (NOCA 7949), two bifaces (NOCA 7951 and 10682), and a cobble tool (NOCA 7956). Most of the tools are manufactured of Hozomeen chert or metasediment from the valley. The chert includes two subvarieties that we have informally called "Little Beaver Green" and "Little Beaver Gray". These subvarieties are more abundant in this site than in any other examined, suggesting use of the Little Beaver Cr. area, where they are exposed in bedrock.

Exotic (nonlocal) lithic material types were examined to determine their source location. Based on comparison of reference specimens, one unifacially edge-modified flake (NOCA 6371) closely matches Allenby chert, which has a source area in the upper Similkameen River drainage on the east slope of the northern Cascade Range (Vivian 1989a). Many sources of chalcedony are suspected on the Columbia Plateau. The closest known source of chalcedony to the project area is in the Princeton Basin of British Columbia (Vivian 1989a). This source has not been chemically characterized and is visually indistinguishable from other translucent types of chalcedonies. The exotic sandstone from the site is of unknown origin. The closest source we know of is the Chuckanut Formation of the western North Cascades, far to the west of the valley. The source of the quartz crystal is unknown. It could be local or exotic in origin.

A high density of chipped stone artifacts was excavated from test unit 1. These consisted predominately of flakes and shatter of the locally available metasediment and Hozomeen chert and chalcedony. The flaking debris represents primary reduction of metasediment river cobbles and Hozomeen chert nodules; cortex on flakes and shatter was common. Other than a few pressure flakes, biface thinning flakes were nearly absent. It does not appear from the debitage that anything but very early-stage bifaces was being made. Rather, there seems to have been a far greater effort expended on the production of flakes from cores, including microblades from microcores. A few of the artifacts exhibited crazing and pot lidding, indicative of heat alteration (whether intentional or unintentional).

Like the surface collection assemblage, tools from the test unit appear to have been made expediently of local materials. Few pieces of exotic lithic raw materials were found. Artifacts from level 1 are from a reservoir deposit. Undisturbed soils were encountered first in level 2. The hammerstone from level 2 is a fragment (NOCA 10062) and exhibits only slight wear. Two of the three schist artifacts (NOCA 10060 and 10072) may be abraders with multiple, parallel striations running along the longitudinal axis and transverse scratches or striations oriented at right angles to the long axis. The striations were cut into the stone by a fairly hard material shaped to a narrow, acute edge or point. A small piece of calcined antler (NOCA 10116) was retrieved from level 4 of the unit, the first such material positively identified from the valley.

The site artifact assemblage indicates that it was a place where metasediment cobbles from the Skagit river were reduced into cobble tools, flake cores, and bifaces. Hozomeen chert nodules were reduced to bifaces, cores, scrapers, and microcores and microblades. Quartz crystals were reduced for use as microblades and flake tools. Other tools made of exotic materials were brought to the site and reshaped or resharpened. Most tools were expediently manufactured as cutting, scraping, abrading, and possibly splitting tools. Wear patterns on some tools suggest use on a relatively resistant material. It is possible, but remains uncertain, that the materials being worked at the site included bone and antler. It is also possible that animals were being butchered and cooked at the site, but this cannot be demonstrated with the existing data. Table 10.35 shows, by level, all cultural material collected from test unit 1, site 45WH283.

Site Chronology

The estimate of the age and period of occupation for the site is based on a radiocarbon date on charcoal collected *in situ* from level 3 of test unit 1. The date of 1,380±110 BP was associated with a high density of flaked stone and a calcined bone fragment in the level, and the levels above and below. The *in situ* charcoal occurred as multiple fragments in a small but dense concentration within the compacted, reddish-brown, silty soil B-horizon matrix. It was not associated with any visible feature, and

Table 10.35 Cultural Material From Excavation Units at 45WH283

test unit: 1 (1x1 m)		NCCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	113 Debitage, Hozomeen Chert, Chalcedony, Metasediment, Quartz Crystal	
	1 Microblade, Hozomeen Chert	10052
	1 Scraper, Chert (Unifacially Edge-Modified)	10053
	1 Biface, Hozomeen Chert	10054
	1 Biface, Chalcedony	10055
	1 Microblade Core Fragment, Heat Modified	10056
L:2 (20-30 cm BD)	50 Debitage, Hozomeen Chert, Metasediment	10057
	58 Debitage, Hozomeen Chert, Metasediment, Quartz Crystal, Chalcedony	10061
	80 Debitage, Hozomeen Chert, Metasediment	10063
	23 Debitage, Hozomeen Chert, Metasediment	10066
	1 Microblade, Hozomeen Chalcedony	10058
	1 Hammerstone, Granitic	10062
	1 Core, Metasediment	10064
	1 Core, Modified, Metasediment	10065
L:3 (30-40 cm BD)	28 Debitage, Hozomeen Chert, Chalcedony	10059
	59 Debitage, Hozomeen Chert, Metasediment	10068
	1 Core, Hozomeen Chert	10067
	1 Bone Fragment, Mammal	10115
	^{14}C, 1,380$\pm$110 BP, Beta 40702	
L:4 (40-50 cm BD)	43 Debitage, Hozomeen Chert, Metasediment	10070
	28 Debitage, Hozomeen Chert, Metasediment, Quartz Crystal	10071
	1 Unspecified Tool, Schist	10060
	1 Core, Metasediment	10069
	1 Unspecified Tool, Schist	10072
	1 Unspecified Tool, Schist	10081
	1 Antler Fragment, Cervidae	10116
L:5 (50-60 cm BD)	15 Debitage, Hozomeen Chert, Metasediment	10073
	19 Debitage, Hozomeen Chert, Metasediment, Quartz Crystal	10074
L:6 (60-70 cm BD)	6 Debitage, Hozomeen Chert, Metasediment	10075

is not demonstrably of cultural origin; however, its association with the high density of flaked stone artifacts, the absence of root and rodent disturbance, and the compact and uniform appearance of the supporting soil matrix, comprise strong field evidence that the

sample provides an acceptible age estimate for the level and is likely to be of cultural origin.

Table 10.36 Table Of ^{14}C Dates from 45WH283

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU1	L-3	Beta 40702	1,380±110

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence for test unit 1 is recorded in Figure 10.27. The surface stratum consists of a reservoir deposit of sand and silt, in places capped by angular rock fragments. In pockets, at the bottom of the stratum, are lenses of charred organic materials that probably reflect burning during reservoir clearing. Unconformably beneath this stratum is a well-developed B-horizon; it is a noticeably compact, reddish-brown, silt loam that supports occasional gravels of the same lithology as the underlying bedrock. The radiocarbon date of 1,380±110 years BP was from a charcoal sample collected from the middle of this soil. The next underlying stratum is a dark brown to brown, silty clay loam, soil BC-horizon. It lie unconformably over the metamorphic greenstone bedrock, which defined the bottom of the test unit. All the soil and sedimentary strata above bedrock contained prehistoric artifacts.

Conclusions and Assessment

Site 45WH283 appears to have been the location of intensive lithic material reduction and the manufacture of expedient tools. In conjunction with this, it served as a task-specific site related to the processing of game and the manufacture of bone and antler implements through the use of bifacial and unifacial scraping, cutting tools, and splitting tools. Other tools may have served as abraders. Microblades and microblade cores are abundant and are likely to be functionally related to other tool classes in the artifact assemblage; however, their exact functions are uncertain. Most tools, including the microblades, appear to be expedient tools that were manufactured, used, and discarded on-site. Other tools made of exotic chalcedony were brought to the site where they were used and maintained. The presence of Allenby chert suggests that occupants of the site traveled both sides of the northern Cascade Range. The presence of subvarieties of Hozomeen chert from the Little Beaver Cr. valley indicates familiarity with this tributary valley. Butchering of animals, including deer or elk, along with cooking meat and use of other body parts, such as antler, are likely to have taken place at the site. The size of the groups that used the landform and the intensity of their occupations are uncertain. Site 45WH283 was occupied sometime before and after circa

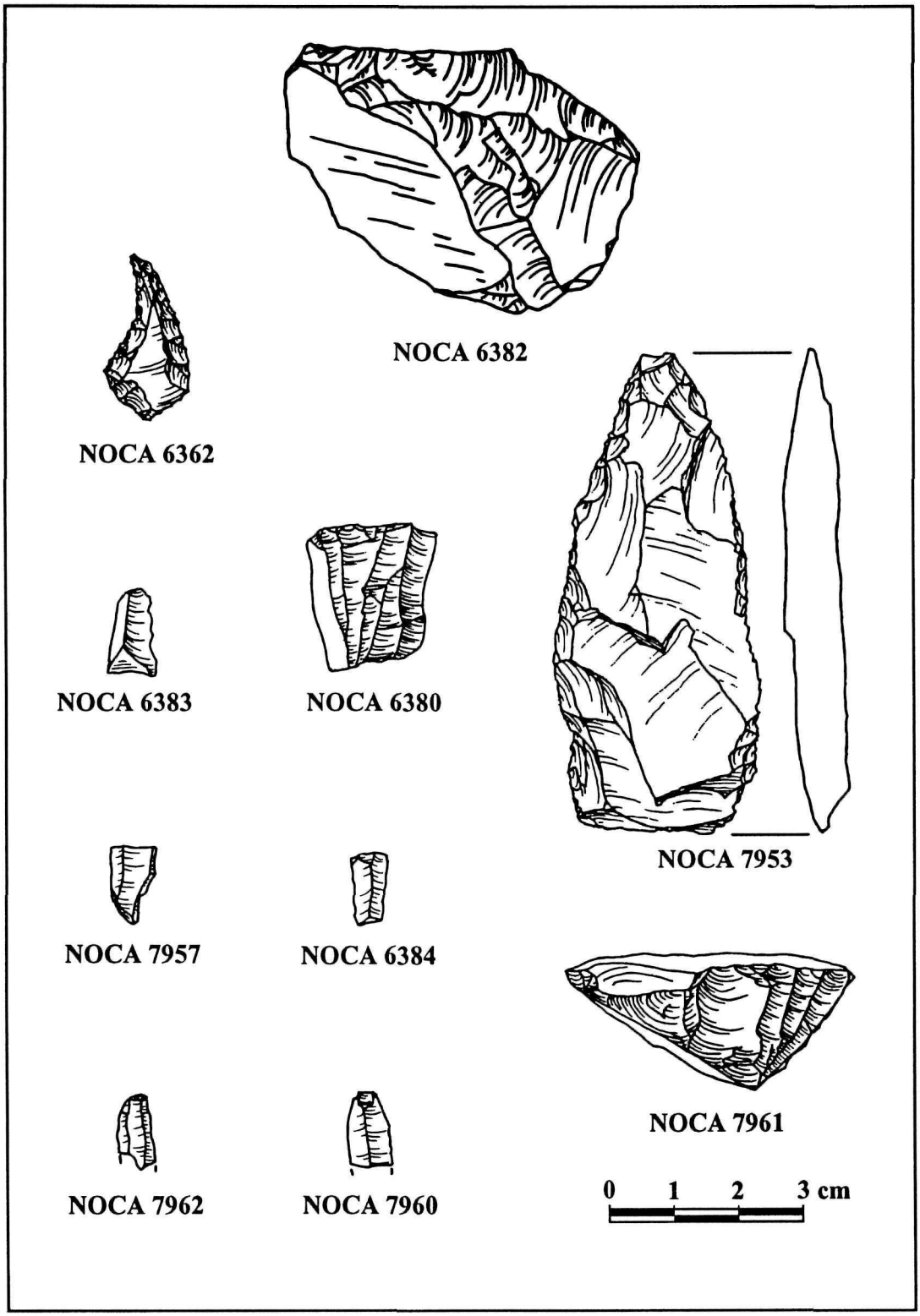


Figure 10.26 Artifact illustrations from Site 45WH283 (FS 103)

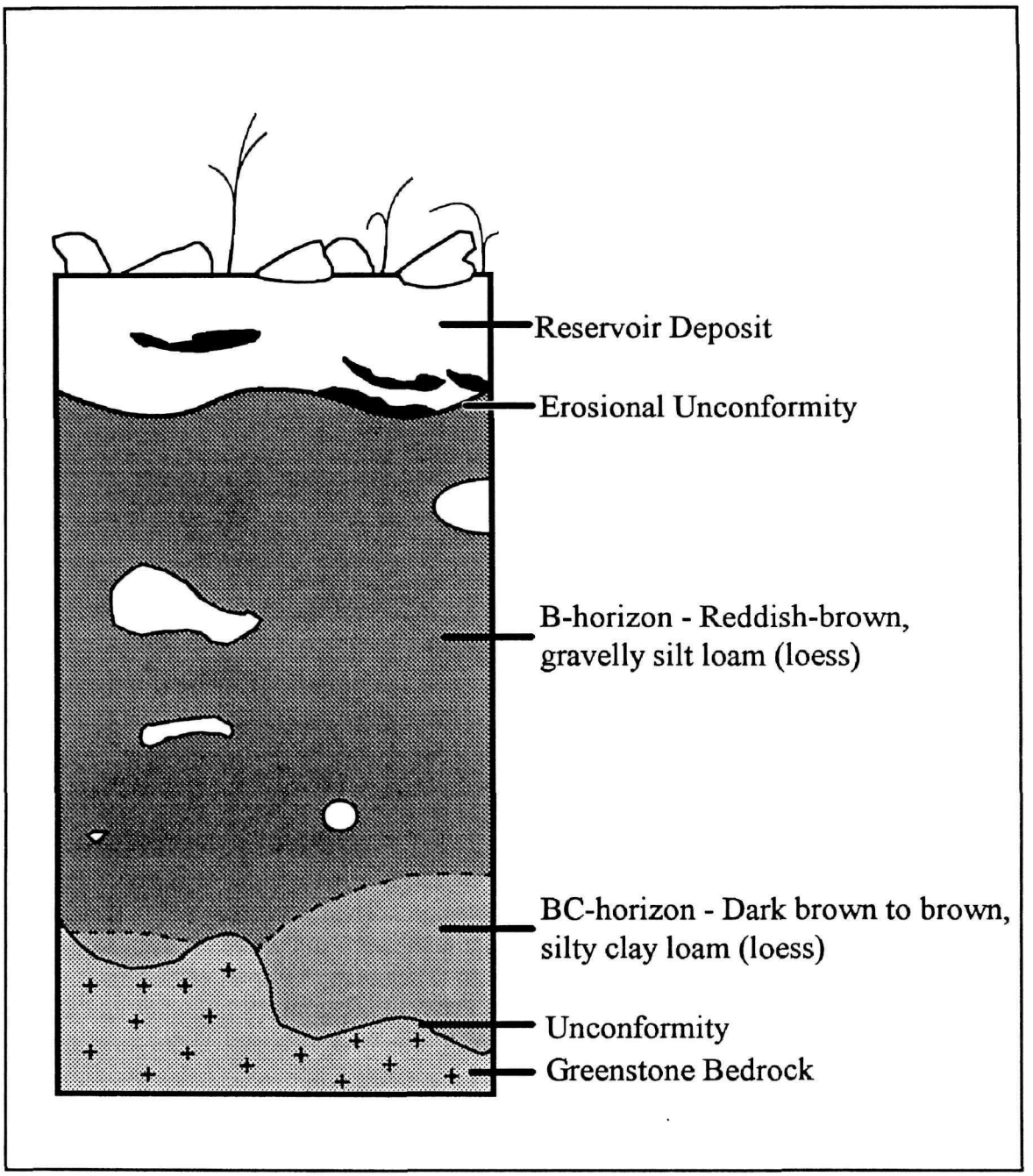


Figure 10.27 Generalized schematic of stratigraphy at Site 45WH283 (FS 103)

1,500 radiocarbon years ago.

Reservoir-induced wave erosion and haul road construction have destroyed the integrity of extensive areas of the site. The *in situ* artifacts at 45WH283 are within remnant patches of soil B-horizon preserved in locations protected from erosion by

bedrock formations. No attempt was made during testing of the site to locate all of these remnants. They occur adjacent to bedrock walls, protrusions, or enclosures, or any other configuration that offers protection from the erosive force of surf breaking along the shoreline. The remnants of intact artifact-bearing deposits are likely to constitute only a small proportion of the 11,200 m^2 (120,512 ft^2) of site area. It is roughly estimated that actual volume of such deposits is likely to be a few hundred cubic meters. These intact deposits comprise the significant portion of the site.

Site 45WH283 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.12 45WH286 (FS#106) North Lightning Creek #10

Site Setting

Site 45WH286 is located in the central portion of the project area, on the east side of the valley, about 350 m (1,148 ft) southwest of Lightning Cr. Campground. At 468 m (1,535 ft) elevation, it is situated on an inactive alluvial fan that has been incised by Lightning Cr. leaving an abrupt, steep terrace dropping to a narrow flood plain of the creek. The landform is nearly flat (0-3% slope) and has a southwest solar exposure. At its eastern end, the terrace pinches out where Lightning Cr. emanates from its V-shaped canyon. Looking south across the creek, about 4 m (13 ft) below, is another flood plain segment, and beyond the land rises steeply up the eroded escarpment of the much higher Pleistocene alluvial fan (see 45WH275 site setting). The broadening flats created by Lightning Cr. before it joins the Skagit River are southwest and west, with the steep rock walls that form the western valley wall beyond. The steep escarpment that rises to the top of the Pleistocene fan surface and site 45WH275 is to the north. The artifact scatter that defines the site is long and narrow, following the sweeping arc of the terrace edge carved by an older, now-abandoned channel of Lightning Cr.

Reservoir erosion and logging of the drawdown zone, including the construction of a haul road, have been the primary sources of historic disturbance to the site. The prevailing southwesterlies are prevented from developing a large surf due to the protection offered by the surrounding, higher glacial landforms. As a result, a large part of the site has been protected by burial under reservoir deposits. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open-canopy conifer forest and shrubland.

General Site Description

The site dimensions are 30 m (98 ft) north-south by 150 m (492 ft) east-west, covering an area of 4,500 m^2 (48,420 ft^2) (Figure 10.27). Artifact depth determined during testing ranged from the surface to 60 cm (24 in) below the surface. Using an approximate average depth value of 40 cm (16 in), the estimated volume of artifact-bearing deposits at the site is 1,800 m^3 (63,558 ft^3). The site is characterized as a low to moderate-density lithic scatter. Artifact types observed at the site include projectile points, bifaces, cores, microblade cores, debitage, and an adze blade. Lithic material types in the artifact assemblage are Hozomeen chert, metasediment, nephrite (or serpentenite), quartz crystal, basalt, and Allenby chert.

Testing Methods and Rationale

The site was recorded during the 1988 survey and surface collections were made in 1989 and 1992. It was test excavated by placement of two 1 x 1 m (3.28 x 3.28 ft) m test units and two 50 x 50 cm (20 x 20 in) test pits. Site sediments were excavated in 10 cm (3.94 in) levels and screened through .63 cm (.24 in) wire mesh. The test strategy was designed to locate undisturbed cultural deposits and determine their approximate distribution within the landform.

Table 10.37 Inventory of Surface Collections from 45WH286

	NOA#
1 Adz Blade, Nephrite	7064
1 Projectile Point, Allenby Chert	7065
1 Projectile Point, Basalt	7066
1 Microblade Core, Hozomeen Chert	7067
1 Projectile Point, Metasediment	10480
1 Wedge, Hozomeen Chert	10481
1 Microblade Core, Hozomeen Chert	10482
1 Projectile Point, Metasediment	10483
1 Microblade Core, Metasediment	10484
1 Flake, Edge-Modified, Hozomeen Chert	10485
1 Flake, Edge-Modified, Hozomeen Chert	10486
1 Flake, Edge-Modified, Hozomeen Chert	10487
1 Flake, Edge-Modified, Hozomeen Jasper	10488
1 Microblade Core, Hozomeen Chalcedony	10489
1 Microblade Core, Metasediment	10490
1 Projectile Point, Basalt	10491
1 Projectile Point, Basalt	10492
1 Flake, Edge-Modified, Hozomeen Chert	10493

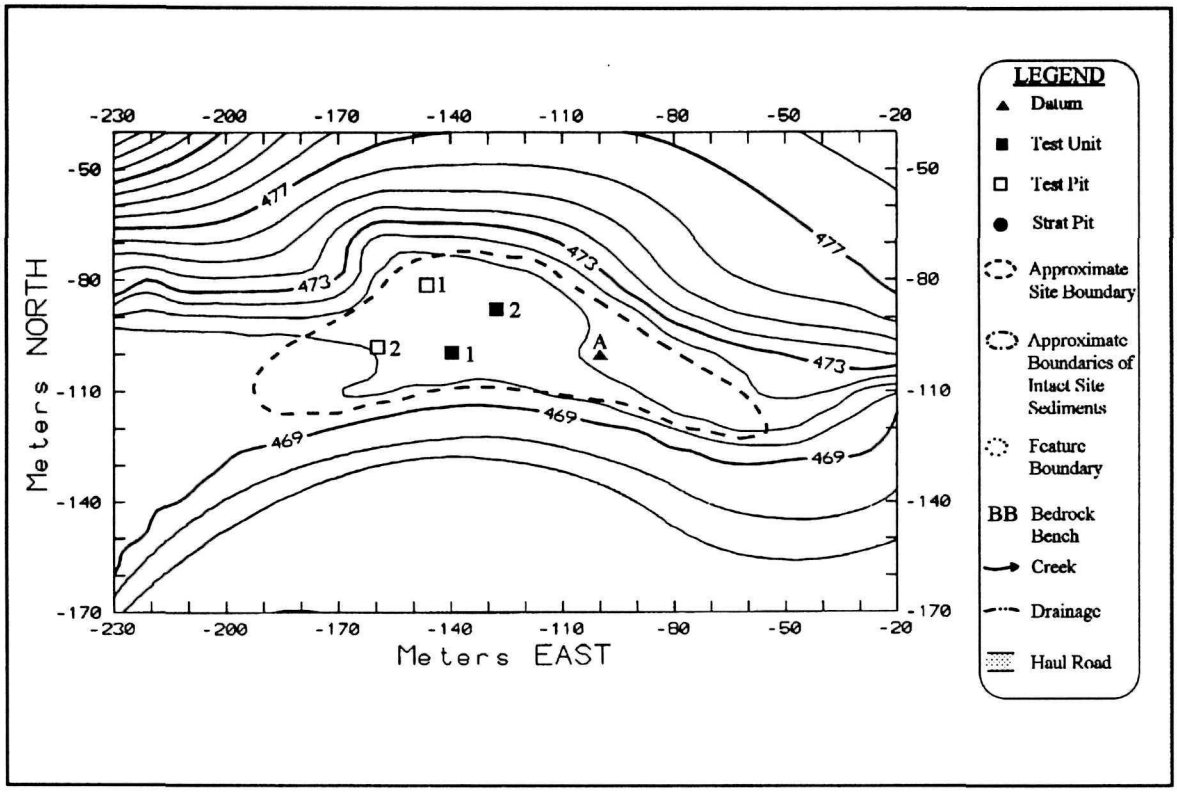


Figure 10.28 Topographic map of Site 45WH286 (FS 106)

Description of Testing Results

Artifact categories identified at site 45WH286 include projectile point, biface, microblade core, microblade, edge-modified flake, flake, shatter, wedge, fire-modified rock, hammerstone, and mammal bone. A total of 111 artifacts was recovered from the site. Ninety-three of these are from test units and pits, and of these, 88 were excavated from intact, undisturbed soil (Table 10.37 and 10.38).

The 18 artifacts collected from the site surface include 4 chronologically diagnostic projectile points (Figure 10.29). Two are classified as Type 3 (NOCA 7065 as 3C, and NOCA 10492 as 3A), and 2 are classified as Type 11B (NOCA 7066 and 10480). Two other projectile points are too fragmented to be reliably classified, but appear to be a Type 2 (NOCA 10491) and a Type 3A (NOCA 10483).

Of the 5 microblade cores recovered from the surface, 2 are made of Hozomeen chert (NOCA 7067 and 10482), 1 of Hozomeen chalcedony (NOCA 10489), and 2 of metasediment (NOCA 10484 and 10490). All but one of these microcores are made from small, blocky chunks. The exception (NOCA 10484) is an oblong flake core, from which a series of microblades was removed from a narrow projection at one end.

Other artifacts include edge-modified flakes that appear to have functioned as cutting or scraping tools. Three of the 5 have bifacially-modified margins that functioned for cutting, grooving, or scoring some resistant material. The wedge (NOCA 10841) consists of a tabular piece of Hozomeen chert with a flat platform at one end with the opposing end bifacially-flaked into a tapered or beveled edge. Both ends exhibit battering and hinge terminations on flake scars. Tools of this class, sometimes referred to as *pièce esquillée*, are considered tools for splitting bone and antler or as products of bipolar reduction (Flenniken 1981).

The only adz blade found in an archeological site in the drawdown (NOCA 7064) is made of a dense nephrite or serpentine; the color is white with green mottles. This adz has a steep, unifacially beveled bit and a smooth, polished surface on one face. The other face is pitted from chemical weathering. The proximal end consists of a smoothly rounded projection, suggesting that it was hafted in a socketed handle rather than an elbow handle. It could have functioned as a slick or a plane. Overall, this assemblage of tools indicates the working of wood and other materials, perhaps bone and antler.

These cultural remains were scattered across the ground surface and within reservoir deposits. A prominent feature of the site is a berm created by shoreline processes along the southern, upwind boundary of the landform. Such berms or beach ridges form where the high energy erosive force of waves breaks along an abrupt terrace edge. The berms are built of eroded and reworked soils that form a lag concentrate of sand, gravel, and other soil material. Most of the material within the berm was eroded from the shoulder of the terrace and transported a short distance inland (downwind). The berm at nearby site 45WH275 had buried a remnant of the soil B-horizon and the artifacts within it. Based on this information, test units at 45WH286 were not placed on the berm because intact sediments were presumed to exist below it.

Inland from the beach ridge (downwind) the site surface is covered with a fine-grained reservoir deposit that caps and preserves the pre-reservoir site surface in its central portion. The two test units and test pits were excavated in this part of the site. Buried, intact artifact-bearing sediments were found in each. In test unit 1 artifacts were excavated from the upper 50 cm (20 in) of sediments. The flaking debris consisted of small, thin broken flakes from the refurbishing of tool margins. About a dozen fire-modified rocks were recovered from level 3 matrix. A well-formed microblade core was found in level 5. It was made of an angular, blocky chunk of dark gray metasediment. Blades had been removed in a continuous series from the entire curved portion of the platform, which was D-shaped in planview outline. A total of 22 partial and complete blade scars can be counted on the core. This microcore is remarkable for the control of flake removal exhibited on this lithic material which is extremely difficult to flake with precision. Only this site has produced metasediment microcores (3); all others are made of Hozomeen chert, chalcedony, or quartz crystal. Note that these metasediment cores have not been subjected to petrographic analysis and lithic material type has tentatively been assigned on the basis of visual inspection; it is possible that they are basalt. Also

from level 5 (NOCA 10499) and in level 6 (NOCA 10500) were found two wedges (*pièce esquillée*), both made from small tabular flakes of Hozomeen chert. These tools may have been used to split antler and bone.

In test unit 2, artifacts were excavated from the upper 40 cm of sediments. Much of the lithic assemblage from this unit represents microblade technology. A total of 10 complete or broken microblades was recovered from levels 2-4; 4 of the microblades are triangular in cross-section (NOCA 10507, 10508, 10509, 10525) and 6 are trapezoidal (NOCA 10509, 10511, 10513, 10520, 10521, 10523); 6 are made of Hozomeen chalcedony, 3 of Hozomeen chert, and 1 of metasediment. One of these (NOCA 19508) is noteworthy for the presence of a unifacially beveled lateral margin. It is unclear whether or not this is wear or intentional edge modification. Two microflake cores (NOCA 10503 and 10504) were recovered, one from level 1 and the other from level 2. Both are made of Hozomeen chalcedony. Like the microblade cores, these are small, angular, blocky chunks, but the negative scars show that irregularly shaped flakes had been removed, rather than long, narrow, and parallel-sided blades. The flaking debris from the unit consists of small percussion flakes and shatter of Hozomeen chalcedony and chert, although some of the former may have been removed from the microflake cores. A few large metasediment flakes and a core indicate that river cobble core reduction is another lithic reduction technology practiced at the site. A large granite hammerstone fragment (NOCA 10515) shows an area of battering on an otherwise smooth cortex and is of the size required to fracture large river cobbles. Overall, the assemblage from test unit 2 reflects the manufacture and use of microflake tools, especially microblades, but also the production (and probable use) of large flakes from metasediment river cobbles.

The small assemblage of artifacts from test pits 1 and 2 conforms to that from the test units. A Hozomeen chert microblade (NOCA 10528) from level 3 of test pit 2 is broken, but retains a triangular cross-section.

The lithic artifact assemblage from this site consists primarily of locally procured Hozomeen chalcedony, Hozomeen chert, and metasediment. The quartz crystal and nephrite may or may not be of local origin. The exotic (nonlocal) material types include basalt and Allenby chert. One projectile point collected from the site surface closely matches Allenby chert, whose source area is located in the upper Similkameen River drainage on the east slopes of the northern Cascade Range (Vivian 1989).

Table 10.38 below lists all cultural material collected from excavation units, by level, from site 45WH286.

Table 10.38 Cultural Material From Excavation at 45WH286

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	

L:1 (0-10 cm BS)	1 Bone Fragment, Mammal	10494
	3 Flakes, Hozomeen Chert, Metasediment	10495
L:2 (10-20 cm BS)	0 Collections	
L:3 (20-30 cm BS)	Fire-Modified Rock	
L:4 (30-40 cm BS)	7 Flakes, Hozomeen Chert, Metasediment, Chalcedony	10497
L:5 (40-50 cm BS)	1 Microblade Core, Metasediment	10498
	2 Flakes, Hozomeen Chert, 1 Wedge, Hozomeen Chert	10499
L:6 (50-60 cm BS)	1 Wedge, Hozomeen Chert	10500
L:7 (60-70 cm BS)	0 Collections	

test unit: 2 (1x1 m)

L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Flake, Hozomeen Chert	10501
	1 Flake, Hozomeen Chert	10502
	1 Core, Hozomeen Chalcedony	10503
L:2 (10-20 cm BS)	1 Core, Hozomeen Chalcedony	10504
	1 Flake, Hozomeen Chalcedony	10505
	1 Debitage, Hozomeen Chert	10506
	1 Microblade, Hozomeen Chert	10507
	1 Microblade, Hozomeen Chert	10508
	15 Debitage, Hozomeen Chert, Metasediment, Hozomeen Chalcedony	10509
	2 Microblades, Hozomeen Chalcedony	10509
	1 Flake, Hozomeen Chert	10510
	6 Flakes, Hozomeen Chert, Metasediment	10511
	1 Microblade, Hozomeen Chalcedony	10511
	1 Tabular Shatter, Hozomeen Chalcedony	10512
	21 Flakes, Hozomeen Chert, Metasediment, Hozomeen Chalcedony	10513
	1 Microblade, Metasediment	10513
	1 Flake, Edge-Modified, Hozomeen Chalcedony	10513
	1 Flake, Quartz Crystal	10514
	1 Hammerstone, Granite	10515
L:3 (20-30 cm BS)	3 Flakes, Hozomeen Chert	10516
	1 Flake, Metasediment	10517
	1 Core, Metasediment	10518
	1 Flake, Metasediment	10519
	1 Microblade, Hozomeen Chalcedony	10520
	1 Microblade, Hozomeen Chert	10521
	1 Shatter, Hozomeen Chalcedony	10522
	1 Flake, Hozomeen Chert	10523
	1 Microblade, Hozomeen Chalcedony	10523
	1 Flake, Metasediment	10524
L:4 (30-40 cm BS)	1 Microblade, Hozomeen Chalcedony	10525

	1 Shatter, Hozomeen Chert	10526
L:5 (40-50 cm BS)	0 Collections	
test pit: 1 (50x50 cm)		
L:S (surface)	0 Collections	
L:1 (0-28 cm BS)	0 Collections	
L:2 (28-38 cm BS)	2 Flakes, Hozomeen Chert	10527
L:3-4 (38-58 cm BS)	0 Collections	
test pit: 2 (50x50 cm)		
L:S (surface)	0 Collections	
L:1-2 (0-38 cm BS)	0 Collections	
L:3 (38-48 cm BS)	1 Microblade, Hozomeen Chert	10528
L:4 (48-58 cm BS)	1 Flake, Metasediment	10529

Site Chronology

The only basis for estimating the age of the site is from chronologically sensitive projectile points. The four complete points consist of one Type 3C (NOCA 7065) and one Type 3A (NOCA 10492), both Cascade/Olcott varieties assigned an age range of 9,000-4,000 years BP. Two others are classified as Type 11B (NOCA 7066 and 10480), referred to in the Columbia Plateau as Quilomene Bar Corner-Notched, and are assigned to the Plateau Horizon of the Fraser Plateau. These styles have a combined age range of circa 3,000-1,200 years BP. Two other projectile points are too fragmented to be reliably classified. The first is likely to be a Type 2 (NOCA 10491) Windust or Plano point dating between circa 10,800 and 8,000 years BP. The other is likely to be a Type 3A (NOCA 10483) Cascade/Olcott point. It is most probable that the site dates between 2,000 and 4,000 years ago; however, an early-period use of the site cannot be ruled out.

Although charcoal fragments were present in very small pockets throughout the artifact-bearing matrix, not enough could be collected for a radiocarbon sample. It is likely, however, that the site can be radiocarbon dated.

Site Stratigraphy

A schematic diagram of the site stratigraphic sequence is shown in Figure 10.30. The surface stratum consists of a relatively thick, stratified reservoir deposit. In most units, the bottom of this unit was marked by the presence of a gray to greenish-gray, clayey silt. Unconformably underlying this stratum is the soil B-horizon that represents the intact, pre-reservoir soil; it appears as a strong brown, silty to pebbly sand. The presence of decayed forest duff and charcoal stains at the top of this stratum indicates that reservoir-induced erosion has not occurred to any great degree. The degree of weathering of this soil, as measured by thickness and hue, is as well-expressed as that

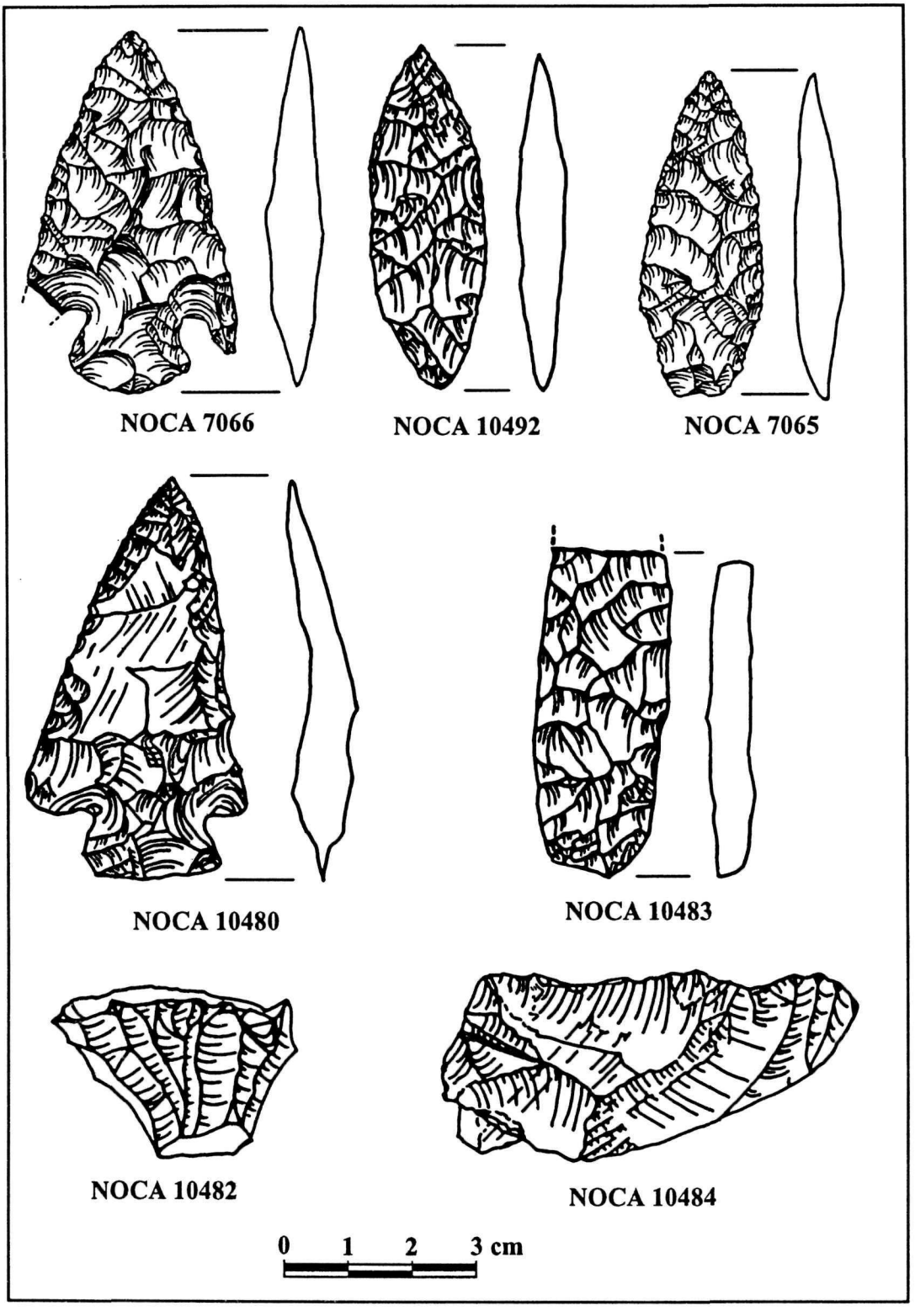


Figure 10.29a Artifact illustrations from Site 45WH286 (FS 106)

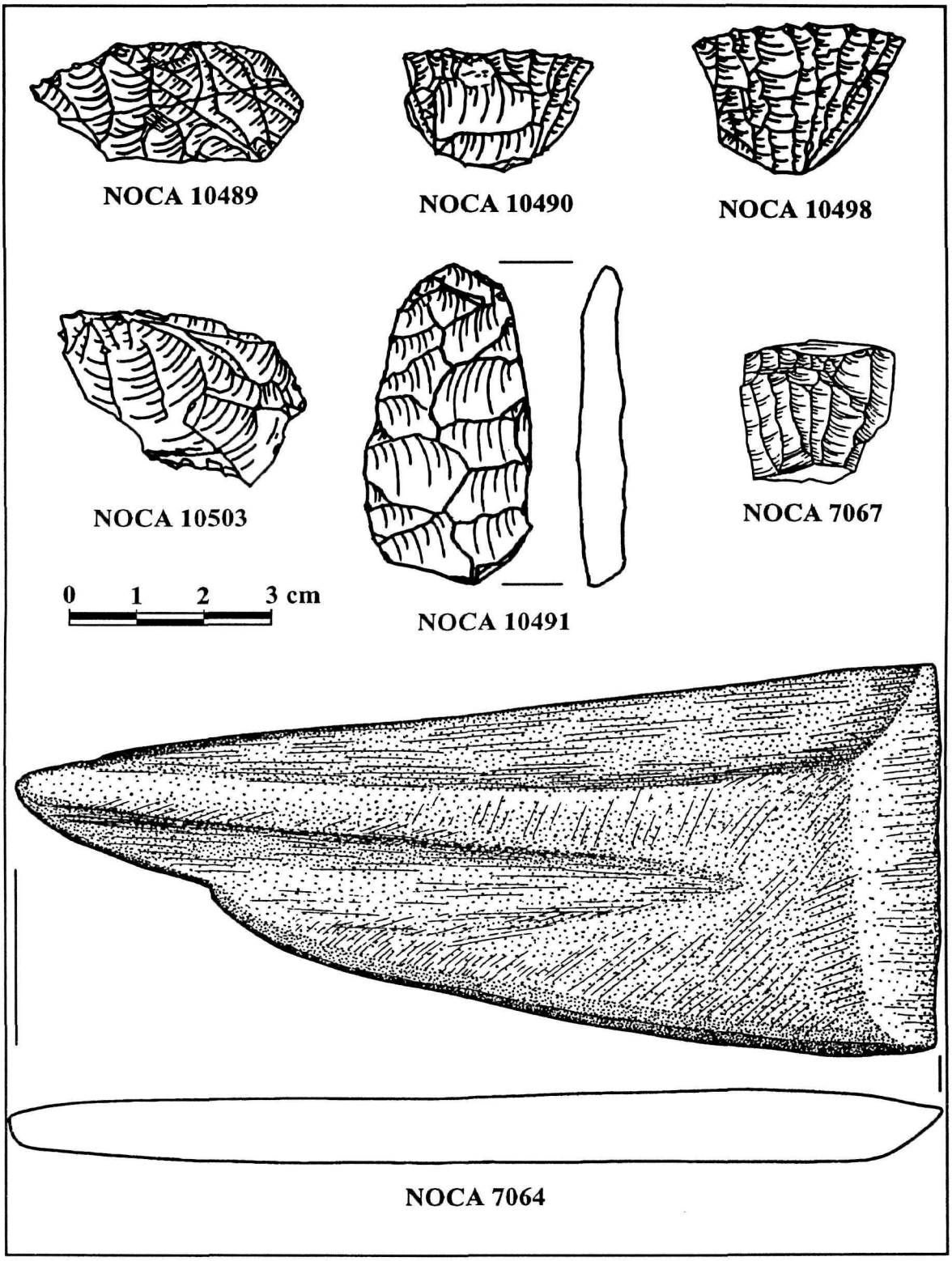


Figure 10.29b Artifact illustrations from Site 45WH286 (FS 106)

observed on high post-glacial river terraces in other parts of the drawdown. Beneath this stratum is a brown to olive brown BC-horizon that has developed in fine gravel and silty sand parent materials. The basal stratum is river gravel consisting of rounded clasts supported in a sandy matrix. Prehistoric artifacts were found predominately within the B-horizon, with some in the BC-horizon.

An inexact depositional history of the landform can be inferred from its weathering profile, surface morphology, and geomorphic position in the Skagit River valley. This landform is part of the small alluvial fan that formed within the deep trench eroded by Lightning Cr. into the much larger and older Pleistocene alluvial fan (see 45WH232 and 45WH275 site descriptions). Lightning Cr. probably entrenched shortly after the fan formed, synchronous with the downcutting of the Skagit River into the valley's glacial fill, between approximately 9,000 and 11,000 years ago. As Lightning Creek's channel cut to its present base level, it deposited a younger, low-gradient alluvial fan. Different terrace levels on the younger fan surface record migrations of the creek channel across the fan surface during its growth and episodes of downcutting and erosion.

Site 45WH286 is positioned on one such terrace at the proximal end of the fan, almost at the canyon mouth. This terrace was built first by the deposition of Lightning Cr. gravels, and later by the accretion of fine-grained fluvial sands and silts, with perhaps the addition of some flood plain loess and tephra from various Cascade volcanos. Soil horizons formed as this fine-grained cap weathered. Prehistoric people began to visit and occupy the landform during this period, and their activities were a factor in the formation of the site's soils.

Conclusions and Assessment

Site 45WH286 appears to have been a short-term base camp. The inhabitants hunted animals in the surrounding terrain and manufactured and used a somewhat specific assemblage of tools that includes microblades, microflakes, wedges (*pièce esquillées*), and unifacially and bifacially-modified flakes. This tool assemblage appears to be related to the processing or preparation of nonlithic materials, most probably bone and antler but other materials may also have been worked. The adz blade recovered from the site surface is likely to have been used to work wood. The tools at the site were probably used for piercing, scraping, cutting, splitting, grooving, and planing. Microblades and microblade cores are abundant and are likely to be functionally related to other tool classes in the artifact assemblage, although their use is uncertain. Except for the projectile points and the adz, most tools, including the microblades, appear to be expedient tools that were manufactured, used, and discarded on-site. The presence of Allenby chert in the raw material assemblage suggests that the occupants of the site traveled both sides of the northern Cascade Range. The relative abundance of high quality Hozomeen chalcedony derived from unknown sources in the valley indicates familiarity with local stone materials. The size of the groups that used the landform and

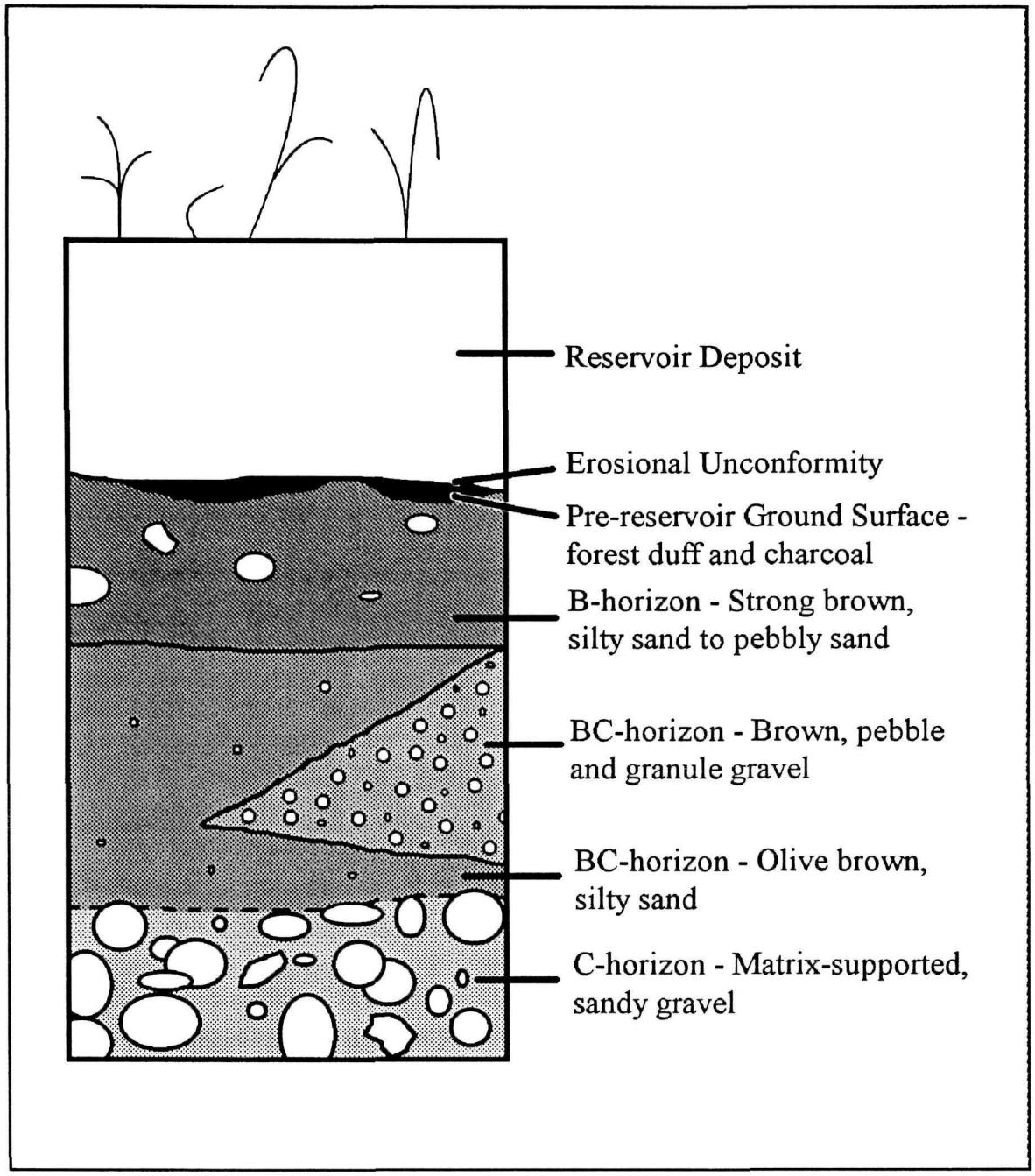


Figure 10.30 Generalized schematic of stratigraphy at Site 45WH286 (FS 106)

the intensity of their occupations are uncertain. Site 45WH286 was probably occupied sometime between 1,200 and 3,000 years ago, and possibly much earlier.

The test excavations revealed that cultural deposits at 45WH286 appear to have been only partially destroyed by shoreline processes. A large percentage of the site

remains intact and buried under historic reservoir deposits. The *in situ* artifacts at the site are within the matrix of a well-developed soil B-horizon. The volume of intact artifact-bearing deposits is estimated to measure approximately 1,200 m^3 (42,372 ft^3). It is these intact deposits that comprise the significant portion of the site.

Site 45WH286 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Most portions of the site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits, the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.13 45WH300 (FS#120) Perry Point #2

Site Setting

Site 45WH300 is located on the west side of the valley in the northern portion of the project area. It is approximately 1.9 km (1.2 mi) north of Little Beaver Cr. and circa 100 m (328 ft) north of a point of land informally called Perry Point. At 462 m (1,515 ft) elevation, the site is situated on a sloping (0-10%) glacial terrace between bedrock outcrops. The landform has an eastern solar exposure, and from the site one looks east to the Skagit River, about 4.6 m (15 ft) lower and a few hundred meters distant, and beyond to the wide flat flood plain and the steep eastern valley wall that rises to the ridgeline connecting Little Jackass Mtn. (1,337 m [4,387 ft]) and Desolation Pk. (1,860 m [6,102 ft]). The southern view is partially of the steep slopes of the western valley wall, and partially down the Skagit River valley to, Jack Mtn. (2,763 m [9,063 ft]) with Nahokameen Glacier below the summit. To the west the valley wall rises steeply to the 1,860 m (6,100 ft) ridgeline north of Little Beaver Cr. To the north is the broad flood plain of the Skagit River with views of distant summits of the northern Cascade Range in today's British Columbia. The lithic scatter that defines the site is long and narrow, conforming for the most part to the terrace, except at the northwest end of the site where it extends up onto a bedrock outcrop of Hozomeen chert.

Logging of the drawdown zone, reservoir erosion, and natural processes related to forest growth and succession have been the primary sources of disturbance to the site. The landform is somewhat protected by the valley wall configuration from the prevailing southwesterlies, but it is exposed to surf generated by northern winds having a long fetch. The pre-reservoir vegetation, as evident from cut stumps, consisted of a mature, closed-canopy, coniferous forest. Some portions of the artifact-bearing matrix at the site have been mixed by tree root penetration and burned by wildfires in the prehistoric past.

General Site Description

The site dimensions are 210 m (689 ft) north-south and 40 m (131 ft) east-west, covering an area of 8,400 m^2 (90,384 ft^2) (Figure 10.31). Artifacts extended from the surface to 90 cm (35 in) below the surface. The estimated volume of artifact-bearing deposits at the site is circa 2,500 m^3 (88,275 ft^3). The site is characterized as a moderate to high-density lithic scatter and lithic procurement site. Fire-modified rocks are scattered across the site surface as irregularly-shaped clusters, and in one case, as a circular hearth feature clearly defined by a ring of rocks, some of them slab-shaped and placed in the soil matrix at a near-vertical angle. Clusters and scattered distributions of chipped stone artifacts, along with a small quantity of calcined bone fragments, occur in and around the FMR scatters. The distribution of these cultural remains as they appear on the eroded site surface is a product of reservoir-controlled erosional and depositional processes, which bury some artifacts under thick mud and expose others within a lag deposit of gravels.

Some bedrock outcrops of poor to high quality Hozomeen chert occur at the site. Unlike the massive bodies of chert that outcrop at 45WH224 (Desolation Chert Quarry) and other locations in the valley, material here outcrops as ribbon chert which weathers from the formation in tabular nodules. Artifact types observed at the site include projectile points, bifaces, cores, microblades, flaking debris, fire-modified rocks, and calcined mammal bones. The lithic material types in the artifact assemblage consist of Hozomeen chert (some of it from the ribbon formation on-site), metasediment, quartz crystal, a black, fine-grained basalt or similar igneous rock, and a very high quality chalcedony.

Testing Methods and Rationale

The highest part of the site, on a small bedrock bench, was recorded during the 1988 survey. During the 1989 survey, the site boundaries were extended lower in the drawdown and four artifacts were collected from the surface. Additional surface collections were made in 1993 and five 1 x 1 m (3.28 x 3.28 ft) test units were excavated. Site sediments were excavated in stratigraphic and 10 cm (3.94 in) arbitrary levels and screened through .32 cm (.125 in) and .63 cm (.24 in) wire mesh. Testing was designed to locate undisturbed artifact-bearing deposits, and to determine the integrity, contents, and age of the hearth features. Test unit locations were selected based on the presence of organic duff layers, which sometimes mark the pre-reservoir forest floor, or on terrain configurations that offered protection from reservoir erosion.

Table 10.39 Inventory of Surface Collections from 45WH300

	NCCA
1 Biface, Basalt	7072

1 Biface, Metasediment	7073
1 Edge-Modified Flake, Basalt	7074
1 Projectile Point, Metasediment	7075
1 Biface, Metasediment	10782
1 Biface, Hozomeen Chert	10783
1 Biface, Basalt	10784
1 Biface, Basalt	10785
1 Flake, Basalt	10786
1 Flake, Exotic Chalcedony	10787
1 Edge-Modified Flake, Basalt	10788
1 Edge-Modified Flake, Metasediment	10789

Description of Testing Results

Artifact categories from site 45WH300 include projectile point, biface, edge-modified flake, microblade, wedge (*pièce esquillée*), flake, shatter, fire-modified rock, and mammal bone. A total of 73 artifacts was recovered from the site, sixty-one from test units, 52 of which are from intact deposits. Locally procured lithic raw materials include Hozomeen chert, Hozomeen chalcedony, and metasediment. Exotic (nonlocal) material types are basalt, chalcedony, and chert. The quartz crystal is of uncertain origin. Artifacts occur in one of three sedimentary contexts: as lag deposit on the top of the eroded site surface, mixed into the redeposited matrix of the reservoir deposit that caps some parts of the site, and within the intact soil B- and BC-horizons.

Artifacts recovered from the site surface consist mostly of bifaces and edge-modified flakes. Of the 6 bifaces, 4 are made of a black, fine-grained basalt (see section 10.7) that is visually similar to Cache Cr. (British Columbia) "basalt"; one is metasediment, and the remaining one is Hozomeen chert. Three of the bifaces are categorized as reduction Stage III (NOCA 7072, 10782, 10783) and 3 are Stage IV (NOCA 7073, 10784, 10785). The last two of these are large and their margins appear to have been sharpened for use as knives (Figure 10.33c). NOCA 10782 is also large, and one margin appears to have been dulled by use as a cutting tool (Figure 10.33b). The edge-modified flakes have steep, unifacially-beveled margins and they appear to have functioned as scrapers. The only projectile point from the site (NOCA 7075) is classified as Type 10A.

Three apparent surface features were test excavated, but only one of these had subsurface integrity. Features 1 and 2 (test units 1 and 2 respectively) consisted of discrete concentrations of FMR in association with charcoal. No subsurface features were found. The fire-modified rocks were not in their original context and formed a lag deposit on the eroded site surface. Charcoal stains were from pre-reservoir fires. The artifact assemblage from test unit 1 included a wedge (*pièce esquillée*) made from a flake struck from a river cobble. The bit end of this tool (NOCA 10790) is blunted from use

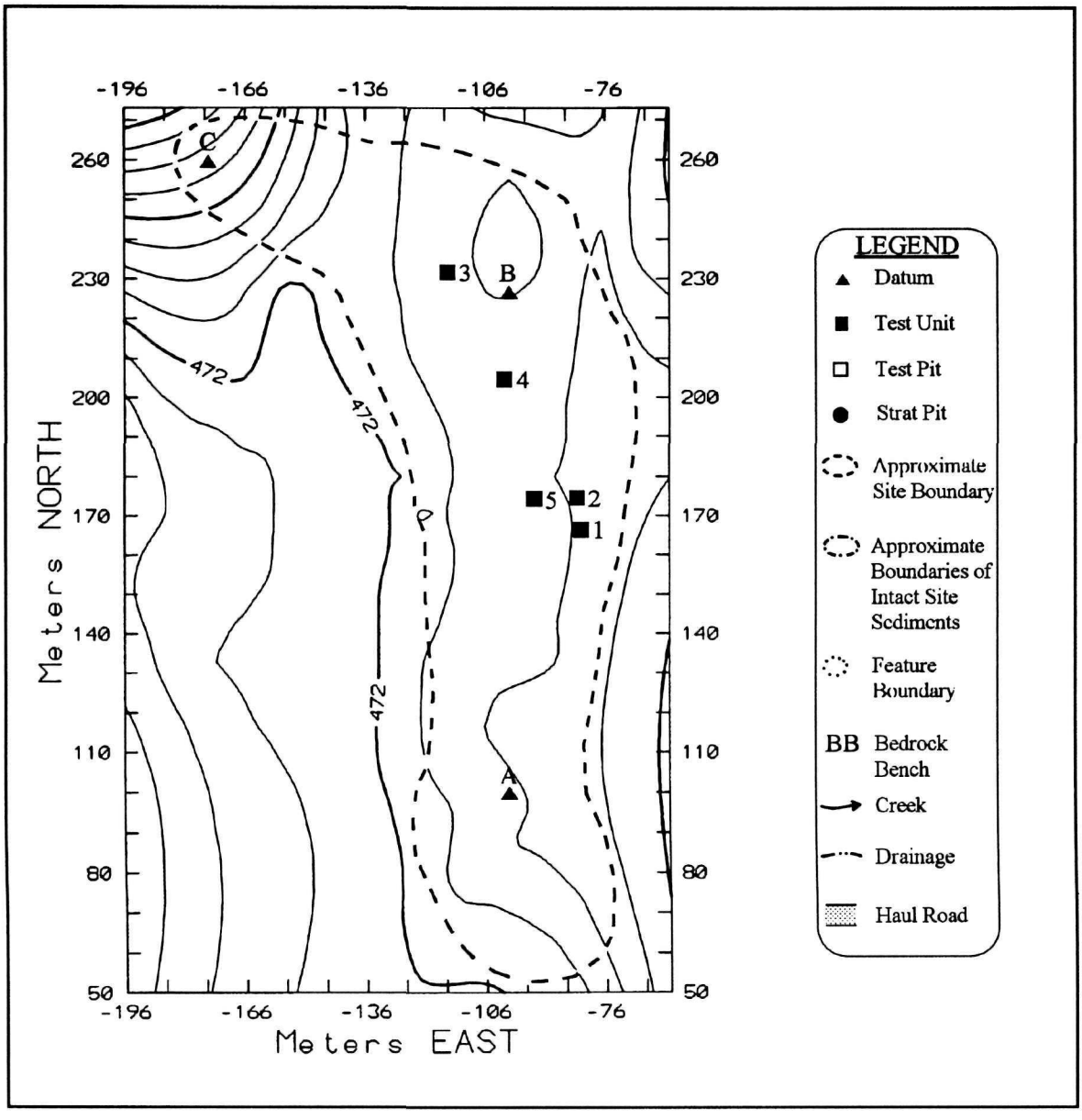


Figure 10.31 Topographic map of Site 45WH300 (FS 120)

against a resistant but otherwise unknown material. A biface thinning flake of Hozomeen chert and a quartz crystal microblade were recovered. The microblade is trapezoidal in cross-section, and one lateral margin exhibits use wear consisting of a continuous series of fine (magnification is required to see them), irregular flake scars on both faces. This pattern of flake removal may result from use as a cutting tool.

Feature 3 (Figure 10.32) was defined by a ring of rocks, a few of them slab-shaped and placed in the soil matrix at a near-vertical angle. This feature was recorded



Figure 10.32 Feature 3, test unit 4, level 2 completed, 45WH300.

during the 1989 survey and was visible because most of the rocks protruded above a reservoir-deposited mud cap. The west end of feature 3 lay against a large, sawn cedar stump (1.3 m [52 in] in diameter) at the point where the roots spread away from the trunk. The test unit was oriented so as to sample 25% of the feature, with the southwest corner of the unit at the feature center and the northeast corner extending for 60 cm outside of the feature boundary. The interior and exterior of feature 3 were excavated separately.

Feature 3 was an intact hearth that contained fire-modified rock, charcoal, and calcined bone. One tool may have been in the feature (NOCA 10801), but was recovered from the thin reservoir deposits on top (level 1) and was not clearly associated with the feature. This tool is of a broken flake of exotic chert. It has a unifacially-steepened margin that was used scraping, and another margin segment which exhibits bifacial edge-wear and may have been used for cutting. All of the remaining chipped stone flaking debris from the test unit was recovered from outside of the feature. This assemblage consists, predominately, of short, thick, irregularly-shaped flakes with flat, usually river-smoothed cortex platforms, and multiple step-fractures, and overlapping flake scars on the dorsal surfaces; most are made of metasediment. A few pieces of shatter are present. One bipolar flake of Hozomeen chert displays a battered, glacial or

alluvial fan cortex surface (NOCA 10809). One thin and fragmented flake (NOCA 10810) appears to have been removed from a biface. The total assemblage represents the manufacture and use of expedient tools made of mostly local lithic materials. The high proportion of short wide flakes suggests that river cobble tools were used to chop or bash a resistant material or a material placed on an anvil, resulting in the unintentional removal of small flakes from the tool surface that contacted the anvil. The most likely candidate for such a material is mammal bone, one piece of which was found within the feature matrix (NOCA 10813). This bone is a 2 cm long, thick-walled, metapodial shaft fragment of a medium-sized mammal. The only artifact recovered that could be related to this type of processing was a fractured river cobble excavated from beneath the feature in level 6 (NOCA 10816).

In sectional view, feature 3 formed a shallow basin excavated into the top of the well-developed soil B-horizon (see diagram of feature in Appendix E). The feature matrix consisted of a thick deposit of black charcoal surrounding a dense layer of heat-fractured rocks. The rocks at the top of this layer were larger and less fractured than those at the bottom. Three charcoal samples from this layer were submitted for radiocarbon dating. They dated 1,940, 1,750, and 1,650 radiocarbon years BP. All three dates overlap at two sigmas with the overlap between 1,790 and 1,760 years BP; the true age of the sample has a 95% probability of being within this range. In addition, a tephra sample collected from below the feature was identified as St. Helens Y, which erupted circa 3,500 years ago. This hearth may represent a brief period of use with the few artifacts in and surrounding it functionally related to that use. Preparation of food and immediate consumption took place. Food included a medium-sized mammal, and it is probable that the leg bones were split for marrow extraction. Feature 3 is the most intact and undisturbed hearth test excavated in the drawdown zone.

Test unit 3 was placed in a saddle between bedrock benches at the north end of the site. A small, intermittent snowmelt stream was west of the test unit. Approximately 50 cm (20 in) of reservoir deposits were removed as overburden before the pre-reservoir surface was encountered. A thin layer of angular colluvium from a nearby bedrock outcrop was present at the top of the soil B-horizon, but no artifacts were found in this layer. A small assemblage of artifacts from the B-horizon below the colluvium consisted of small flakes and shatter of Hozomeen chert and quartz crystal. These results indicate that, in some parts of the site, undisturbed, artifact-bearing deposits are buried under thick reservoir deposits.

Table 10.40 shows, by level, all cultural material collected from excavation units, from site 45WH300.

Table 10.40 Cultural Material From Excavation Units at 45WH300

test unit: 1 (1x1 m) NOCA

L:S (surface)	1 Wedge, Metasediment	10790
L:1 (10-20 cm BD)	^{14}C Sample	
L:2 (20-30 cm BD)	0 Collections	
L:3 (30-40 cm BD)	2 Flakes, Hozomeen Chert, Metasediment	10791
	1 Microblade, Quartz Crystal	10791
L:4 (40-50 cm BD)	0 Collections	

test unit: 2 (1x1 m)

L:S (surface)	0 Collections	
L:1 (0-10 cm BD)	1 Flake, Hozomeen Chalcedony	10792
L:2 (10-20 cm BD)	^{14}C Sample	
L:3-4 (20-40 cm BD)	0 Collections	

test unit: 3 (1x1 m)

L:S (surface)	0 Collections	
L:1 (0-52 cm BS)	0 Collections	
L:2 (52-62 cm BS)	0 Collections	
L:3 (62-72 cm BS)	1 Debitage, Hozomeen Chert	10794
L:4 (72-82 cm BS)	1 Flake, Quartz Crystal	10795
	1 Flake, Quartz Crystal	10796
	1 Flake, Hozomeen Chert	10797
L:5 (82-92 cm BS)	1 Flake, Hozomeen Chert	10798
L:6 (92-102 cm BS)	0 Collections	

test unit: 4 (1x1 m)

L:S (surface)	1 Flake, Hozomeen Chert	10799
	1 Debitage, Metasediment	10800
L:1 (0-2 cm BS)	4 Flakes, Metasediment,	10801
	1 Flake, Edge-Modified, Chert	10801
	1 Flake, Metasediment	10802
	1 Bone, Metapodial Shaft Fragment, Mammal	10812
L:2 (2-12 cm BS)	1 Flake, Basalt	10803
	17 Debitage, Metasediment, Hozomeen Chert, Chert, Basalt	10804
	1 Bone, Metapodial Shaft Fragment, Mammal	10813
	feature 3: ^{14}C Sample, 1,650$\pm$70 BP, Beta 64824	
	Tephra, ROLA89 229-2, Glacier Peak B, St. Helens Wn, Mazama O	10820
	1 Bulk Sample	
	feature 3: ^{14}C Sample, 1,940$\pm$90 BP, Beta 64825	
L:3 (12-22 cm BS)	1 Flake, Metasediment	10806
	1 Flake, Metasediment	10807
	1 Debitage, Metasediment	10808
	1 Debitage, Hozomeen Chert	10809

	8 Debitage, Hozomeen Chert, Metasediment	10810
	1 Bone Fragment	10814
	1 Flake, Metasediment	10815
	feature 3: ^{14}C Sample, 1,750±60 BP, Beta 64826	
L:4 (22-32 cm BS)	3 Debitage, Metasediment	10811
L:5 (32-42 cm BS)	0 Collections	
L:6 (42-52 cm BS)	2 Debitage, Metasediment	10805
	1 Cobble, Flaked	10816
L:7-8 (52-72 cm BS)	0 Collections	
Strat Unit 3A	1 Tephra	10825
Strat Unit 3C	Tephra, St. Helens Y	10821
test unit: 5 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-6 cm BS)	0 Collections	
L:2 (6-16 cm BS)	1 Flake, Hozomeen Chalcedony	10793
L:3 (16-26 cm BS)	0 Collections	

Site Chronology

The estimated age of the site and its periods of occupation are based on a chronologically-sensitive projectile point (Figure 10.33a), three radiocarbon dates on charcoal, and identification of two volcanic ash layers. The basalt point (NOCA 7075) is triangular with a contracting stem. It is classified as Type 10A (Rabbit Island Stemmed) and is assigned an age between 1,500 and 4,000 years old. Based on the neck-width of the stem, such points were probably used to tip darts.

Three charcoal samples were collected from feature 3 and submitted for radiocarbon dating (Table 10.41). They were all collected from the *in situ* charcoal-rich matrix encasing the dense concentration of fire-modified rocks excavated from within the center of the feature. The dates overlap at two sigmas (the overlap is 1,790-1,760 radiocarbon years BP) and such a narrow timespan confirms the stratigraphic evidence indicating the hearth is intact and retains integrity of location and association. These data also suggest the possibility that only limited use was made of the hearth before it was abandoned.

Table 10.41 Table Of ^{14}C Dates from 45WH300

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU4	L-2	Beta 64824	1,650±70
TU4	L-2	Beta 64825	1,940±90
TU4	L-3	Beta 64826	1,750±60

Two tephra samples from the site were submitted for identification (Table 10.42). The first (NOCA 10820) was collected from a small lens within the B-horizon matrix just outside the feature 3 boundaries. This sample appears to be a mix of three tephras from three different sources and has little chronological value. The second sample (NOCA 10821) was collected from what appeared to be a primary, discontinuous lens at the bottom boundary of feature 3. It was identified as Mt. St. Helens Y tephra dated to about 3,500 years ago which agrees with its stratigraphic relationship to feature 3.

The three independent dating techniques used at the site are in agreement. Based on these data, it appears that the site was occupied by prehistoric people between 1,500 and 3,500 radiocarbon years ago. If feature 3 is representative of the entire site, the occupation is between 1,900 and 1,600 years BP. However, because the site is large and only a small part of it was sampled by testing, cultural remains of other ages may be preserved elsewhere in the site.

Table 10.42 Table Of Identified Tephra from 45WH300

TU	LEVEL	NOCA	BULK GLASS	GLASS 1	GLASS 2	GLASS 3
TU4	L-2	10820	Glacier Peak B	St. Helens Wn	Mazama O	ROLA89 229-2
Number of shards analyzed:			21	6	3	10
TU	LEVEL	NOCA	VENT	AGE YBP		
TU4	SU3C	10821	St. Helens Y	2,930-3,510	(17 shards)	

SU = Stratigraphic Unit

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence for the site is shown in Figure 10.34. The surface stratum most often consists of reservoir deposits varying from a few centimeters to 50 cm (20 in) thick. In some areas soil B-horizon is exposed at the surface. Reservoir deposits cap pre-reservoir forest duff in some areas. Where the duff has been eroded, reservoir deposits cap remnants of the dark yellowish-

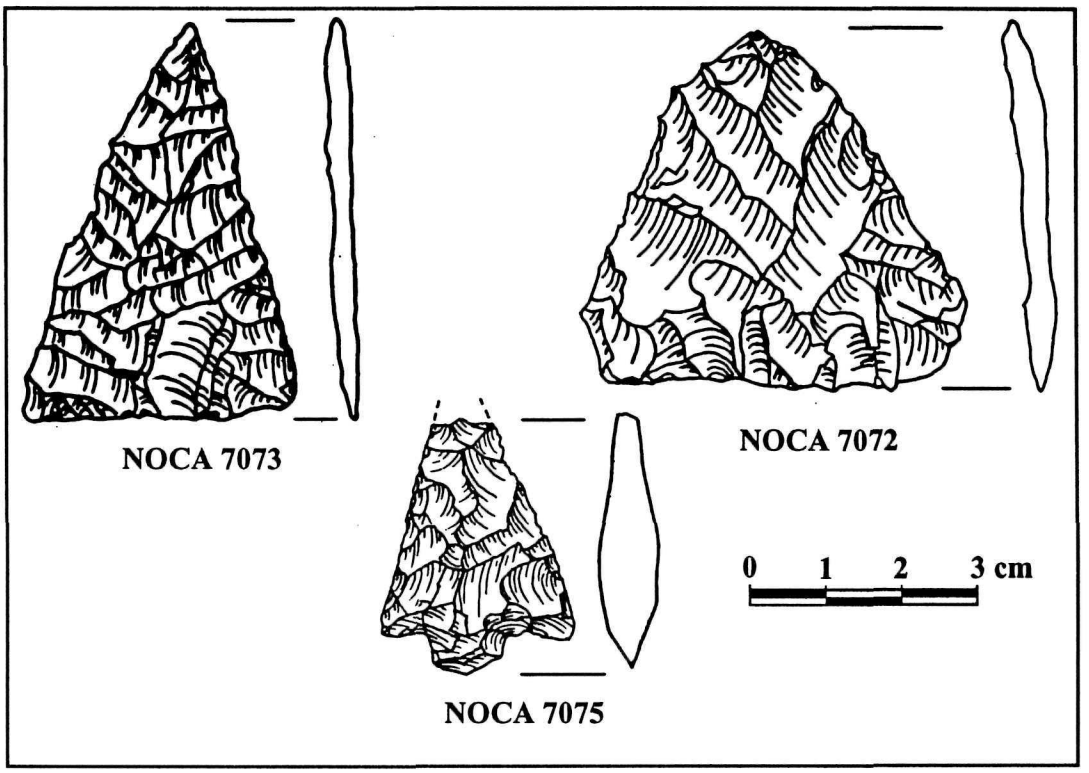


Figure 10.33a Artifact illustrations from Site 45WH300 (FS 120)

brown, silty fine sand, soil B-horizon. Feature 3 rested conformably under the reservoir deposits because it was protected from erosion by an adjacent cedar tree stump. Within the upper part of the B-horizon matrix are discontinuous lenses of Mt. St. Helens Y tephra, dating circa 3,500 years old. Black charcoal stains, charred tree parts, and reddened, heat oxidized sediments record forest fires on the landform during the last 2,000 or so years. The B-horizon makes a gradual transition to the underlying, olive-brown, fine sand BC-horizon. In test unit 3 a dark yellowish-brown, gravelly, coarse sand C-horizon was encountered. Prehistoric features and artifacts were found *in situ* in the soil B- and BC-horizons.

Only a general approximation of the depositional history of the landform can be inferred from its weathering profile, surface morphology, and geomorphic position in the Skagit River valley. The terrace appears to be an erosional remnant of a formerly much larger glacial terrace. It is assumed the landform is underlain by coarse glacial gravels deposited by the ice sheet or the water released by the glacier's melting. After deposition, the Skagit River cut into the valley's glacial fill and eroded part of the terrace. As with most glacial terraces in the valley, a fine-grained cap of airborne silt, including ash from Cascade volcanos, accumulated on the terrace surface. Angular colluvial gravels weathered from bedrock formations and more rounded gravels from till deposits on the steep slopes above. These spilled onto the terrace surface and thickened

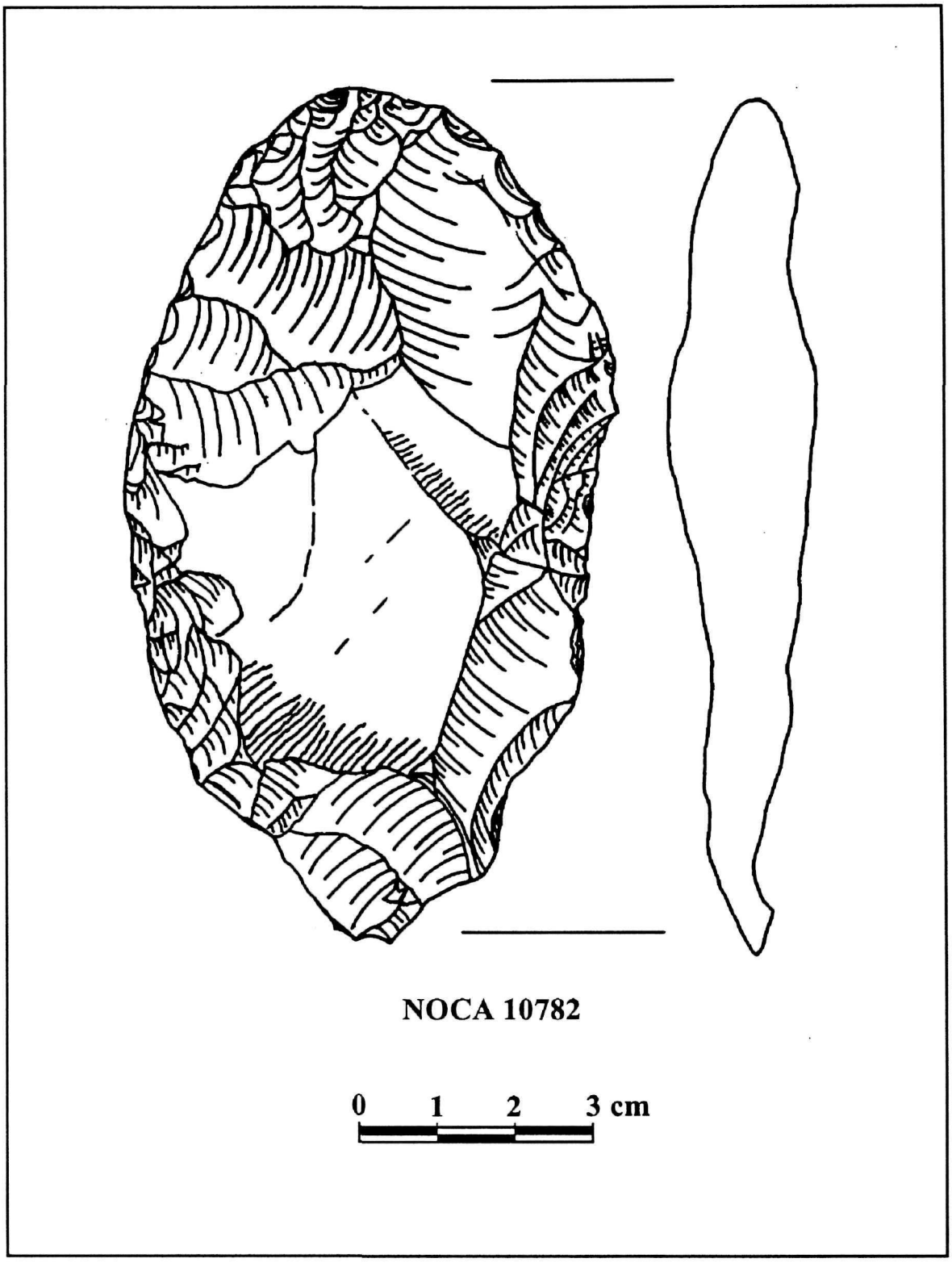


Figure 10.33b Artifact illustrations from Site 45WH300 (FS 120)

the surface deposits. Soils developed in the upper part of these deposits at the same time that prehistoric people began to occupy the landform. Some of the charcoal, and the often mixed character of some of these soils may be a consequence of the activities of these early people during the time that they lived here.

Conclusions and Assessment

Site 45WH300 appears to have been a seasonal residential site where food resources were cooked and consumed. The large area covered by the site suggests that it was either used by a large group of people, or that small groups reoccupied it over a span of time. Due to the small volume of artifact-bearing deposits sampled, this problem cannot be resolved with the available data. From these data we know inhabitants hunted medium-sized mammals and cooked them in basin-shaped hearths. In direct association with the hearths are chipped stone artifacts, used for cutting and scraping, and fragments of stone from the edges of pounding or crushing tools, perhaps used to fracture mammal leg bones for marrow extraction. Most of these tools were manufactured on-site from locally

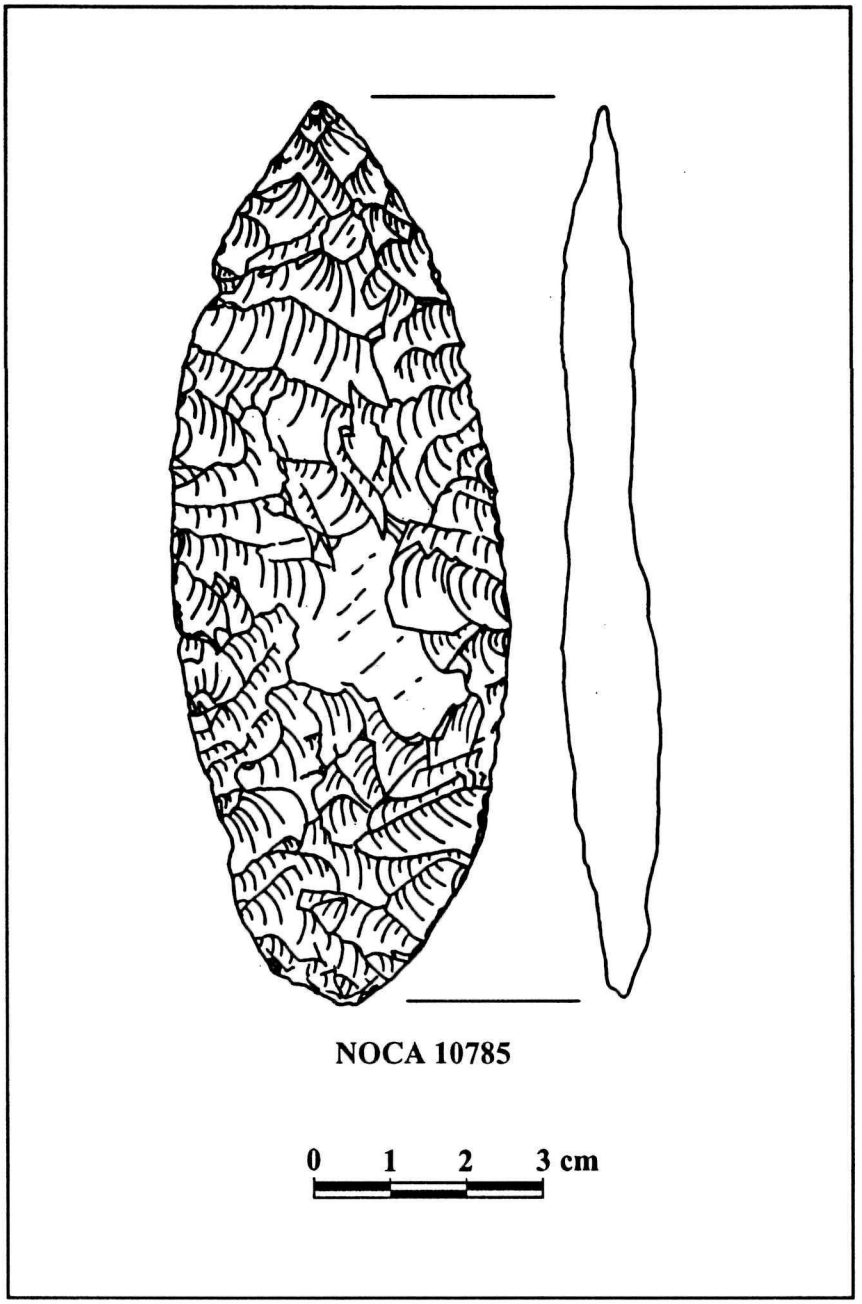


Figure 10.33c Artifact illustrations from Site 45WH300 (FS 120)

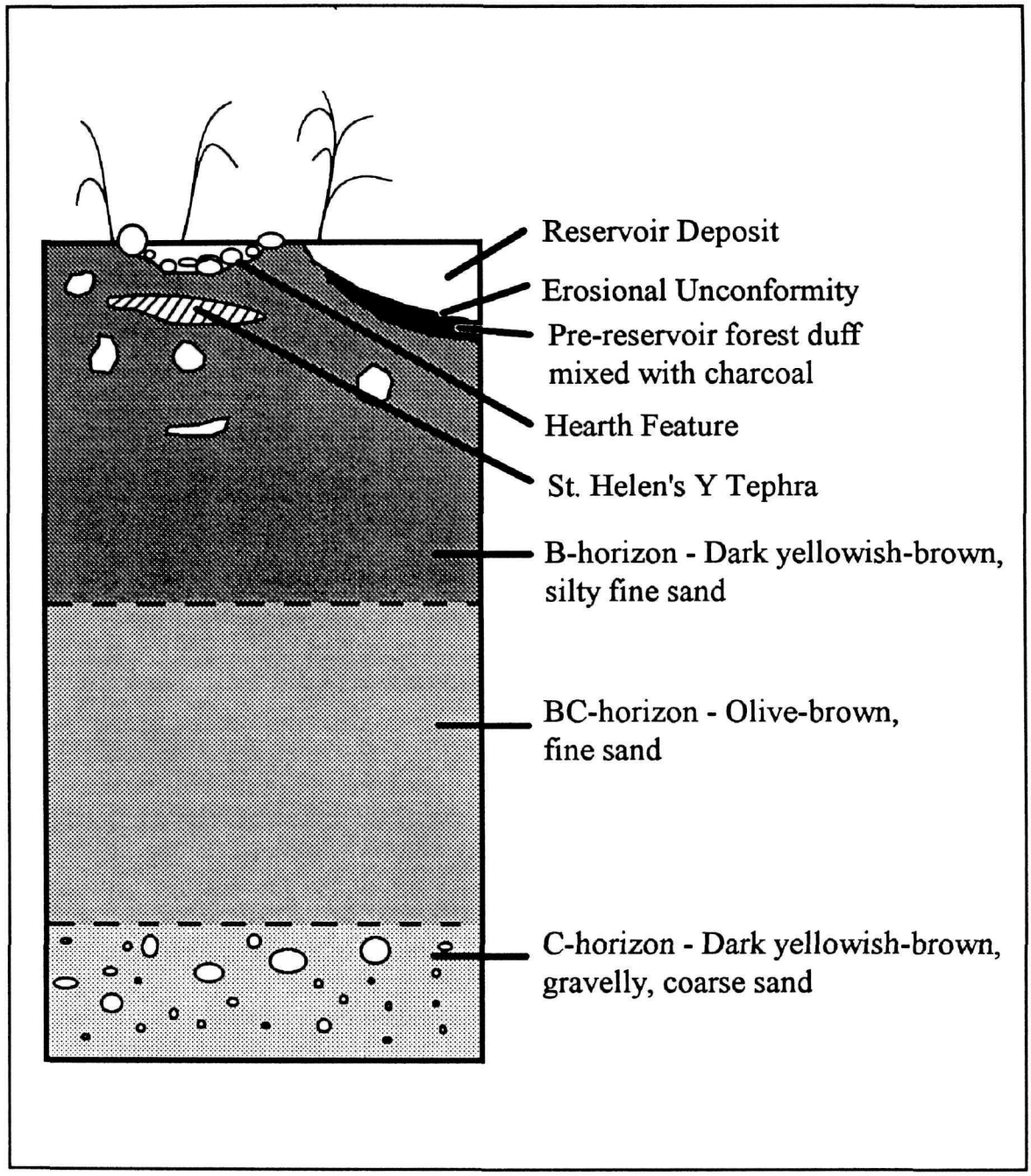


Figure 10.34 Generalized schematic of stratigraphy at Site 45WH300 (FS 120)

procured Hozomeen chert and metasediment. The assemblage of tools from across the entire site includes microblades, wedges (*pièce esquillées*), unifacially-modified flakes that served as scrapers, bifaces that served as knives, and projectile points used as weapons. This tool assemblage appears related to processing meat and hides, and to a lesser degree, bone and antler. The presence of a relatively high proportion of basalt in

the raw material assemblage suggests that the occupants of the site traveled to or traded with populations on the Fraser River where this stone may originate. Site 45WH300 was occupied during the last 3,500 years, perhaps between 1,600 and 1,900 years ago.

The test excavations revealed that cultural deposits at 45WH300 were only partially destroyed by reservoir shoreline processes. A large percentage of the site remains intact and buried under historic reservoir deposits. The *in situ* artifacts and feature 3 are within the matrix of a well-developed soil B-horizon. Feature 3 is the most undisturbed prehistoric cultural feature recorded in the drawdown. There is a high probability of others existing at the site. The volume of artifact-bearing deposits, which comprises the significant portion of the site, is estimated to measure roughly 2,500 m^3 (88,275 ft^3).

Site 45WH300 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Most site deposits retain integrity of setting, and the artifacts in them retain integrity of location and association. Through scientific excavation and study of these deposits, the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.14 45WH303 (FS#123) Hozomeen Creek #5

Site Setting

Site 45WH303 is located at the northern end of the project area on the flood plain of the Skagit River approximately .5 km (.36 mi) west of Hozomeen Campground. This location is west of the eastern valley wall about one-third of the distance between the eastern and western margins of the valley. At 482 m (1,580 ft) elevation, it is situated on a flat (0-3% slope) floodplain terrace remnant adjacent to an abandoned flood channel of the Skagit River, which is 0.8 km (0.48 mi) further west and 6 m (20 ft) lower. The flood plain throughout this part of the valley is dissected by channels, either abandoned or active during the drawdown and carrying water from Hozomeen and Howlett Creeks, from seasonal meltwater streams along the valley walls, and from the Skagit River. From the site one has open views up and down (north-south) the length of the Skagit Valley. To the east are the nearby, towering rock faces and summit of Hozomeen Mtn. (2,460 m [8,066 ft]). The western valley wall rises steeply to subalpine ridgelines. The artifact scatter that defines the site is linear, and its configuration follows the terrace edge along the adjacent channel.

Logging, logging haul road construction, and reservoir erosion have been the primary sources of historic disturbance to the site. The site is bisected by a fork in the logging haul road that served as the main stem for numerous spur roads in the northern end of the reservoir drawdown. Haul road construction at the site required grading and building a bridge across the flood channel. During lowered reservoir levels, especially

when the reservoir shoreline migrates across the site surface, erosion caused by heavy surf is severe. The pre-reservoir vegetation, evident from the remaining stumps, consisted of an old growth forest composed of mixed conifer and deciduous trees.

General Site Description

Site dimensions are 100 m (328 ft) northeast-southwest and 25 m (82 ft) northwest-southeast covering an area 2,500 m^2 (26,900 ft^2) (Figure 10.35). Artifact depth, determined during testing, ranged from the surface to 10 cm (3.94 in) below the surface. The estimated volume of artifact-bearing deposits at the site is 250 m^3 (8,828 ft^3). The site is characterized as a moderate-density lithic scatter containing irregular-shaped concentrations of FMR and calcined animal bone fragments. Artifact types observed include projectile points, scrapers, flaking debris, calcined animal bone, FMR, and groundstone. Lithic material types include locally available Hozomeen chert and metasediment. Exotic material types include basalt, chalcedony, and jasper.

Testing Methods and Rationale

The site was recorded during the 1988 survey and surface collections were made in 1989 and 1990. Testing with excavation of nine 1 x 1 m (3.28 x 3.28 ft) test units, three 1 x 2 m (3.28 x 6.6 ft) test units, and three 2 x 2 m (3.28 x 6.6 ft) test units took place in 1989. Sediments were excavated in 10 cm (3.94 in) levels and screened through .32 cm (.125 in) and .63 cm (.24 in) wire mesh. Water from a nearby pond was used to screen sediments through the .32 cm (.125 in) mesh. Because the site surface appeared to be excessively eroded, a testing strategy was implemented to locate any undisturbed artifact-bearing deposits and to determine the integrity of two FMR and calcined bone concentrations designated features A and B. Test unit 9 was placed in feature A and test unit 8 in feature B. Test units 10-15 were shovel-skim units for the purpose of recovering bone and fragments of carved and polished soapstone observed within a FMR and bone concentration feature. Backhoe trenches were excavated south and west of the site in order to define the depositional record of site sediments.

Table 10.43 Inventory of Surface Collections from 45WH303

	NCCA
1 Flake, Edge Modified, Hozomeen Chert	7076
1 Projectile Point, Chalcedony	7071
1 Flake, Edge Modified, Chert	7078
1 Flake, Edge Modified, Jasper	7079
1 Scraper, Exotic Chalcedony	7080
1 Scraper, Exotic Chalcedony	7081
1 Scraper, Exotic Chalcedony	7082
1 Preform, Basalt	7083

5 Debitage, Hozomeen Chert, Metasediment, Chalcedony	7084
1 Flake, Edge Modified, Chalcedony	7085
3 Debitage, Hozomeen Chert, Chalcedony	7094
4 Bone Fragments: 2 Unidentifiable, 2 Medium Mammal	7659
14 Bone Fragments: 6 Small Mammal, 2 Medium Mammal 3 Goat, 3 Unidentifiable	7661
26 Bone Fragments, Medium Mammal	10118

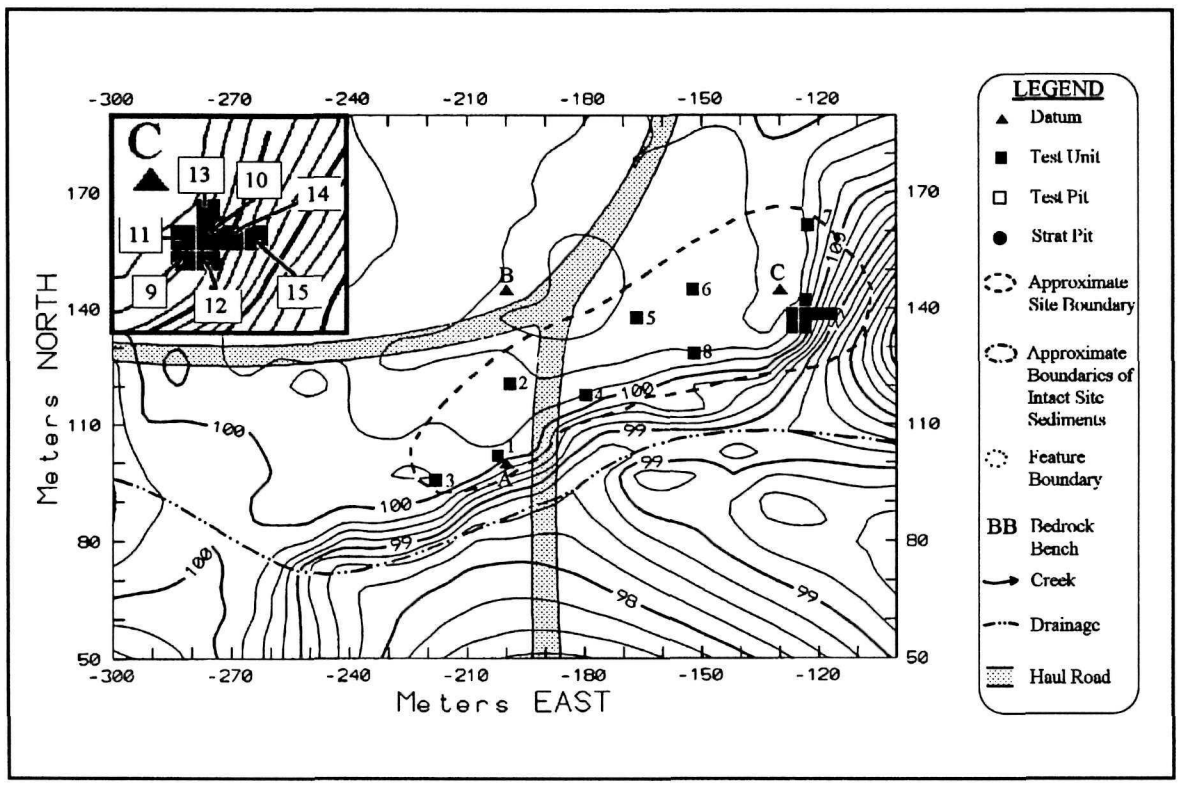


Figure 10.35 Topographic map of Site 45WH303 (FS 123)

Description of Testing Results

The assemblage of artifact categories from site 45WH303 includes projectile point, biface, edge-modified flake, flake, shatter, groundstone, pressure flake, calcined bone, and FMR. The assemblage of 155 artifacts consists of 107 bone fragments, 46 lithic items (flaked and ground), and 2 pieces of wire. Although Hozomeen chert and metasediment materials were flaked at the site, high flaking-quality, exotic agate-like chalcedony was relatively abundant. No artifacts were recovered from intact or undisturbed soils, and the site surface appears to have been disturbed initially by logging and burning.

Artifacts recovered from the surface include a Type 14 and Type 15 (NOCA 7077 and 7140) projectile point which functioned as arrow tips and date to the latest prehistoric period (Figure 10.36). Six flakes were unifacially edge-modified to function as scrapers (NOCA 7078, 7079, 7080, 7081, 7082, and 7085). All are made from vitreous, fine-grained, transparent to nearly opaque varieties of chalcedony. One small, triangular pressure-flaked biface may be an arrow point preform (NOCA 7083). Other items are broken flakes, pressure flakes, and flakes collected as exotic raw material samples.

A carved and polished soapstone (also called steatite, a form of talc) pipe bowl was fitted together from broken fragments recovered from test units 10 through 15. These units were shovel-skimmed to 10 cm (3.94 in) deep. The pipe has a tubular expanding bowl (trumpet), and the outside surface is incised on two opposing sides with double rows of short, linear, slightly curving incisions that start at the rim and continue downward, in a weak spiral, until they stop just above the junction of the stem with the bowl. It is not known when or how the pipe was broken and crushed, but based on the small and numerous fragments, a moderate amount of weight or force was involved, possibly from heavy machinery during logging activities. A total of 25 fragments was recovered, 21 of which fitted together to form a nearly complete bowl except for a gap on one side. Two remaining pieces fit together to form a long piece from the rim to the bottom of the bowl. This piece is incised with the same design as the bowl. Two other fragments do not fit any of the recovered pieces. No fragments of the stem or mouth piece of the pipe were recovered.

Two small pieces of metal wire were found at 32 cm below the surface in test unit 2. It appeared that drawdown-related logging had disturbed this area of the site to a depth of approximately 50 cm (20 in) below the surface. Of the remaining test units (1,3,4,5,6, and 7), only test units 4 and 6 contained cultural material. This material was recovered from the upper 10 cm (3.94 in) of the test unit from within the reservoir deposits.

Both rock features lacked integrity of location and association. Calcined bone fragments were found on the surface and in levels one and two; no lithic artifacts were found in this feature. Feature B was a thin surface scatter of rounded to angular pebbles and cobbles, some appearing to be thermally altered. No lithic artifacts or calcined bone were found in this feature.

Test unit 6 was excavated deeply in order to expose a geologic column of flood plain deposits. A series of buried soil A-horizons that had experienced ground fires was recorded. The matrices exhibited color mottling caused by heat oxidation and abundant charcoal fragments. A charcoal sample from one horizon was radiocarbon dated at 2,530$\pm$150 BP. A primary volcanic ash layer directly below the dated surface was submitted for identification and was assigned to tephra layer Y of Mt. St. Helens (circa 3,500 years BP).

Three backhoe trenches located outside the site boundaries were dug to the west to compare and record the flood plain stratigraphy. The stratigraphy correlates well with that of the site, and the stratigraphic location of the burn horizon above the St. Helens Y tephra was found to be consistent with test unit 6 stratigraphy.

Table 10.44 lists, by level, all cultural material collected from excavation units at site 45WH303.

Table 10.44 Cultural Material From Excavation Units at 45WH303

		NOCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1-6 (0-70 cm BD)	0 Collections	
L:7 (70-80 cm BD)	1 Tephra Sample, Source Unknown	7722
L:8 (80-90 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1-2 (10-30 cm BD)	0 Collections	
L:3 (30-40 cm BD)	2 Wire, Metal	7138
L:4-7 (40-80 cm BD)	0 Collections	
test unit: 3 (1x1 m)		
L:S (surface)	0 Collections	
L:1-7 (10-80 cm BD)	0 Collections	
test unit: 4 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	26 Bone Fragments, Unidentifiable	7658
L:2-6 (20-70 cm BD)	0 Collections	
L:7 (70-80 cm BD)	1 ^{14}C, No Date	7741
test unit: 5 (1x1 m)		
L:S (surface)	0 Collections	
L:1-5 (10-60 cm BD)	0 Collections	
test unit: 6 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Debitage, Heat Modified, Hozomeen Chert	7139
L:2-6 (20-70 cm BD)	0 Collections	
L:7 (70-80 cm BD)	1 Tephra Sample, Source Unknown	7724
	^{14}C, 2,530±150 BP, Beta 33510	
L:8 (80-90 cm BD)	Tephra, St. Helens Y	7723

L:9-10 (90-110 cm BD)	0 Collections	
test unit: 7 (1x1 m)		
L:S (surface)	0 Collections	
L:1-8 (10-90 cm BD)	0 Collections	
test unit: 8 (1x1 m)		
L:S (surface)	0 Collections	
L:1-3 (10-40 cm BD)	0 Collections	
L:4 (40-50 cm BD)	1 Tephra Sample, Source Unknown	7725
L:5-7 (50-80 cm BD)	0 Collections	
test unit: 9 (1x1 m)		
L:S (surface)	7 Bone Fragments: 2 Long Bone medium mammal; 5 Unidentifiable	7660
L:1 (10-20 cm BD)	1 Bone Fragment, Unidentifiable	7662
L:2 (20-30 cm BD)	1 Bone Fragment, Unidentifiable	7663
L:3-4 (30-50 cm BD)	0 Collections	
Strat Unit	1 Tephra Sample, (70+ cm BD), Source Unknown	7721
test unit: 10 (2x2 m)		
L:S (surface)	1 Projectile Point, Allenby Chert	7140
	1 Flake, Chalcedony	7142
L:1 (0-10 cm BS)	21 Pipe Fragments, Soapstone	7137*
	1 Flake, Metasediment	7141
test unit: 11 (2x2 m)		
L:S (surface)	0 Collections	
L:1 (0-10cm BS)	1 Bone Fragment, Possible Beaver/Rabbit	7664
test unit: 12 (2x2m)		
L:S (surface)	0 Collections	
L:1 (0-10cm BS)	1 Flake, Heat Modified, Unknown	7143
	3 Bone Fragments, Possible Goat	7665
	20 Bone Fragments: 2 Unidentifiable; 18 Possible Goat	7666
test unit: 13 (1x2m)		
L:S (surface)	0 Collections	
L:1 (0-10cm BS)	1 Pipe Fragment, Soapstone	7137*
test unit: 14 (1x2m)		
L:S (surface)	0 Collections	
L:1 (0-10cm BS)	2 Pipe Fragments, Soapstone	7137*

	2 Bone Fragments, Possible Goat	7667
test unit: 15 (1x2m)		
L:S (surface)	0 Collections	
L:1 (0-10cm BS)	1 Bone Fragment, Possible Goat	7668
Test Trench: 1		
	1 Tephra Sample, Source Unknown	7720
	1 Charcoal Sample	7739
Test Trench: 2		
	1 Charcoal Sample	7740

* All pipe fragments were assembled and accessioned under one NOCA number.

Site Chronology

The age of the site and periods of its occupation were derived using three techniques. Two time sensitive projectile points were recovered from the site. One is made of a reddish variety of Allenby Chert (NOCA 7140), and the other, of a clear translucent chalcedony (NOCA 7077). The first of these is a small, corner-notched barbed arrow point, classified as Type 14 (Columbia Plateau Corner-Notched) that is assigned a date of about 2,000 to 150 BP. The other is a small, triangular side-notched arrow point classified as Type 15 (Columbia Plateau Side-Notched or Kamloops Side-Notched) which is assigned an age range from 1,200 to 150 BP, but is likely to date sometime during the last 600 years.

One charcoal sample was submitted for radiocarbon dating. It was collected from a charcoal rich, heat oxidized soil A-horizon that was buried 70 cm (28 in) below the ground surface and clearly lay stratigraphically below the artifact-bearing deposits of the site. A large sample of calcined bone fragments from test unit 9 was also sent for dating, but no date could be obtained due to the absence of collagen.

Tephra layers were interbedded within the flood plain deposits and under buried A-horizons at the site. One tephra sample was submitted for identification. It was collected from a primary, but discontinuous lens stratigraphically below the charcoal sample that dated 2,530 years old. As shown in Table 10.46, it is identified as Mt. St. Helens Y and it predates the overlying radiocarbon date. The archeological assemblage is clearly younger than 2,500 radiocarbon years, and based on the time sensitive arrow points, it most likely dates between 200 and 1,200 years ago.

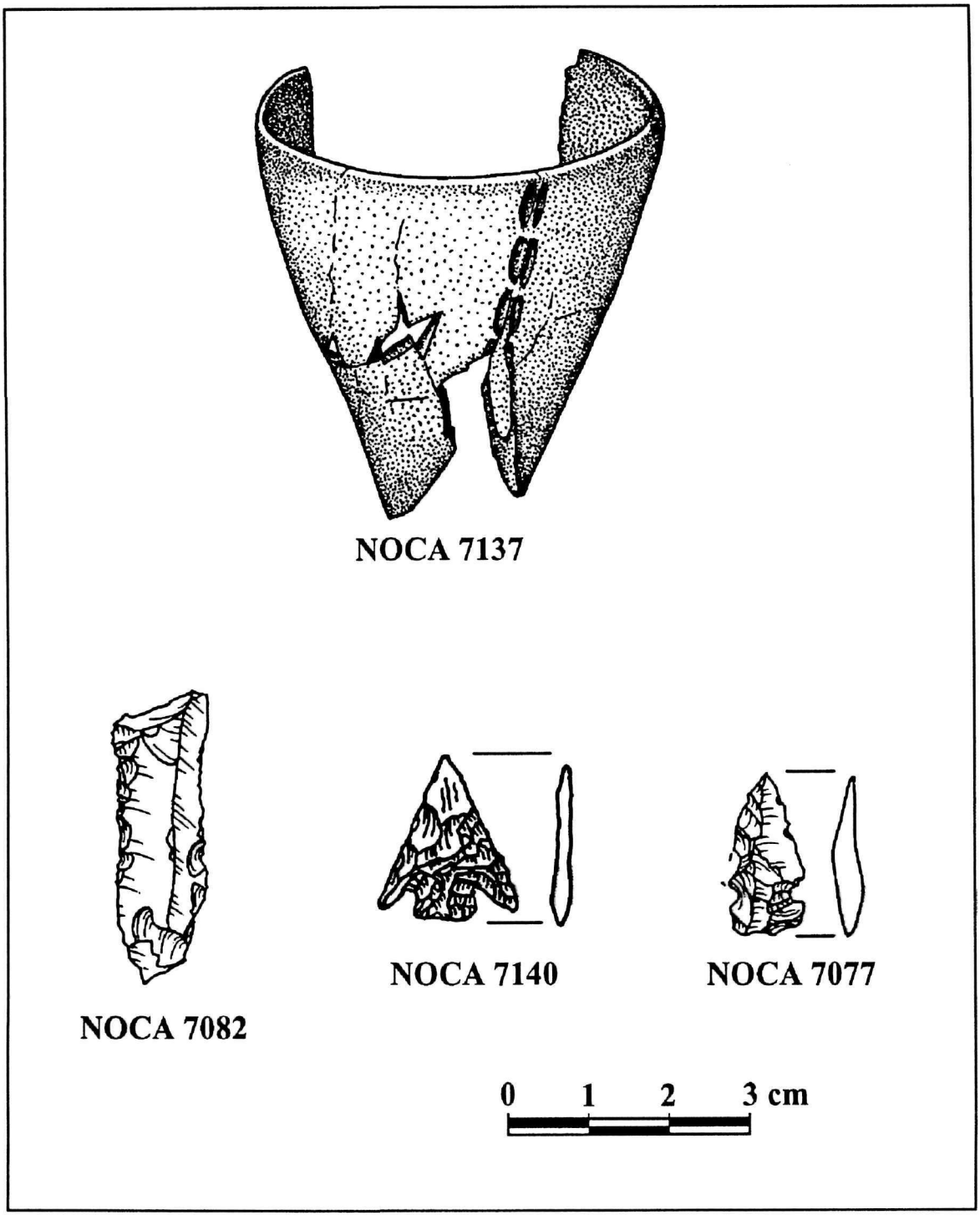


Figure 10.36 Artifact illustrations from Site 45WH303 (FS 123)

Table 10.45 Table Of ^{14}C Dates from 45WH303

TU	LEVEL	LAB#	UNCORRECTED BP DATE
TU6	L-7	Beta 33510	2,530±150

Table 10.46 Table Of Identified Tephra from 45WH303

TU	LEVEL	NOCA#	VENT	AGE YBP
TU6	L-8	7723	St. Helens Y	circa 3,500

Site Stratigraphy

The generalized stratigraphic sequence is shown in Figure 10.37. A variable thickness reservoir deposit caps the landform. This stratum is composed of soil particles that have been eroded, transported, and redeposited by wave action during lowered reservoir levels, with the consequent exposure of artifacts on the surface that had been in the undisturbed soil matrix. Beneath the erosional unconformity that marks the bottom of the reservoir deposit is a very dark grayish-brown, clayey to sandy overbank deposit. This stratum displays little soil development and was deposited by flood waters overspilling the flood channel that forms the eastern boundary of the site. Underlying this stratum is a mottled and mixed root burn consisting of black to dark yellowish-brown charcoal and clay loam sediments. The next underlying stratum is a very dark grayish-brown, silty fine sand deposit of river alluvium. This stratum shows little evidence of soil development. It overlies a dark soil A-horizon that is mottled very dark gray, dark yellowish-brown, to very dark gray in a silt loam matrix. This represents an earlier stable ground surface that has been buried by alluvium deposited on the Skagit River flood plain. Beneath the unconformity that defines the lower boundary of this stratum is a series of thin beds of river alluvium alternating between clayey silt and sand. Some of these beds have been oxidized dark reddish-brown by ground fires, and they are stained black by concentrations of charcoal. A charcoal date from one of these beds immediately at the bottom of this series dated 2,530 years BP. The next stratum is a thin, nearly continuous primary layer of yellowish-brown, fine sandy tephra from a circa 3,500 BP eruption of Mt. St. Helens. Beneath the volcanic ash is a series of dark brown, silty to clayey river alluvium beds; these are unweathered. Underlying them is a dark yellowish-brown soil B-horizon that has developed in a pebbly silt and in the top of the underlying river gravels. This basal stratum consists of river-rounded, clast-supported pebble and cobble gravels.

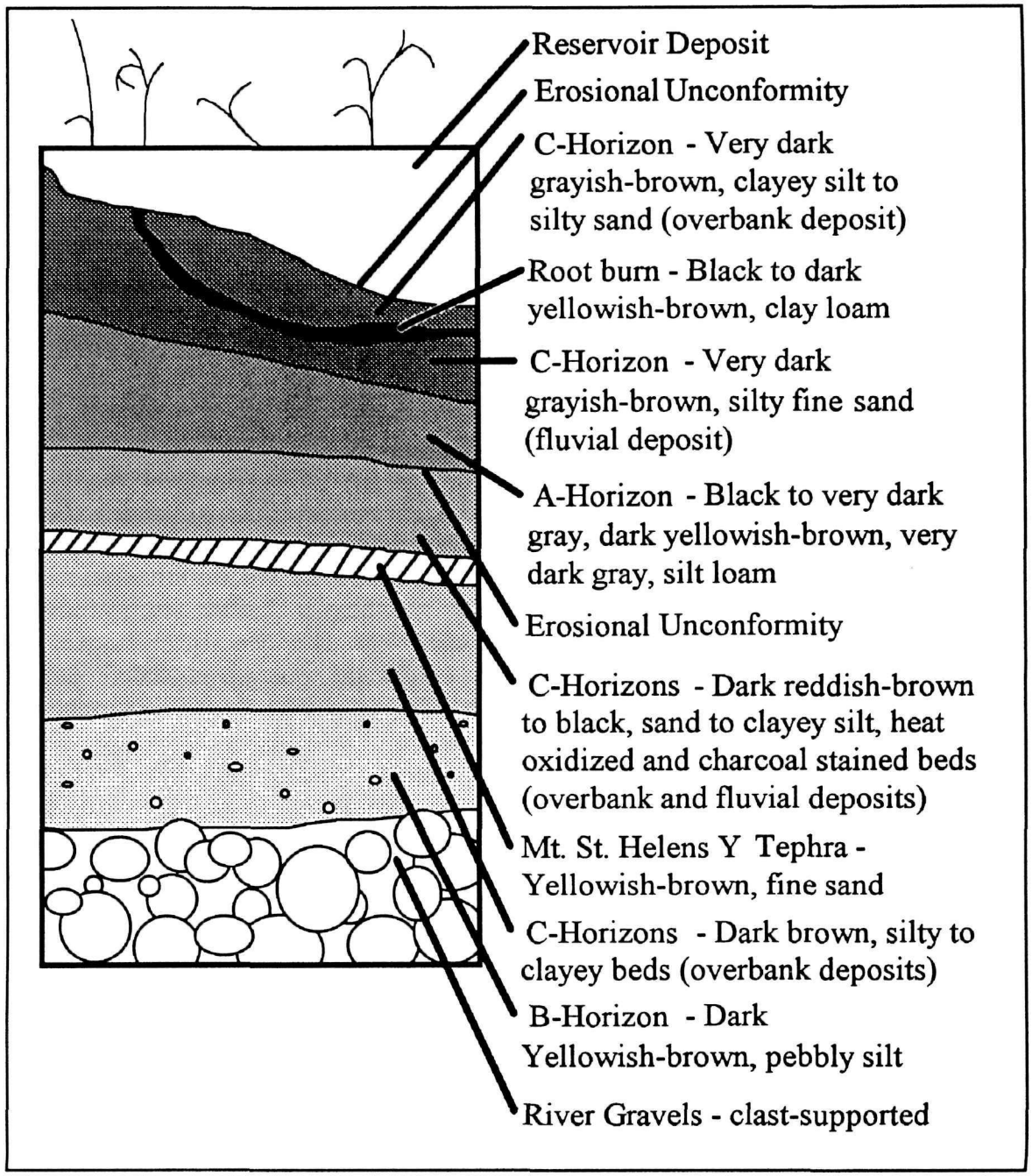


Figure 10.37 Generalized schematic of stratigraphy at Site 45WH303 (FS 123)

The age of the stratigraphic sequence described above is uncertain because the basal gravels were not dated. However, the primary layer of Y tephra dating to about 3,500 BP indicates that the Skagit River had begun to build up its flood plain through the deposition of river alluvium before this time. In addition, the charcoal date of 2,530 BP on an alluvial bed above this tephra indicates that flood plain building continued after this

time; it also indicates that forest or brush fires occurred on the ephemeral flood plain surfaces prior to their burial by subsequent alluvium. These data may be evidence of mid- to late-Holocene climatic events that resulted in the rapid build-up of the Skagit River flood plain. This conclusion is supported by stratigraphic evidence from other portions of the drawdown, in particular, the depositional sequence containing Mt. Mazama O and Mt. St. Helens Y tephra at site 45WH239. Presently, there is no evidence that the flood plain at 45WH303 was occupied by prehistoric populations during this period of late-prehistoric aggradation, except for the artifact-bearing deposits eroded by waves at the top of the flood plain. This occupation probably dates to about the last 500 years.

Conclusions and Assessment

Site 45WH303 appears to have functioned as a short-term base camp used intermittently by a small group of people to butcher and process medium and small-sized mammals. These activities took place during the Late Prehistoric period, most probably around 500 years ago. The mammals were procured nearby, and whole or partial carcasses were brought to the site. Game animals used by the inhabitants include mountain goat (*Oreamnos americanus*) and rabbit or beaver. After preservation or consumption of the meat, the bones of the animals were split open, probably for the extraction of marrow, and subsequently they may have been pulverized to boil out and collect the bone grease. The animals were processed using unifacially-modified scraping or cutting tools manufactured of high quality varieties of chalcedony having a nonlocal origin, possibly from the Columbia Plateau. An arrow point made of Allenby chert suggests that the inhabitants traveled to the upper Similkameen River valley or traded with the inhabitants there. Local varieties of lithic raw material appear to have been used to make expediency tools.

A carved soapstone pipe bowl was reconstructed from fragments recovered during testing. Soapstone pipes are rare artifact types in the Pacific Northwest, especially west of the Cascade Range (Wright 1991). The one from 45WH303, along with the pipe bowl fragment excavated at site 45WH241, constitute the only two pipes known from the project area or reported in the northern Cascade Range. The pipe bowls are distinctive in yet another way, for they constitute the only artifact category in the project area not representative of purely subsistence concerns. Instead, their presence suggests some measure of leisure, possibly associated with ceremonial activities in the valley.

Residue analysis of the pipes has not been attempted and we do not know what plant materials may have been burned in them, but it is possible that identifiable residues are present. However, indigenous tobaccos, possibly including *Nicotiana* (genus of the plant species used for nicotine tobacco) may have been smoked in the pipe. One species of the latter (*N. attenuata*) is native to east slopes of the Cascades (Hitchcock et al. 1959) and the plant is known to have been cultivated and used by Northwest Indian groups, including the Nlakápamux (Lower Thompson) (Turner 1972:255). Teit (1930) describes

the preparation of tobacco and lists five other plants that were mixed with *Nicotiana* to reduce its strength, including dried and toasted leaves of bearberry (*Arctostaphylos uva-ursi*), valerian (*Valariana sylvatica* and *V. sitchensis*), the dried bark and leaves of bald-hip rose (*Rosa gymnocarpa*), the leaves of dogwood (*Cornus pubescens* and *C. stolonifera*), and whortleberry (*Vaccinium ovalifolium* and *V. parvifolium*). The social and cultural contexts of pipe use are uncertain. Carlson (1983) suggests they were associated with shamanistic curing rituals. In the last century, Dawson (1891:11) observed in Indian graves "straight pipes made of steatite, shaped much like an ordinary cigar-holder and marked with patterns in incised lines." They may have been associated with the exchange of tobaccos and other items, and the Skagit River valley may have functioned as a trade corridor within the northern Cascade Range.

Soapstone pipes like those described here are associated with late period sites of the Columbia Plateau and Fraser River valley. Pipes first appear in the archeological record of the Great Basin around 9,000 years ago, and the use of them probably spread north to the Columbia Plateau by about 2,000 years ago (Wright 1991). At the Mile 28 Ranch site (Sanger 1970), located in the Fraser Valley north of the project area, two similar pipes were found associated with burials. The artifact assemblage from this site included narrow-necked, side-notched arrow points of the same type found at 45WH303 and the site was assigned an age of 2,000-500 years BP (Sanger 1970:105). Sanger (1970:90) defined three different tubular pipe shapes: the straight tube type, gently expanding bowl type, and a sharply flaring bowl (or trumpet) type. The pipe from 45WH303 matches most closely the sharply flaring bowl type. Several pipe stem terminations (or mouth pieces) were also present on these pipes, but the stem from the 45WH303 pipe has not been found. The meaning of the incised design on the bowl is unknown; however, each pair of curved lines resembles the track made by an ungulate hoof.

Haul road construction and reservoir-induced wave erosion have destroyed the integrity of location of nearly all artifact-bearing deposits at site 45WH303. However, the controlled collection of specific artifact types, such as carved soapstone, from the eroded site surface and from the remaining undisturbed deposits (estimated at 250 m^3) contributes new and important information to local and regional prehistory. Furthermore, beneath the eroded site surface there exists a well-stratified sequence of middle and late Holocene flood plain deposits. Interbedded within these is a primary volcanic ash assigned to Mt. St. Helens Y tephra and relict flood plain surfaces containing abundant and datable charcoal. This stratigraphic sequence complements the one preserved at 45WH239, and like it, provides an important depositional and climatic record for the Skagit River valley and the northern Cascade Range.

Site 45WH303 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. It possesses integrity of setting, and a portion of the artifacts and cultural deposits retain integrity of association. Factors contributing to site significance are the presence of the soapstone pipe and the possible

implications for the use of native plants for smoking (possibly including *Nicotiana attenuata*), the associated diagnostic artifact and exotic lithic material types from known sources, identifiable faunal remains, botanical remains within feature A, and the relic buried ground surfaces and geochronological record of late-Holocene alluviation of the Skagit River flood plain. The remaining portion of feature A may contain important information about the subsistence resources utilized during the Late Prehistoric period and a larger sample of charcoal from which to obtain a radiocarbon date. Scientific excavation and study of the few remaining artifacts is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.15 45WH473 (FS#197) North Cat Island #10

Site Setting

Site 45WH473 is located on the east side of the valley in the mid-portion of the project area. At 465 m (1,523 ft) elevation, it is situated approximately .4 km (.24 mi) north of Cat Island on the gentle slope (5%) of an erosional remnant of a Pleistocene terrace. This terrace is located between bedrock outcrops to the north and south. To the west the landform drops steeply along an erosional escarpment and to the east it rises gradually to higher bedrock and terrace levels. The landform has a western solar exposure with views of the Skagit River and its flood plain 17 m (55 ft) below, and the steep western valley wall, which is dominated along this segment by prominent cliff faces and a series of avalanche gullies cut into bedrock. To the north and south are views of the length of the Skagit River valley and the adjacent peaks, particularly Jack Mtn. (9,063 ft; 2,763 m) and Nahokameen Glacier. To the east the land rises to the top of the terrace, and beyond is the valley wall that rises to the ridgeline leading to the summit of Desolation Pk. (6,102 ft; 1,860 m). The artifact distribution is roughly circular.

Logging of the drawdown area and reservoir erosion have been the primary sources of historic disturbance to the site. The western edge of the terrace is exposed to erosional force of waves generated by winds having a long, uninterrupted fetch along the length of the valley. The pre-reservoir vegetation, as evident from sawn stumps, consisted of an immature, open-canopy coniferous forest.

General Site Description

The site is a low-density scatter of metasediment, Hozomeen chert and basalt flaked lithics and includes two hearth features and a large, irregular scatter of FMR exposed at the ground surface. The features are dense, circular concentrations of FMR, charcoal fragments, and calcined animal bone. Feature 1 measured 2 m north-south and 1.1 m east-west. It consisted of angular and subangular pebbles and cobbles of granite and metasediment. Feature 2 was located at the base of the higher terrace edge and was partially mantled by sediments transported from the adjacent slope. The site dimensions

are 55 m north-south and 80 m east-west covering an area of 4,400 m^2 (47,337 ft^3) (Figure 10.38). Artifacts appear to be shallowly buried, and the volume of artifact-bearing deposits may be < 100 m^3 (3,529 ft^3). A total of 18 flaked or ground artifacts was inventoried at the site, including a projectile point, pecked and ground stone tools, and debitage. The lithic material types in the assemblage are available locally, and consist primarily of metasediment with some Hozomeen chert and basalt. The last of these material types does not naturally occur in the project area.

Testing Methods and Rationale

The site was recorded, surface collected, and test excavated in 1991. One 1x0.5 m test unit was placed so as to intersect the western margin of feature 1. A single 5 cm arbitrary level was excavated and screened through 1/8 in wire mesh. The top of this hearth appeared to be eroded and disturbed by reservoir wave action, so the test unit was excavated to determine if artifacts in feature 1 retained integrity of location and association, and if any of the feature matrix was undisturbed. The testing was designed to minimize disturbance to the feature beyond what was needed to determine its integrity.

Table 10.47 Inventory of Surface Collections from 45WH473

	NOCA
1 Unspecified Tool, Ground Stone	10380

Description of Testing Results

The total artifact assemblage consists of 58 items (18 lithic and 54 bone), not counting the FMR that define the excavated portion of feature 1. Of this total, 58 items were excavated from test unit 1. The one item inventoried in Table 10.47 (NOCA 10380) was collected from Feature 2 on the eroded surface. It consists of a river-rolled cobble having the shape of a flattened cylinder. On one side is a small area consisting of semi-linear, pecked markings. On the opposite side (Figure 10.39) are two larger areas with similar markings. These may be wear marks resulting from use as both a hammerstone and an anvil stone.

The results from excavation of test unit 1 indicate that feature 1 is *in situ*. However, like feature 1 at site 45WH255, the original sedimentary matrix on top of the feature has been eroded or otherwise altered by reservoir wave action while the sediments at the bottom of the hearth remain intact. The intact hearth matrix was a thin deposit of charcoal under the FMR in and near the bottom of the hearth. A small side-notched (Type 15) projectile point (NOCA 10377) was recovered from the disturbed surface of feature 1. Fifty-four calcined bone fragments were recovered from the hearth matrix, which included the eroded surface, the uneroded matrix, and the matrix

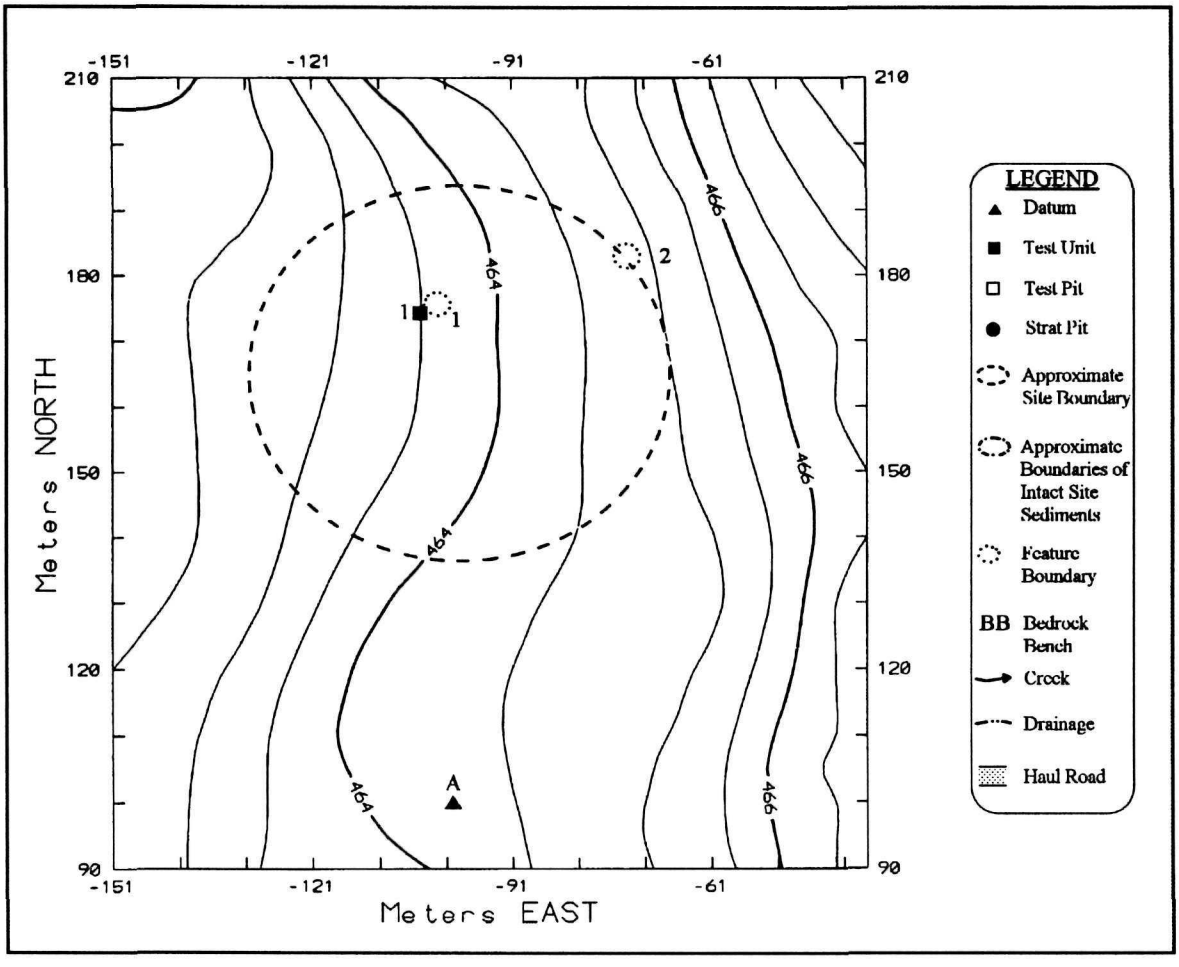


Figure 10.38 Topographic map of 45WH473 (FS 197)

immediately adjacent to the hearth. One fragment was identified as the third phalanx of a deer. Two small, black metasediment or basalt flakes (NOCA 10378 and 10379) were recovered from immediately adjacent to the hearth and suggest that only the edges of stone tools were sharpened at the site. Feature 1 appears to have functioned as a cooking hearth. The intentional fragmentation of the bones probably occurred prior to the extraction of marrow and the removal of bone grease by boiling (Table 10.48).

Site Chronology

The site age is estimated on the basis of a time-sensitive artifact and a radiocarbon date. A basalt projectile point (Figure 10.39) was collected from the surface of the test unit within the feature 1 boundary. It is classified as Type 15 (Columbia Plateau Side-Notched or Kamloops Side-Notched) which has been dated between 1,200 and 150 BP in other parts of the Pacific Northwest. Projectile points of this morphology date in the last 700 years within North Cascades National Park Service Complex (see Appendix D).

Table 10.48 Cultural Material From Excavation Units at 45WH473

		NCCA
test unit 1 (1x0.5 m)		
L:S (surface)	1 Projectile Point, Basalt	10377
L:1 (0-5 cm BS)	West 1/2: 1 Debitage, Basalt	10379
	1 Debitage, Basalt	10378
	25 Bone Fragments: 24 Unidentifiable; 1 Long Bone Fragment, Medium Mammal	10398
	1 ^{14}C Sample, No Date	
	^{14}C, 370±80 BP, Beta 64828	
	East 1/2: 29 Bone Fragments: 28 Unidentifiable; 1 Proximal End of 3rd Phalanx of Deer	10394
	1 Bulk Sample	10395

One charcoal sample from test unit 1 was submitted for radiocarbon dating. It was collected from small concentrations scattered across the unit floor to a depth of 5 cm below the reservoir surface. This combined sample is directly associated with feature 1. The date of 370 BP agrees with the typological date derived from the projectile point. Together they date the use of the hearth feature to the last part of the Late Prehistoric period.

Table 10.49 Table Of ^{14}C Dates from 45WH473

TU	LEVEL	LAB#	UNCORRECTED BP DATE
TU1	L-1	Beta 64828	370±80

Site Stratigraphy

Only the top of the stratigraphic sequence at site 45WH473 was revealed in the limited excavations conducted to assess Feature 1. The surface of test unit 1 was covered with a thin, silty sand reservoir deposit having a lower boundary marked by an erosional unconformity. The underlying stratum is a yellowish-brown, sandy silt soil B-horizon containing discontinuous lenses of a gray volcanic ash. The top of feature 1, including the sandy matrix between FMR, consisted of reservoir deposit. The FMR at the bottom of feature 1 rested on the top of the undisturbed B-horizon. Although the depth and degree of development of this soil horizon in unknown, these characteristics match those reported in the test results for nearby site 45WH273 (this report).

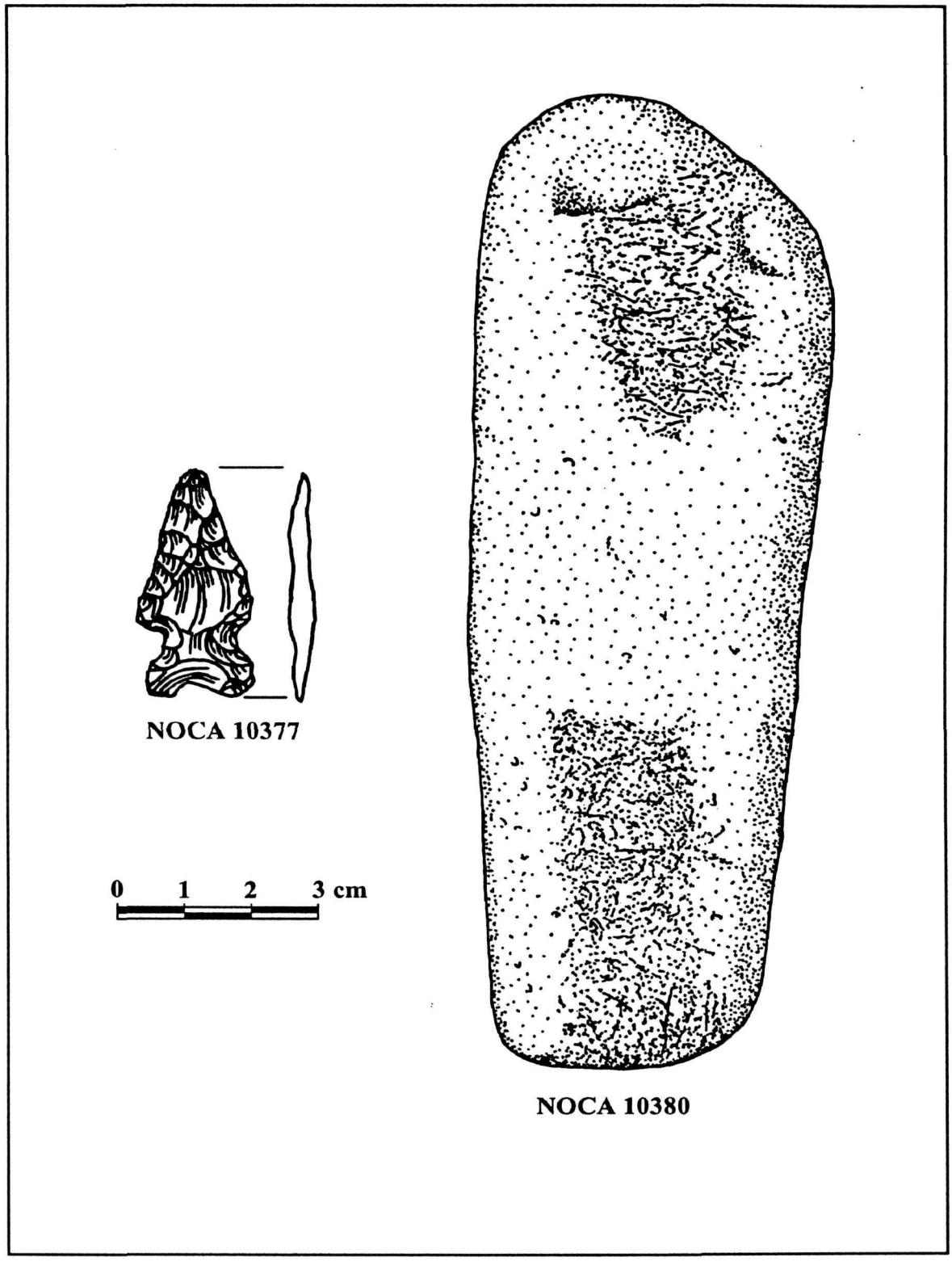


Figure 10.39 Artifact illustrations from 45WH473 (FS 197)

Conclusions and Assessment

Site 45WH473 appears to have been used a few hundred years ago by small groups of people as a task site for processing deer. These inferred "processing" activities include cooking meat, and bone marrow and grease extraction. Consumption of some or all of these foods probably took place at the site. The stone tools associated with features 1 and 2, an arrow point and a hammerstone, are consistent with these inferred functions. The hammerstone was made of stone derived from local sources, but the arrow point is made of a material that resembles reference samples from the Cache Cr. "basalt" source in British Columbia (see section 10.3.6).

Reservoir-induced erosion, logging, and vegetation clearing prior to impoundment have eroded artifact-bearing deposits, including the soil matrix associated with the hearth features. However, most of the hearth rocks, flaking debris, animal bone fragments, stone tools, and charcoal appear to be intact and undisturbed. Due to excessive erosion, probably only a small portion of the deposits remain intact. The exact volume of intact deposits is uncertain, but is estimated to be < 100 m^3 (3,529 ft^3). The significant portions of the site are embodied within the soil matrices in and adjacent to the FMR features and other intact remnants of artifact-bearing soils that have survived reservoir erosion.

Site 45WH473 is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits, particularly those directly associated with hearth features, are *in situ* and retain integrity of location and association. Further excavation and study of these deposits is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

10.2.16 45WH496 (FS#214) Boundary Bay #18

Site Setting

This site is located on the east side of the valley at the northern end of the project area, about .25 km (.15 mi) south of Boundary Bay Campground. At an elevation of 467 m (1,532 ft), the site is situated on a small, gently sloping (0-5%) glacial terrace remnant between two alluvial fans, one north and one south. The western edge of the terrace drops gradually along an erosional escarpment, and at the eastern edge, the land rises gradually to the valley wall. The terrace has a western solar exposure that faces the flat flood plain of the Skagit River, the mouth of Little Beaver Cr., and the steep slopes of the western valley wall. To the north is the Skagit valley and flood plain flanked on the east by the steep mountain slopes rising to the rounded ridgelines and summit of Little Jackass Mtn. at 1,337 m (4,387 ft). To the east the valley wall rises steeply to the summit of Desolation Pk. at 1,860 m (6,102 ft). To the south is the Skagit

Valley and flood plain flanked by the lower shoulders of the eastern valley wall. The artifact distribution is roughly circular and is defined on the basis of surface artifact distribution.

Logging and vegetation clearing prior to impoundment and reservoir erosion have been the primary sources of historic disturbance to the site. As with most other sites in the drawdown zone, wind-generated surf breaking against the site surface during lowered reservoir levels has eroded artifact-bearing soils; however, such erosion has not been excessive due to a degree of protection afforded by the adjacent alluvial fans. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of a mature coniferous forest. A secondary source of disturbance to the site sediments appears to be the result of bioturbation from trees. This source of disturbance predates reservoir construction and probably reflects cycles in forest succession as controlled by climate, fire history, and other natural factors.

General Site Description

The site is characterized as a moderate-density lithic scatter. Its dimensions are 16 m north-south and 12 m east-west, covering an area 192 m^2 (2,066 ft^2) (Figure 10.40). Artifacts were excavated from between 20 and 60 cm below the surface. Using an average depth of 0.4 m, the estimated volume of artifact-bearing deposits is ca. 77 m^3 (2,117 ft^3). During initial recording of the site, more than 305 lithic artifacts were observed on the surface, the vast majority (>300) of which consisted of Hozomeen chert flakes. Other artifact types present include projectile points, bifaces, and two andesite hammerstones. The lithic material types present in the artifact assemblage consist of locally available Hozomeen chert and exotic basalt.

Testing Methods and Rationale

Site 45WH496 was recorded, surface collected, and tested in the 1993 field season. Two 1x1 m test units were excavated in 10 cm arbitrary levels, and the sediments were screened through 1/4 in wire mesh. Test unit locations were selected in order to determine the depth of undisturbed, artifact-bearing deposits. Test units were placed one meter apart in the center of the site.

Table 10.50 Inventory of Surface Collections from 45WH496

	NOCA
1 Debitage, Hozomeen Chert (red)	10744
1 Biface, Hozomeen Chert	10742
1 Biface, Hozomeen Chert	10743
1 Projectile Point, Basalt	10741

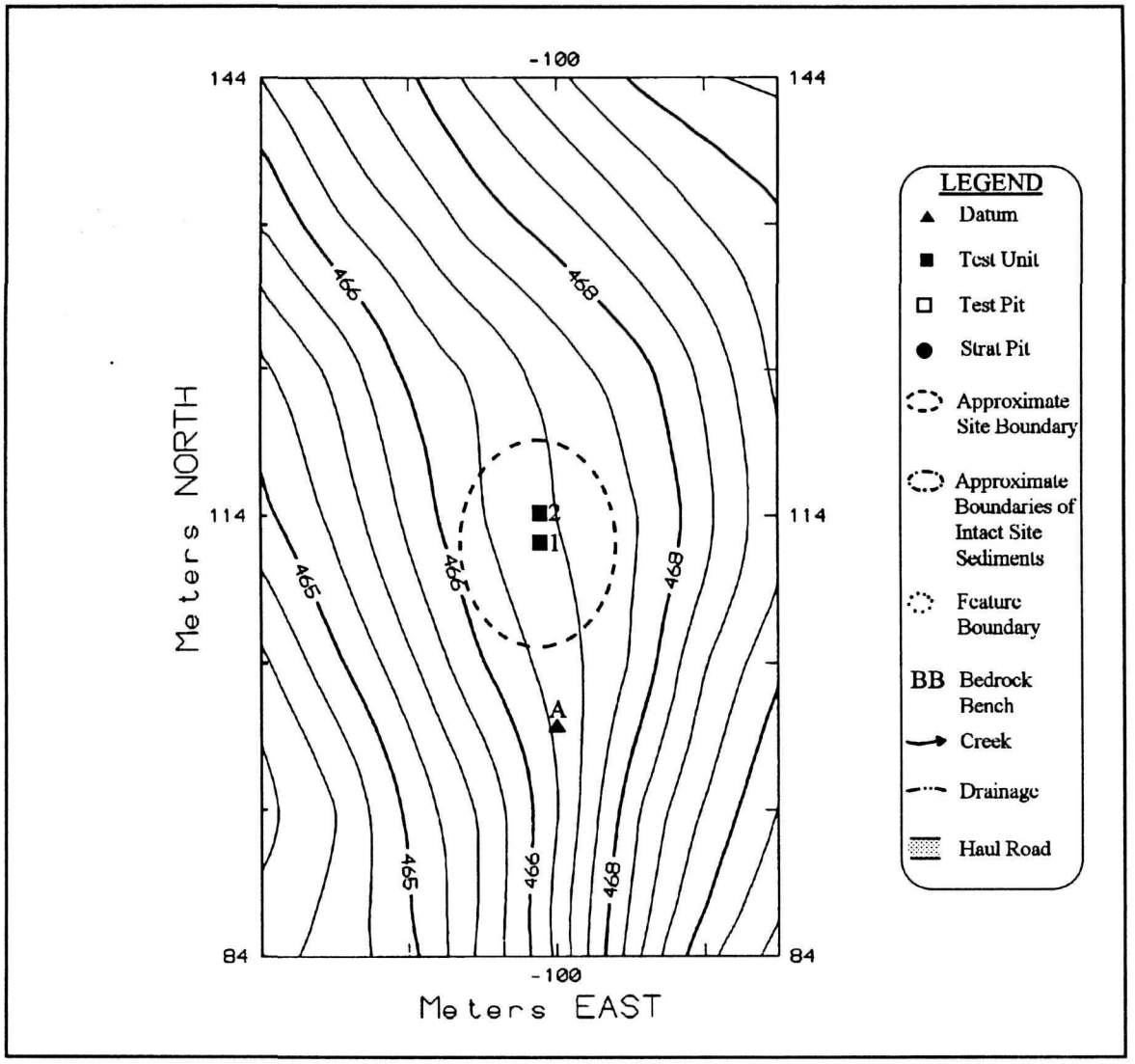


Figure 10.40 Topographic map of 45WH496 (FS 214)

Description of Testing Results

The assemblage of artifact categories represented at the site includes biface, projectile point, flake, and shatter. A total of 52 artifacts was recovered from the site; 5 from the site surface, 43 from test unit 1, and 5 from test unit 2. Of the total, 12 were collected from the eroded site surface and 40 from *in situ* deposits. The intact deposits extended to a depth of 60 cm below ground surface. No evidence of features or layers of cultural origin were observed in the test units.

Artifacts collected from the site surface include one shatter of red Hozomeen chert (NOCA 10744), 2 bifaces, and a projectile point (Table 10.590. Both bifaces (NOCA

10742 and 10743) are fragments exhibiting transverse breaks more or less near the mid-section. Both fragments are classified as reduction stage III. The point (NOCA 10741) (Figure 10.41) is manufactured of basalt and is classified as Type 8, which is assigned to the Late-Middle prehistoric period. The basalt is black and fine-grained, resembling reference samples from the Cache Cr. "basalt" source in British Columbia (see section 10.3.6). This point was probably used as a dart tip.

In test unit 1, artifacts were found to a depth of 60 cm below the surface in a mottled, reddish-brown, possibly thermally altered, soil B- and BC horizon. The entire flaked stone assemblage, from the surface to the lowest level, consisted of noncortex Hozomeen chert broken and complete flakes, and shatter. The category, biface thinning flake, is represented by at least three certain members. A few flakes are short and thick with flat platforms forming a 90° angle between the platform and adjacent dorsal surface. This flake assemblage is consistent with that observed at other sites in the project area, such as 45WH224 and 45WH262, where early and middle-stage Hozomeen chert bifaces were manufactured.

Test unit 2 contained cultural material to a depth of 20 cm below the surface in mixed soil B- and BC-horizons containing what appeared to be primary, discontinuous tephra layers. The degree of soil mixing by tree root disturbance was greater in this unit than in test unit 1. The results of the tephra identification indicate a mix of glass chemistries representing eruptive sources widely separated in time and space. The artifact assemblage from this unit, although small, is identical to the assemblage described from test unit 1 and reflects use of the site as a lithic reduction workshop for the manufacture of early to middle-stage bifaces made of Hozomeen chert.

Table 10.51 shows all artifacts collected from excavation units by level.

Table 10.51 Cultural Material From Excavation Units at 45WH496

test unit: 1 (1x1 m)		NOCA
L:S (surface)	1 Flake, Hozomeen Chert	10745
	1 Flake, Hozomeen Chert	10746
	1 Flake, Hozomeen Chert	10747
	1 Flake, Hozomeen Chert	10748
	1 Flake, Hozomeen Chert	10749
	1 Flake, Hozomeen Chert	10750
L:1 (0-10 cm BS)	1 Flake, Hozomeen Chert	10751
	1 Flake, Hozomeen Chert	10752
	1 Flake, Hozomeen Chert	10753
	1 Flake, Hozomeen Chert	10754
	1 Flake, Hozomeen Chert	10755
	1 Flake, Hozomeen Chert	10756

	1 Flake, Hozomeen Chert	10757
	6 Debitage, Hozomeen Chert	10770
L:2 (10-20 cm BS)	1 Flake, Hozomeen Chert	10758
	1 Flake, Hozomeen Chert	10759
	1 Flake, Hozomeen Chert	10760
	1 Flake, Hozomeen Chert	10761
	5 Debitage, Hozomeen Chert	10771
L:3 (20-30 cm BS)	4 Debitage, Hozomeen Chert	10772
L:4 (30-40 cm BS)	1 Flake, Hozomeen Chert	10762
	9 Debitage, Hozomeen Chert	10763
L:5 (40-50 cm BS)	0 Collections	
L:6 (50-60 cm BS)	1 Flake, Hozomeen Chert	10764
L:7 (60-70 cm BS)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	1 Flake, Hozomeen Chert	10765
	1 Flake, Hozomeen Chert	10769
L:1 (0-10 cm BS)	1 Flake, Hozomeen Chert	10766
	1 Flake, Hozomeen Chert	10767
L:2 (10-20 cm BS)	1 Flake, Hozomeen Chert	10768
	1 Tephra Sample, Source Unknown	10824
L:3 (20-30 cm BS)	0 Collections	
Strat Unit 3	Tephra, ROLA89 229-1, Glacier Peak B, St. Helens Wn, Mazama O	10822
Strat Unit 5	Tephra, ROLA89 229-1, St.Helens Wn and -Y, Mazama O	10823

Site Chronology

The estimation of site age and periods of occupation is based on a time-sensitive projectile point. Results of the identification of two tephra layers for this purpose were inconclusive.

A basalt projectile point (NOCA 10741) collected from the surface is classified as Type 8. This variety of triangular-eared series is similar to one called "Shuswap Horizon Type 1" and "Oxbow" in southern British Columbia and the northwestern Plains respectively (Appendix D). Based on dates from sites in these regions, this class of points ranges in age from 4,000 to 2,800 BP and represent the Late-Middle prehistoric period (4,000-2,000 BP). On this basis the age of the site is estimated to be between 2,000 and 4,000 years old.

Two tephra samples from test unit 2 were submitted for source identification (Table 10.52 below). A profile diagram and description of the north wall of test unit 2,

from which the samples were removed, is provided in Appendix E. As observed in the test unit wall, both tephra deposits formed discontinuous lenses within the soil B- and BC-horizons. The results of the analysis are inconclusive for dating purposes. A primary deposit of Glacier Pk. B (NOCA 10822) has never been identified within the project area or its immediate vicinity. Due to the valley's proximity to Glacier Pk., any primary tephra from this eruptive event would likely be dominated by clasts in the coarse sand to lapilli size fractions. Furthermore, the assignment of the sample to Glacier Pk. B (an eruption dated circa 11,200 BP) is incompatible with its stratigraphic position above St. Helens Wn (NOCA 10823). On a shard by shard basis, both samples constitute a mix of tephra from geographically and temporally distinctive eruptive events. This suggests that one or more agents have mixed together these once separate tephra. Such a conclusion is compatible with stratigraphic evidence of mixing (see section 10.3.2 for a discussion of this problem).

Table 10.52 Table Of Identified Tephra from 45WH496

TU	Level	NOCA	Bulk Glass	Glass1	Glass2	Glass3
TU2	SU3	10822	Glacier Pk. B	St. Helens Wn	ROLA89 229-1	Mazama O
Number of shards analyzed			23	9	8	5
TU2	SU5	10823	St. Helens Wn	St. Helens Y	ROLA89 229-1	Mazama O
Number of shards analyzed			23	17	2	1

Site Stratigraphy

A profile diagram and description from test unit 2 is provided in Appendix E of this report. The generalized site stratigraphic sequence begins with a thin reservoir deposit that caps most parts of the landform. Beneath the erosional unconformity that forms the lower boundary of this stratum is a mottled, strong brown to dark yellowish-brown B-horizon. Below the B-horizon is a mottled, weakly developed BC-horizon which, in turn, overlays an olive C-horizon. The B-horizon in both test units is mottled with soil colors and textures characteristic of the underlying BC and C-horizons. Artifacts, however, were not confined to any one matrix type.

The depositional history of the landform can be partially inferred on the basis of surface morphology, geomorphic position in the Skagit River valley, and weathering profile. The landform appears to be an eroded remnant of a late-glacial or early Holocene terrace. The former extent of this terrace and whether or not it matches other remnants in the project area is unknown. As with other such landforms, the soils built

up through the vertical accretion of fine-grained silts and sands deposited by wind (including volcanic ash and floodplain loess) and slopewash from steep adjacent mountain slopes. Because the test unit excavations were confined to this fine-grained cap, the deeper sedimentary matrix, internal to the landform, was not observed. Generally, the degree of reddening of the B-horizon matches that observed at other ancient terrace remnants in the project area, as does the evidence for bioturbation of some portion of the site deposits by tree root movement and burning. Prehistoric people began to visit and occupy the landform after most of the fine-grained cap had built up and soils began to develop.

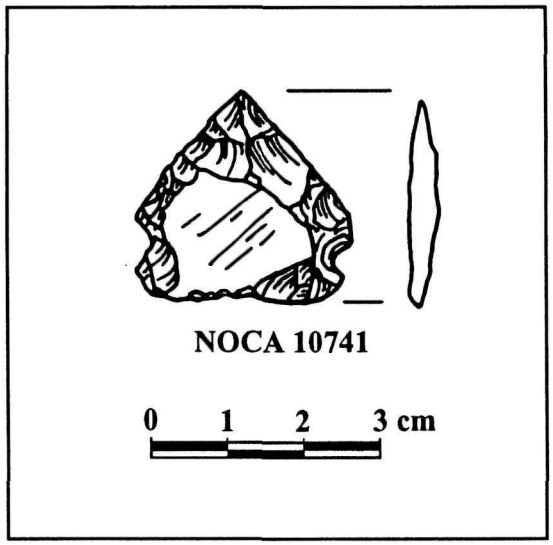


Figure 10.41 Artifact illustrations from 45WH496 (FS 214)

Conclusions and Assessment

Site 45WH496 appears to have functioned as a lithic reduction workshop for the manufacture of early to middle-stage bifaces made of Hozomeen chert between approximately 2,000 and 4,000 years ago. The source of the Hozomeen chert used at the site is unknown, but a number of nearby outcrops could have been used. Based on the absence of weathered cortex and shatter on flakes at the site, it is inferred that the chert was cleaned and initially shaped at the location of raw material procurement, and that such pieces were brought to the terrace workshop for further reduction and manufacture. The occupants of the site used an exotic lithic material which may be from British Columbia (Cache Cr. "basalt"). Access to nonlocal lithic materials may have been through participation in a large inter-regional exchange network, or the occupants may have spent part of their subsistence round in the Fraser River drainage to the north. Other subsistence activities may have been conducted at the site, but there is no conclusive evidence for this.

Reservoir-induced erosion and historic logging activities associated with vegetation clearing have exposed a portion of the artifact-bearing deposits at the site; however, undisturbed, deposits and artifacts are likely to remain buried from 20 to 60 cm below the reservoir bottom. Tree root growth, especially root tipping and burning, are disturbance processes that have affected site deposits. The exact volume of intact site deposits is difficult to ascertain, but may amount to 77 m^3 (2,717 ft^3). The significant portion of the site includes those remnants of intact artifact-bearing deposits and the adjacent deposits where artifact integrity may have been lost through bioturbation. This association of two distinct soil matrices, one with artifacts lacking physical integrity and

the other with artifacts retaining such integrity, constitutes a critical relationship that is key to understanding the local archeological data base for the entire project area.

The site is eligible for inclusion in the National Register of Historic Places according to criterion D of the National Register. Portions of the site deposits are *in situ* and retain integrity of setting. The artifacts in them retain integrity of location and association. Just as importantly, other portions of the site deposits are not *in situ* and the artifacts in them may lack integrity of location and association. Through scientific excavation and study of the genetic relationship of these two types of deposits, the site is likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

11. TESTING RESULTS: SITES ASSESSED AS NOT ELIGIBLE TO THE NATIONAL REGISTER OF HISTORIC PLACES

11.1 Introduction

This section describes the results of the test excavations conducted at 20 archeological sites in the reservoir drawdown. As in the previous section, the physical location, setting, artifact inventory, chronology, function, and stratigraphy of each site is described and discussed. This section differs, however, in that each site is recommended as ineligible to the National Register of Historic Places. These sites have been altered to a high degree by reservoir-related erosion which has resulted in the loss of integrity of location and association of artifacts, features, and sedimentary matrices.

11.2 Results of Site Testing

11.2.1 45WH79 (FS#3) Hozomeen Campground

Site Setting

This site is located on the east side of the valley, at the north end of Ross Lake, near the Canadian border, about .5 km (.3 mi) south of the main channel of the Skagit River. A recreational vehicle camping area (informally called Winnebago Flats) borders the site on the east, and Howlett Cr. forms the northern and western boundaries. The artifact scatter defining the site is oriented north-south. It follows the distal west edge of an old remnant of Howlett Creek's alluvial fan at an elevation of 485 m (1,590 ft). This remnant of the alluvial fan has been truncated by the present channel of Howlett Cr., thus creating a 3-4 m high escarpment which forms a clear boundary between the higher fan surface and the lower flood plain. The site has a western exposure, and from this location, one looks towards the broad, flat flood plain of the Skagit River. To the east one looks at higher elevation glacial terraces supporting closed-canopy coniferous forests, and further east, one sees the vertical rock walls forming the west face of Hozomeen Mountain.

The first historic impact to the site began with the logging of the valley in the 1940s prior to impoundment of water behind Ross Dam. Initially, areas were logged south of the Hozomeen vicinity, but haul roads were constructed north through the valley and across the site. Subsequently, this vicinity was logged prior to inundation by reservoir waters in the early to mid-1950's. Immediately following inundation, the soil and artifact-bearing deposits at the site were eroded by lake shoreline processes. In the early 1970's the landform and the site were effected by additional ground-disturbing activities related to the construction of a recreational vehicle campground, a boat dock, and a boat launch ramp. During campground construction, a large borrow pit was dug into the east side of the site, and the material was used to fill and grade the campground.

The boat launch ramp was constructed through the northern portion of the site along an east-west axis. Shoreline erosion from the reservoir has removed approximately 30 to 60 cm of sediment from the original landform surface. The pre-reservoir vegetation, as evident by sawn stumps on-site, appears to have been a mature conifer forest with some trees in excess of 2 m dbh.

General Site Description

The site dimensions are 300 m north-south and 75 m east-west, which is an area of 22,500 m^2. Artifact depth determined from test excavations ranged from 1 to 25 cm below the surface. The average depth of artifact-bearing deposits at the site is 8.7 cm. The estimated volume of artifact-bearing deposits at the site is 1,957 m^3. Stone flaking debris was recovered from two stratigraphic units. The first unit consists of a "reservoir deposit," a depositional unit that was created by shoreline erosion and deposition subsequent to inundation of the landform. Artifacts found in this stratigraphic layer have been disturbed from their original context. The second unit, which underlays the first, consists of remnants of the weathered subsoil (the soil B-horizon in pedological terminology). The upper portion of this soil horizon has been removed through erosion, and the remaining, lower portion is mixed with reservoir deposits. This unit was mottled with pockets of other soil horizons, indicating that mixing of soils had occurred. Although some flaking debris may have been *in situ*, most of the artifacts came from the disturbed top of this unit or the mixed deposits.

The site is a moderate-density lithic scatter within which are several clusters or loci of exhibiting a high density of chipped stone remains. A low density of artifacts was observed along the site's northern and southern extremities. All artifacts exposed on the site surface have been eroded and are within modern reservoir deposits. A wide range of chipped stone artifact types have been collected from the site, including large cobble cores, microblade cores, flakes, projectile points, bifaces, flake tools, flaking debris, and a very scattered and low frequency of fire-modified rock (FMR). No intact, undisturbed features have been identified at the site. The assemblage reflects use of a wide range of lithic raw material types. These include exotic lithic materials from known and unknown sources distant from this part of the Skagit Valley. The great majority of raw materials were acquired locally, particularly metasediment varieties from the Skagit River gravels and a lower frequency of chert from gravels and bedrock outcrops in the valley.

Testing Methods and Rationale

This site was first recorded and tested by archeologists from Western Washington University (Grabert and Pint 1978). A large quantity of flaking debris and some tools were collected from the surface. Although the site was considered important for understanding the early prehistory of the Pacific Northwest, the authors suggested that Ross Lake levels protected the site and recommended excavation only prior to implementation of the High Ross Dam project (Grabert and Pint 1978:71). Observation

and reassessment of the site in 1984 and 1986 suggested that the site had been extensively disturbed by a variety of agents, but that some remnant portion might be intact and undisturbed (Mierendorf 1986:173). Mierendorf and Thomson (1986) assessed the effects of boat launch ramp improvements and observed and collected additional artifacts from the site surface, including new artifact types that added significant information regarding the site's age and function. Subsequently, the site was recommended as potentially eligible for inclusion in the National Register of Historic Places (Mierendorf 1987a).

The site has been periodically monitored and surface collections made by NPS archeologists beginning in 1986 (Table 11.1). It was tested during the 1991 project field season in order to determine the presence and extent of undisturbed cultural deposits and to assess significance according to the National Register of Historic Places.

Prior to excavation, a baseline aligned to true north was established across the landform in the general vicinity of Grabert's earlier work and site datums were established. All collected artifacts are located relative to one of these datum points. The datum points established and reported in Grabert and Pint (1978) were located and referenced to the baseline. Only diagnostic artifacts were collected. Their locations were measured and recorded from the nearest site datum. The site was tested by excavation of six 1x.5 m test units and one 1x1 m test unit. Site sediments were excavated in 5 and 10 cm thick levels. Vertical control of excavation levels was maintained by establishing a line level subdatum 10 cm above ground surface, adjacent to the highest elevation corner of the unit. Units were excavated in 5 cm increments when cultural material was present, and 10 cm increments when excavating culturally sterile sediments. All artifact-bearing sediments were screened through 1/8 in mesh hardware cloth. Culturally sterile sediments were screened through 1/4 in mesh hardware cloth. Several excavation units were placed in close proximity to large tree stumps to test the possibility that such locations were protected from ground-disturbing activities. Other units were placed in areas of obvious disturbance in order to acquire comparative data pertaining to landform development, site depth, disturbance processes, and integrity of archaeological remains.

Table 11.1 Inventory of Surface Collections from 45WH79*

	NOCA
1 Biface, Metasediment	6324
1 Projectile Point, Metasediment	6325
1 Flake, Vitrophyre	6353
1 Edge Modified Flake, Metasediment	6488
1 Projectile Point, Metasediment	6489
1 Projectile Point, Metasediment	6490
1 Biface, Hozomeen Chert	6491

1 Flake, Quartz	6492
1 Flake, Edge Modified, Hozomeen Chert	6493
1 Projectile Point, Exotic Chert	6494
1 Flake Tool, Metasediment	6495
1 Microblade Core, Hozomeen Chert	6496
1 Biface, Basalt	6497
1 Biface, Metasediment	6498
1 Biface, Hozomeen Chalcedony	6499
1 Projectile Point, Metasediment	6500
1 Flake, Edge Modified, Chalcedony	6501
1 Projectile Point, Metasediment	6502
1 Knife, Metasediment	6503
1 Biface, Hozomeen Chalcedony	6504
1 Flake, Chalcedony	6505
1 Projectile Point, Metasediment	6506
1 Projectile Point, Metasediment	6507
1 Hammerstone, Granitic Rock	6508
1 Projectile Point, Metasediment	6984
1 Flake, Edge Modified, Chalcedony	6986
1 Projectile Point, Metasediment	6987
1 Projectile Point, Metasediment	6985
1 Flake, Edge Modified, Hozomeen Chalcedony	6988
1 Scraper, Hozomeen Chert	6989
1 Modified Quartz Crystal	6990
1 Flake, Heat Modified, Chalcedony	6991
1 Flake, Edge Modified, Metasediment	6992
1 Biface, Basalt	6993
1 Microblade Core, Quartz Crystal	6994
1 Projectile Point, Metasediment	6995
1 Cobble Tool, Metasediment	6996
1 Projectile Point, Metasediment	6997
1 Projectile Point, Hozomeen Chert	6998
1 Projectile Point, Hozomeen Chert	6999
1 Projectile Point, Metasediment	7000
1 Projectile Point, Hozomeen Chert	7001
1 Flake, Edge Modified, Metasediment	7002
1 Flake, Edge Modified, Hozomeen Chert	7003
1 Projectile Point, Metasediment	7004
1 Flake, Edge Modified, Allenby Chert	7005
1 Projectile Point, Metasediment	7006
1 Projectile Point, Metasediment	7007
1 Projectile Point, Metasediment	7008
1 Projectile Point, Metasediment	7009
1 Biface, Metasediment	7010

1 Biface, Metasediment	7011
1 Modified Quartz Crystal	7012
1 Biface, Hozomeen Chert	7917
1 Biface, Jasper	7918
1 Projectile Point, Hozomeen Chert	10360
3 Flakes, Quartz	10448
1 Flake, Pressure, Obsidian	10449
1 Flake, Obsidian	10450
1 Flake, Obsidian	10451
1 Flake, Edge Modified, Jasper	10452
1 Flake, Allenby Chert	10453
1 Shatter, Quartz Crystal	10454
1 Biface Fragment, Hozomeen Chert	10455
1 Biface, Slate	10456
1 Biface, Metasediment	10457
1 Projectile Point, Metasediment	10687
1 Core, Chalcedony	10688
1 Shatter, Metasediment	10689

*(Grabert and Pint Collections Not Included)

Description of Testing Results

Most of the artifacts recovered from the test excavations were found within the disturbed reservoir deposits (Figures 11.1a-11.1e). All of the excavated artifacts consisted of chipped stone flaking debris (a total of 49 items). Absent were diagnostic artifacts, formed tools, and features. Only test unit 3 contained artifacts (levels 2-4) in what appeared to be intact, undisturbed deposits consisting of a thin, uneroded remnant of the soil B-horizon. The original (pre-logging) depth of these artifacts below the ground surface is unknown. Portions of this soil had been reddened by heat-oxidation of iron-bearing minerals in the sediments, possibly due to burning of tree roots some time in the past after the artifacts had become buried in the soil.

The total chipped stone assemblage from the site indicates a wide range of lithic reduction strategies and technologies were practiced at this location. The most prominent of these is the reduction of river-rounded cobbles of metasedimentary rock types which are abundant locally in river, alluvial fan, and glacial gravels. Cobbles appear to have been reduced by direct percussion into flake cores, large flakes, and unifacially-flaked "choppers" or "flaked cobbles." Small, noncortex flakes suggest secondary reduction of some of these materials into bifaces and other tool forms. Pressure flakes indicate final tool manufacturing stages or resharpening of tool edges.

Exotic (nonlocal) raw material types were analyzed to determine source location. For this purpose, two obsidian flakes collected from the surface (NOCA 10450 and

10451) and one vitrophyre flake (NOCA #6353) were selected for XRF analysis. The obsidian flakes produced chemical signatures matching a source from Glass Buttes, Oregon. The vitrophyre produced a chemical signature that does not match a presently known source; however, it resembles in hand specimen samples reported from one recorded source in North Cascades National Park (Mierendorf 1987b). Based on comparison of hand specimens with reference collections, two flakes collected from the site surface match closely with Allenby chert, whose source area is located in the upper Similkameen River drainage to the northeast (Vivian 1989). More detailed results of the XRF analysis is reported in section 10.7 and Appendix G of this report.

Metasedimentary lithic types dominate the raw material types used to manufacture projectile points and bifaces; much less use was made of Hozomeen chert, basalt, Hozomeen chalcedony, and exotic jasper. Scrapers and edge modified flakes had the greatest variability in lithic material types with the greatest proportion being of exotic and high quality local raw materials.

Two microblade cores were collected from the site surface, one made of Hozomeen chert and one of quartz crystal. The site also contained two modified quartz crystals. One is a complete euhedral crystal with a small groove ground into one of the crystal faces, the other exhibits multi-directional flake scars.

The following table shows, by level, the distribution of cultural material excavated from test units by level (1977 testing not included).

Table 11.2 Cultural Material From Excavation Units at 45WH79

test unit 1 (1x0.5 m) 1991		NOCA
L:S (surface)	0 Collections	
L:1 (0-1 cm BS)	4 Debitage, Metasediment	10361
L:2-8 (1-56 cm BS)	0 Collections	
test unit 2 (1x0.5 m) 1991		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	3 Debitage, Metasediment	10362
L:2 (5-10 cm BS)	3 Debitage, Hozomeen Chert, Metasediment	10363
L:3-4 (10-20 cm BS)	0 Collections	
L:5 (20-25 cm BS)	1 Debitage, Metasediment	10364
	1 Debitage, Obsidian	10364
L:6-8 (25-45 cm BS)	0 Collections	
test unit 3 (1x0.5 m) 1991		
L:S (surface)	1 Debitage, Metasediment	10365

L:1 (0-10 cm BS)	13 Debitage, Metasediment	10366
	1 Tephra Sample, Source Unknown	10403
L:2 (10-15 cm BS)	6 Debitage, Metasediment	10367
L:3 (15-20 cm BS)	5 Debitage, Metasediment	10368
L:4 (20-25 cm BS)	2 Debitage, Metasediment	10369
L:5-7 (25-50 cm BS)	0 Collection	
test unit 4 (1x1 m) 1991		
L:S (surface)	2 Debitage, Hozomeen Chert	10370
L:1 (0-5 cm BS)	5 Debitage, Hozomeen Chert	10371
L:2 (5-10 cm BS)	2 Debitage, Hozomeen Chert	10372
L:3-8 (10-50 cm BS)	0 Collections	
test unit 5 (1x0.5 m) 1991		
L:S (surface)	0 Collections	
L:1-7 (0-40 cm BS)	0 Collections	
test unit 6 (1x0.5 m) 1991		
L:S (surface)	0 Collections	
L:1-5 (0-45 cm BS)	0 Collections	
No Provenience:	Strat Unit 3: 1 Tephra Sample, Source Unknown	10401
	Strat Unit 4: 1 Tephra Sample, Source Unknown	10402
	Strat Unit 4: 1 Tephra Sample, Source Unknown	10404
test unit 7 (1x0.5 m) 1991		
L:S (surface)	0 Collections	
L:1-3 (0-30 cm BS)	0 Collections	

Site Chronology

No charcoal was collected from this site and no charcoal was observed that appeared to be suitable for radiocarbon dating purposes. Four Tephra samples were collected (NOCA#'s 10401 through 10404), but none of these samples were considered reliable for analysis. Estimates of site age and occupation must be derived from time-sensitive artifact types. These are displayed in Figures 11.1a-e.

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 11.2. Across most of the site area, the ground surface consists of a sandy reservoir deposit. Prehistoric artifacts found in this unit are out of their original context. The reservoir deposit is up to 30 cm or more thick, but in some locations it is thin to nonexistent. Below the reservoir deposit is a discontinuous organic layer consisting of

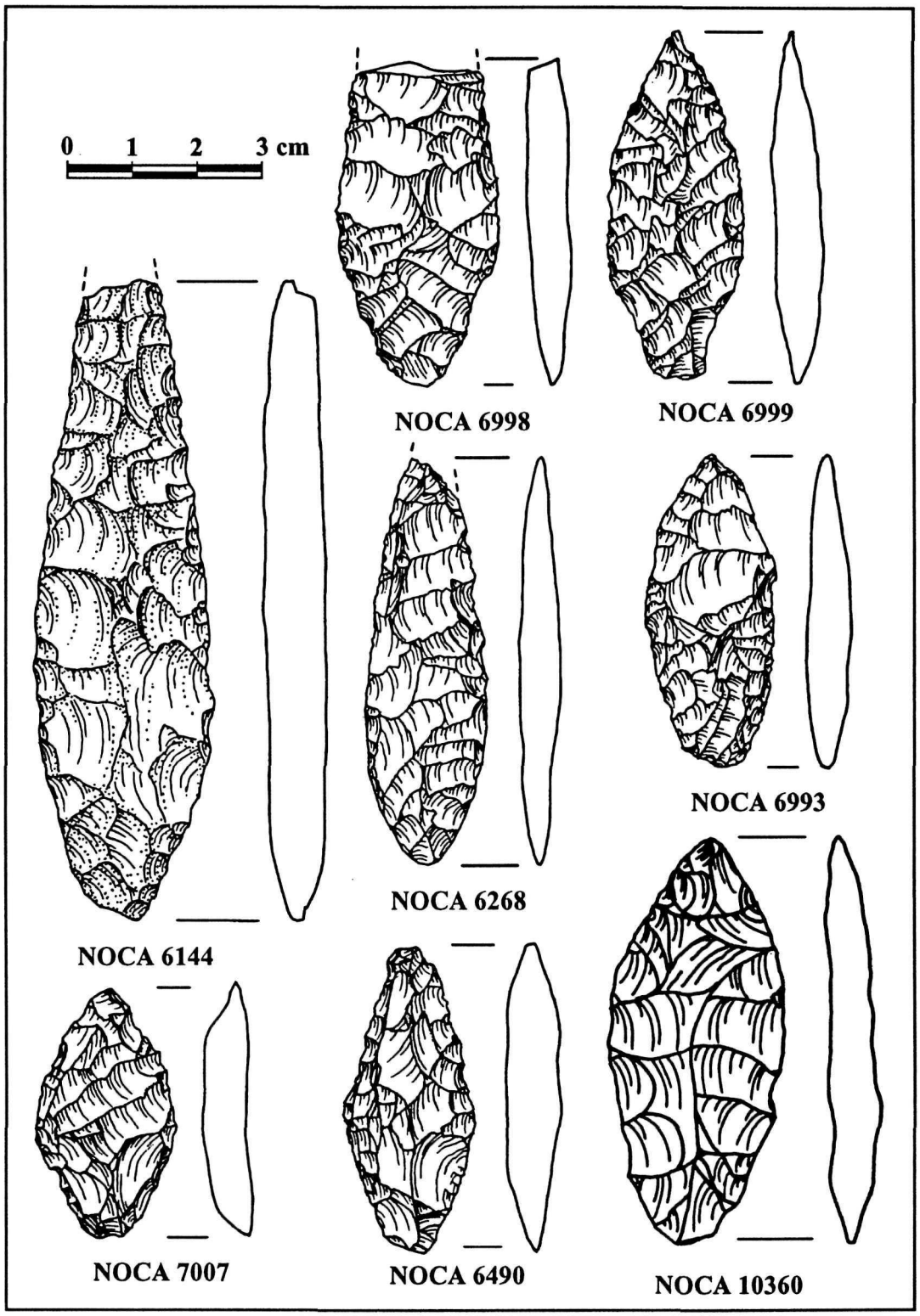


Figure 11.1a Artifact illustrations from 45WH79 (FS#3)

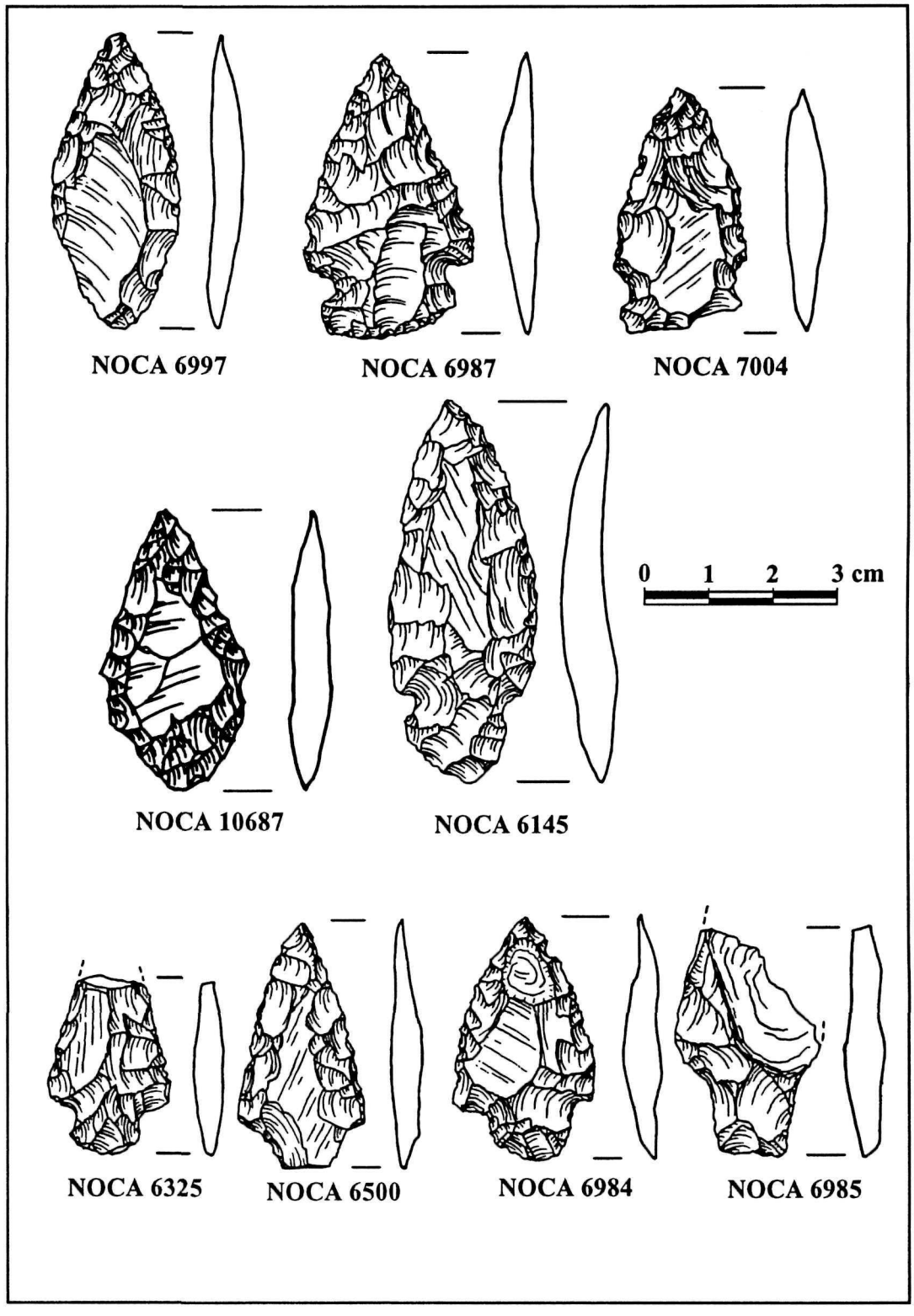


Figure 11.1b Artifact illustrations from 45WH79 (FS#3)

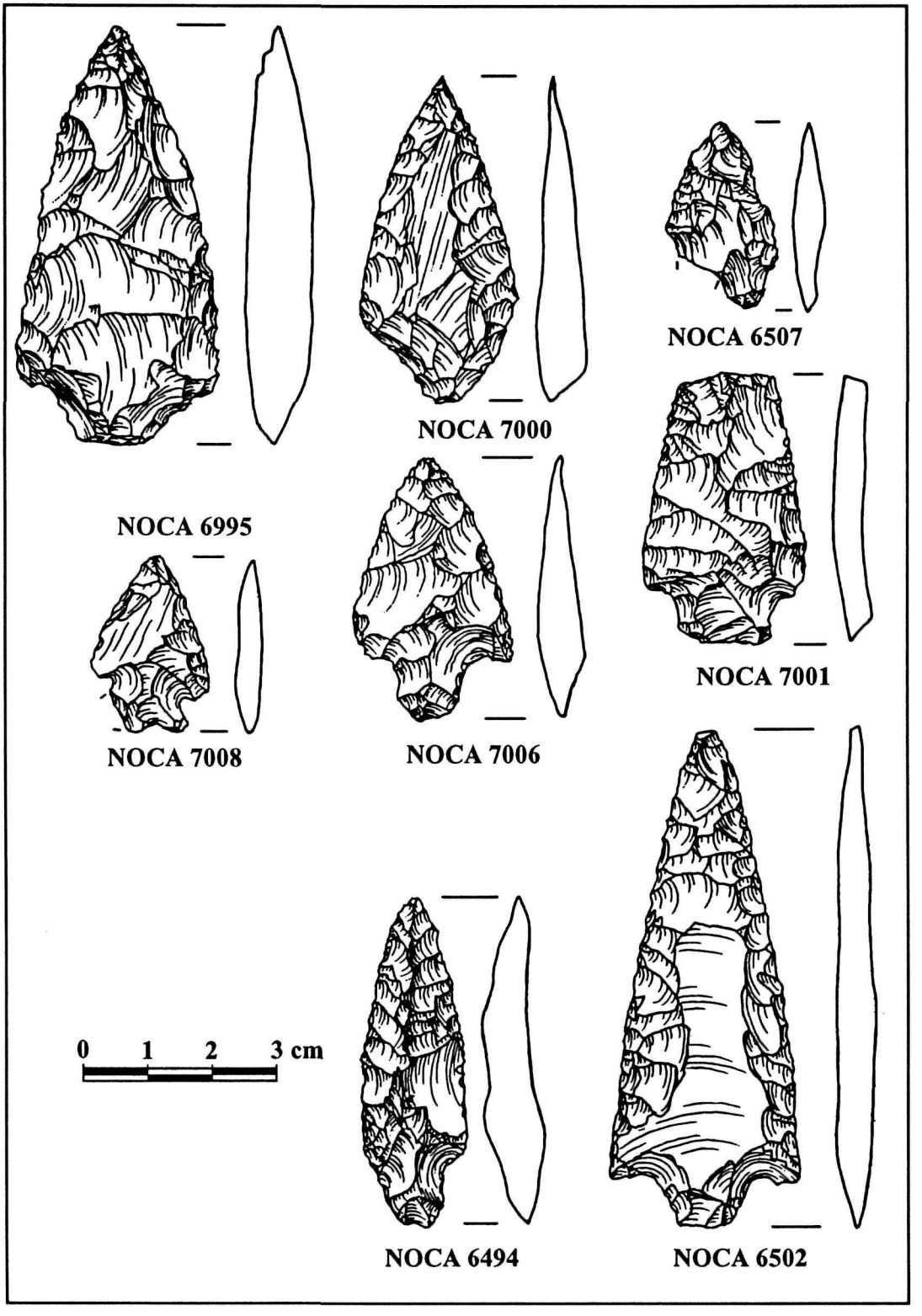


Figure 11.1c Artifact illustrations from 45WH79 (FS#3)

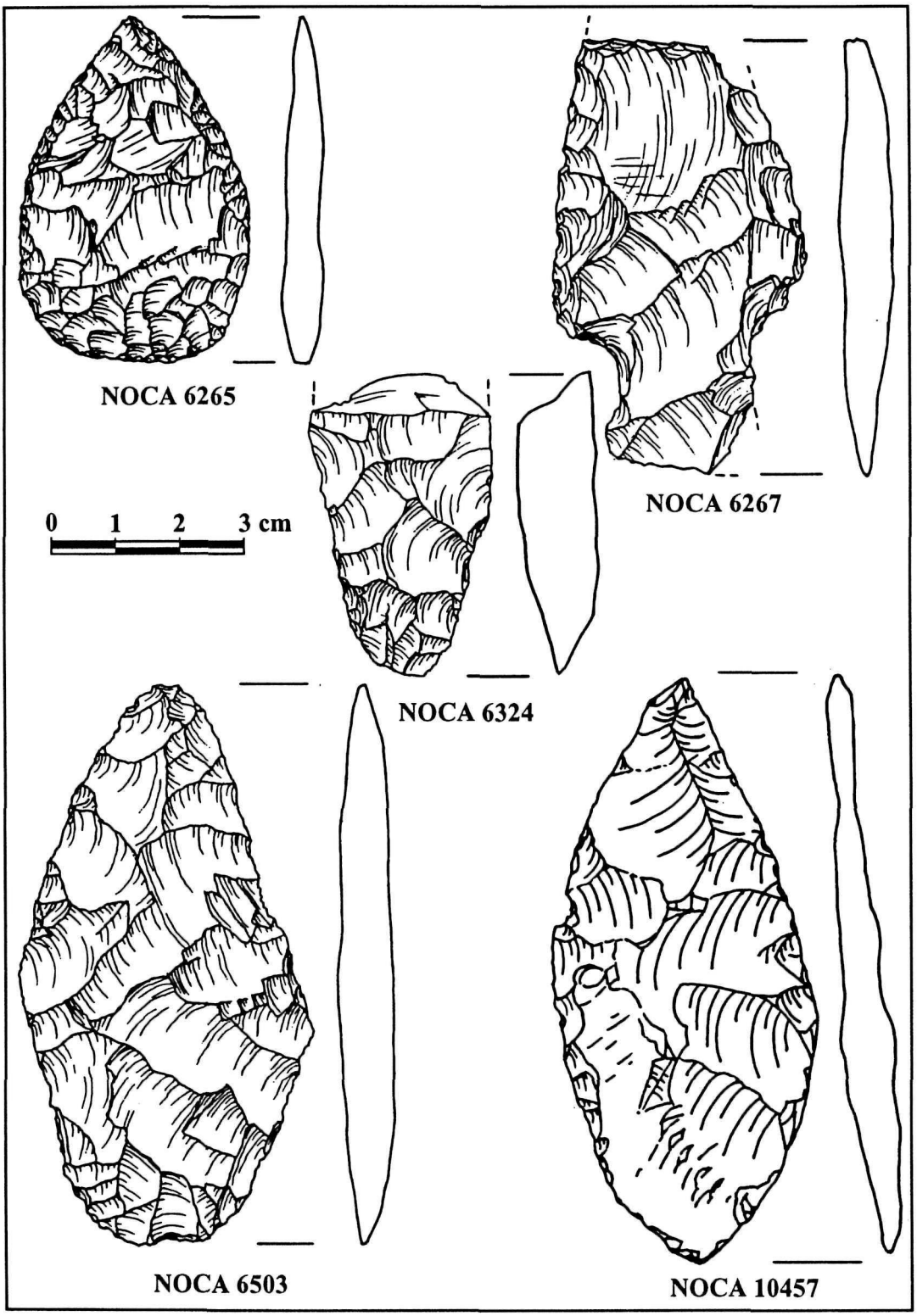


Figure 11.1d Artifact illustrations from 45WH79 (FS#3)

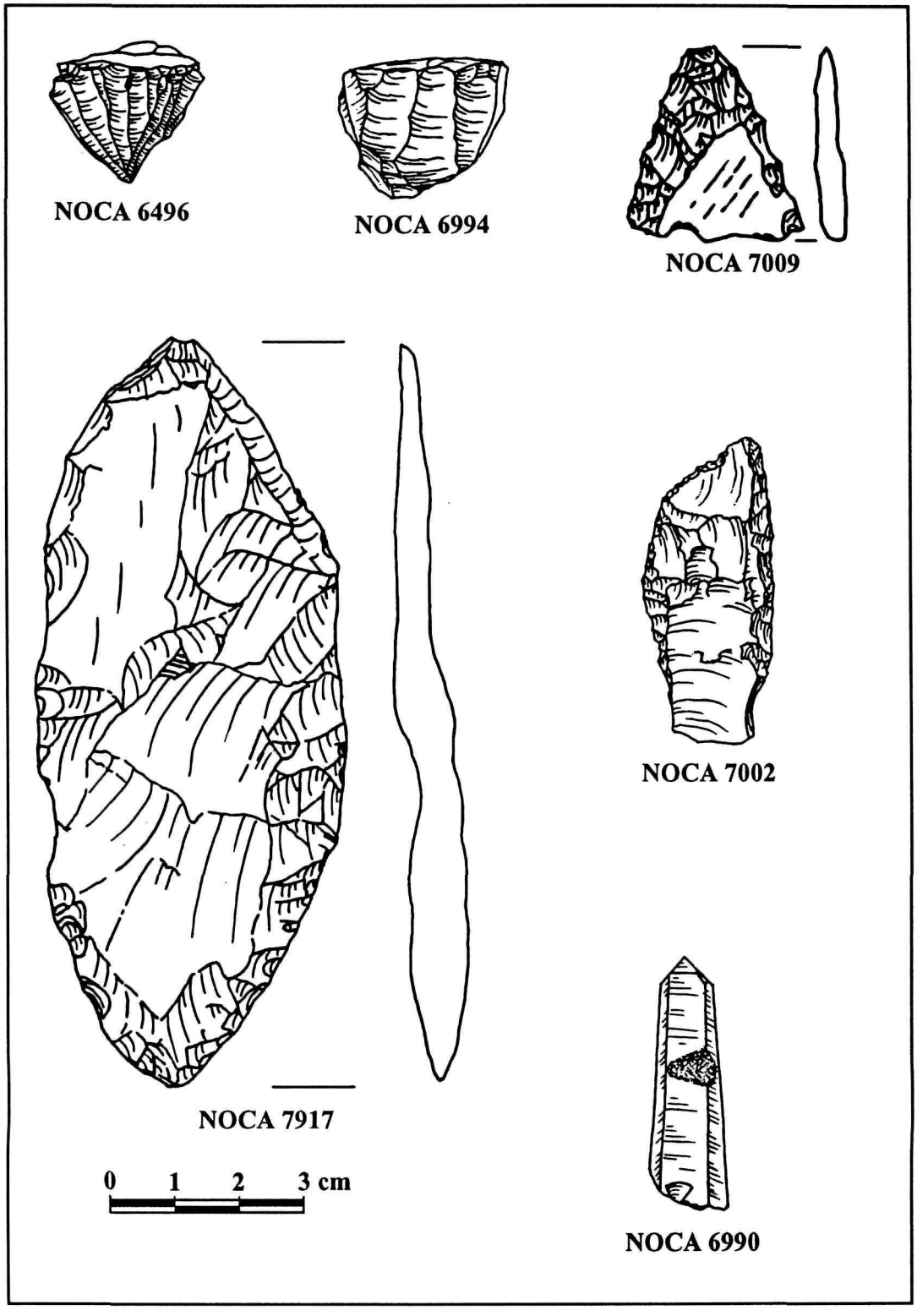


Figure 11.1e Artifact illustrations from 45WH79 (FS#3)

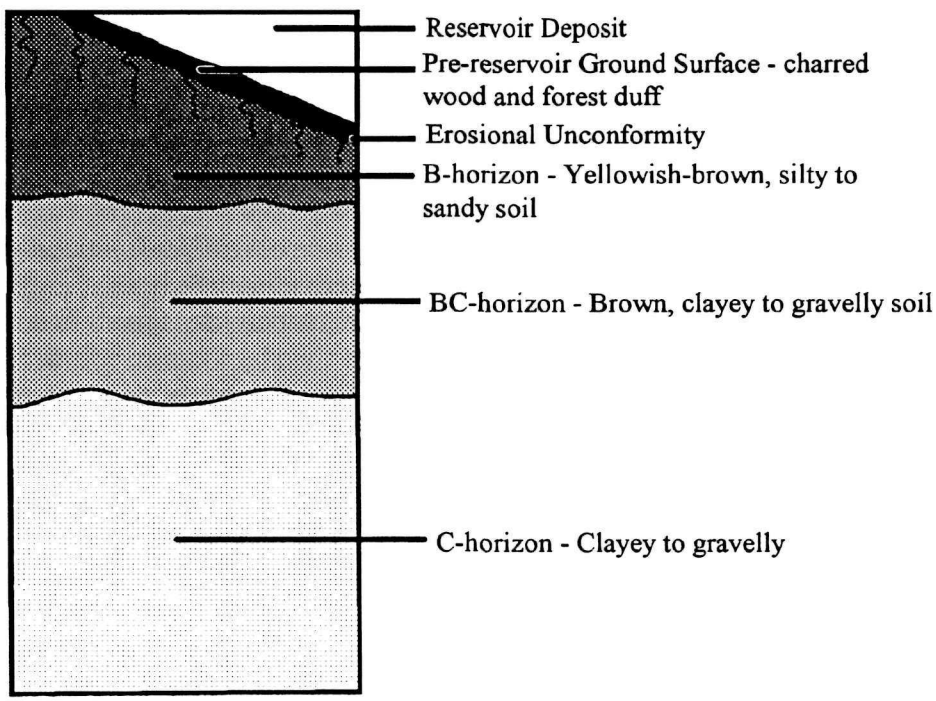


Figure 11.2 Generalized schematic of stratigraphy of 45WH79 (FS#3)

charred wood fragments and forest litter marking the original ground surface prior to reservoir construction. However, in many places this forest floor has been stripped away, and in some locations, so much material has been eroded that subsoil horizons are exposed at the ground surface. Thin, discontinuous lenses of volcanic ash are interbedded between the organic layer and the subsoil. The uppermost "subsoil" horizon

is the brown, weathered, iron-rich B-horizon. Artifacts found in this stratum may or may not be *in situ*, depending on the degree of disturbance by tree root penetration, tree root tip-ups, rodent burrowing, ground fires, and reservoir clearing activities. In man y places, the upper portion of the soil B-horizon has been completely stripped away. (In our search to find undisturbed soil B-horizon, a backhoe trench was dug through the haul road that crosses the site in case the road fill had inadvertently buried intact cultural deposits. We found that the B-horizon had been removed by blading as the first step in road construction). The next underlying stratum is a soil horizon (BC) that is transitional between the B-horizon above and the unweathered C-horizon below. The boundaries between these soil horizons are often unclear and gradual; also, these horizons are weathering zones that develop naturally during and after the accretion of sediments by geologic processes. A few pieces of flaked stone were found in the top of the BC-horizon; the C-horizon lacks any cultural remains.

The evolutionary history of the landform can be roughly inferred from the stratigraphic evidence acquired during excavation of archeological test units and backhoe trenches. Following retreat of the Cordilleran ice sheet, sometime in the late Pleistocene or early Holocene (ca. 9,000-11,000 years ago), clay was deposited in a lacustrine environment. This clay stratum was encountered at the bottom of some of our excavation units and in a backhoe trench. This deposit appears to be the same one encountered during excavation of two archeological sites located ca. 1 km to the north, just across the international border (Rousseau 1989). At the same time, or immediately thereafter, fluvial sand and gravel layers were deposited over the clay stratum by Howlett Cr. as it built a low-gradient alluvial fan. After the lake disappeared, the Skagit River began to cut through the valley deposits and lower its base level. It was during this time that either the Skagit River or Howlett Cr., or both, eroded the distal end of the alluvial fan and created the escarpment that forms the landform's western boundary. Eventually Howlett Cr. abandoned its original channel and ceased to deposit alluvial sediments on the fan surface. Except for moderate accumulation of wind-blown silts, the fan surface stabilized and soil horizons developed as the surface sediments weathered. It is likely that all of these events likely occurred prior to 8,000 years ago. It was at this time that the landform was first occupied by humans.

Conclusions and Assessment

Based on results of the test excavations, the cultural strata at 45WH79 appear to have been almost completely destroyed by shoreline processes and recreational uses. This result contrasts with the earlier interpretation of Grabert and Pint (1978:32) who thought that the site had experienced only minor erosion and that current reservoir levels tended to protect the site. Such a conclusion is incompatible with the evidence gathered from the site and with studies of reservoir effects to archeological sites. These show that the zone of maximum disturbance occurs where waves break along shorelines and shallow near-shore landforms (Lenihan et al. 1981; Ware 1989). Based on the excavation of two 1x1 m units, Grabert and Pint (1978) concluded that undisturbed

cultural strata extended to 50 cm in depth. Our 1991 excavations measured cultural deposits to only half this depth, suggesting that much erosion transpired between 1977 and 1991. This conclusion accounts for the greater abundance of artifacts scattered over a much larger area of the landform that has appeared since the mid-1980s, as compared with the late 1970s.

Grabert and Pint (1970) also considered the site to be significant because of its age. Based on the presence of Cascade type projectile points and the apparently high degree of weathering on some artifacts, they estimated the site was perhaps as old as 9,000 years. They further compared the site to two other early sites in the Fraser River Valley, DjRi-3 (Milliken) and DgRc-6 (Glenrose Cannery). Using data acquired from the site subsequent to Grabert and Pint's investigations, we do not disagree with this assessment as far as it goes; however, based on the full range of time-sensitive artifacts types recovered from the site, it is our belief that all prehistoric time periods are represented at the site. Furthermore, it is likely that prior to destruction of the cultural deposits at the site, these different periods of occupation may have been stratigraphically separated, either vertically or horizontally, in the sedimentary matrix -- the site appears to have more than one component. It is likely that the site was repeatedly occupied as a seasonal hunting camp by small groups of foragers. These groups used the locally abundant stone material to make their tools and brought with them tools already made of lithic materials from other sources outside of the valley.

The site is assessed as ineligible for inclusion in the National Register of Historic Places. The site lacks integrity of setting, and the artifacts and cultural deposits lack integrity of location and association. However, the site may contribute information through the presence on the eroded site surface of culturally or temporally diagnostic artifact types. It is suggested that annual monitoring and controlled surface collection of selected artifact types be conducted. The artifacts should be cataloged and added to the existing site collection.

11.2.2 45WH227 (FS#44) Hozomeen Creek #1

Site Setting

This site is located at the north end of Ross Lake on the east side of the valley. It is 10 m north of the present course of Hozomeen Cr. with an elevation of 486 m (1595 ft), the site is situated on a nearly flat alluvial fan surface deposited by Hozomeen Cr.. The creek has subsequently bisected the alluvial fan by cutting and lowering its modern channel into the fan deposits. The site has a western solar exposure, and faces the broad, flat flood plain of the Skagit River and beyond, to the steep western valley wall formed by the lower shoulders of the Mt. Spickard massif. The artifact scatter defining the site is relatively circular and conforms to the northern half of the bisected alluvial fan surface. The site is bordered on the west and north by the erosionally truncated fan escarpment, on the east by an abandoned logging haul road, and on the south by the

channel of Hozomeen Cr.. The alluvial fan surface is elevated about 7 m above the adjacent Skagit River flood plain.

Reservoir erosion, logging, and logging haul road construction in the drawdown zone have been the primary sources of historic disturbance to the site. This began with reservoir clearing in the 1940s prior to impoundment of water behind Ross Dam. Immediately following inundation, the soil and artifact-bearing deposits at the site were eroded by reservoir shoreline processes. Erosion from Hozomeen Cr. has modified the periphery of the site area. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of a mature conifer forest.

General Site Description

Site dimensions are approximately 100 m north-south, and 80 m east-west. They encompass an area 8,000 m^2. Artifact depth, determined during testing, ranged from 0 to 40 cm below the surface. The average depth of artifact-bearing deposits at the site is 24 cm, giving an estimated volume of cultural deposits of 1920 m^3. The site is characterized as a moderate-density lithic scatter. Artifacts were generally scattered across the entire landform, though several discrete, higher density concentrations were observed. The types of artifacts present are formed tools and debitage. No defined features have been identified at the site. The proportion of different lithic material types at the site matches closely those at 45WH79, located about 800 m to the north. Metasediment dominates the lithic assemblage, followed by Hozomeen chert. There are very low frequencies of quartz crystal and Allenby chert. Cluster areas represent reduction loci of metasediment and Hozomeen chert cobbles.

Testing Methods and Rationale

This site was first recorded during a reconnaissance survey conducted in April, 1987 (Mierendorf 1987a). Five artifacts were collected from the surface at this time. The site was further documented in 1988 during the survey portion of this project, at which time it was mapped, and five artifacts were collected from the surface. The site was test excavated in 1989 with four 1x1 m test units and one 2x2 m shovel skim unit. In addition, an extensive surface collection of 97 items was made, including a large quantity of debitage from one cluster, four chronologically diagnostic artifacts, and nondiagnostic formed tools (Table 11.3). Site deposits were excavated in 10 cm levels and screened through 1/4 in wire mesh. Test units were located to determine the horizonal and vertical extent of undisturbed cultural deposits.

Table 11.3 Inventory of Surface Collections from 45WH227

	NCCA
1 Flake, Edge Modified, Metasediment	6327
1 Scraper, Hozomeen Chert	6328
1 Biface, Jasper	6329
1 Biface/Knife, Allenby Chert	6330
1 Scraper, Metasediment	6331
1 Projectile Point, Metasediment	6369
1 Projectile Point, Metasediment	6375
1 Projectile Point, Basalt	6376
1 Flake, Metasediment	6939
1 Projectile Point, Metasediment	6940
1 Core, Metasediment	6941
1 Biface, Metasediment	6942
1 Flake, Metasediment	6943
1 Debitage, Hozomeen Chalcedony	6944
1 Debitage, Hozomeen Chert	6945
1 Flake, Edge Modified, Metasediment	6946
1 Flake, Edge Modified, Metasediment	6947
1 Flake, Hozomeen Chert	6948
1 Core, Metasediment	6949
2 Debitage, Metasediment	6950
2 Debitage, Metasediment	6951
3 Debitage, Metasediment	6952
2 Debitage, Hozomeen Chert/Metasediment	6953
4 Debitage, Metasediment	6954
3 Debitage, Metasediment	6955
2 Debitage, Metasediment	6956
5 Debitage, Metasediment/Hozomeen Chalcedony	6957
2 Debitage, Metasediment	6958
19 Debitage, Metasediment/Hozomeen Chert	6959
4 Debitage, Metasediment	6960
3 Debitage, Metasediment/Hozomeen Chert	6961
3 Debitage, Metasediment	6962
4 Debitage, Metasediment	6963
1 Flake, Metasediment	6964
1 Flake, Metasediment	6965
1 Flake, Metasediment	6966
1 Core, Metasediment	6967
1 Core, Metasediment	6968
1 Debitage, Metasediment	6969
1 Flake, Hozomeen Chert	6970

1 Flake, Metasediment	6971
1 Flake, Metasediment	6972
1 Flake, Metasediment	6973
1 Debitage, Metasediment	6974
1 Core, Metasediment	6975
1 Flake, Edge Modified, Hozomeen Chert	6976
1 Debitage, Metasediment	6977
1 Debitage, Metasediment	6978
1 Debitage, Metasediment	6979
1 Debitage, Metasediment	6980
1 Flake, Metasediment	6981
1 Tool, Andesite	6982
1 Flake, Metasediment	6983

Description of Testing Results

Cultural remains from the site consist of chipped stone flaking debris, formed tools, diagnostic artifacts, a hammerstone, and a bone fragment. A total of 97 artifacts was recovered from excavation units. Most of these artifacts were found on the surface or were incorporated into the reservoir deposits. A few pieces of debitage, one hammerstone, and one quartz crystal microblade core were recovered from a remnant of uneroded soil B-horizon. The site sediments have sustained massive disturbance from the effects of wind-generated waves breaking against the alluvial fan surface whenever the reservoir level has been at or near full pool elevation. Although the original (pre-logging) depth of most of the artifacts below the ground surface is unknown, the few artifacts recovered from *in situ* deposits suggest they were shallowly buried under the layer of forest duff and woody debris. No features, clearly-defined cultural strata, or strata of prehistoric cultural origin were observed.

Diagnostic artifacts from this site include the microblade core and four projectile points collected from the surface. One of the points is classified as Type 3B which dates between 9,000 and 4,000 years BP (Appendix D). Three of the points are classified as Types 10A, 11A, and 11B, which date between 4,000 and 1,500 years BP (Appendix D). All are made from locally available metasediment and basalt rocks. One Allenby chert biface (a knife) was collected from the surface. Six metasediment flake cores were collected. Some of these cores had river-rolled cortex, suggesting that they were procured from nearby river or glacial gravels. Six scrapers and edge-modified flakes made of metasediment and Hozomeen chert were also recovered from the site.

The artifact assemblage is similar to that recorded for 45WH79, located about 0.8 km to the north. The assemblage from 45WH227 differs, however, in having a lower lithic raw material diversity, few fire-modified rocks, lower frequencies of flaked cobbles and spalls representing reduction of river cobbles, and few if any pressure flakes.

The following table shows, by level, all cultural material excavated from test units at this site.

Table 11.4 Cultural Material From Excavation Units at 45WH227

		NOCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	2 Debitage, Metasediment	7237
L:2 (10-20 cm BS)	1 Flake, Metasediment	7238
L:3-5 (20-50 cm BS)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Bone Fragment, Unidentifiable	7674
L:2 (10-20 cm BS)	0 Collections	
L:3 (20-30 cm BS)	1 Flake, Metasediment	7239
	1 Microblade Core, Quartz Crystal	7240
L:4 (30-40 cm BS)	1 Flake, Quartz Crystal	7241
L:5-7 (40-70 cm BS)	0 Collections	
test unit: 3 (1x1 m)		
L:S (surface)	2 Debitage, Hozomeen Chert	7244
L:1 (0-10 cm BS)	4 Debitage, Hozomeen Chalcedony/Metasediment	7243
	Tephra, Mazama O	7710
L:2 (10-20 cm BS)	1 Hammerstone, Granitic	7242
	4 Debitage, Hozomeen Chert, Metasediment	7245
L:3-5 (20-50 cm BS)	0 Collections	
test unit: 4 (2x2 m)		
L:S (surface)	1 Flake, Metasediment	7246
	1 Flake, Metasediment	7247
	1 Flake, Metasediment	7248
	1 Flake, Metasediment	7249
	1 Flake, Metasediment	7250
	1 Flake, Metasediment	7251
	1 Flake, Unknown	7252
	1 Flake, Metasediment	7253
	1 Flake, Metasediment	7254
	1 Flake, Metasediment	7255
	1 Flake, Metasediment	7256
	1 Flake, Metasediment	7257
	1 Flake, Metasediment	7258
	1 Flake, Metasediment	7259

	6 Debitage, Metasediment	7260
L:1 (0-10 cm BS)	Quad A: 14 Debitage, Hozomeen Chert, Metasediment, Quartz Crystal	7261
	Quad B: 5 Debitage, Metasediment	7262
	Quad D: 1 Core, Metasediment	7263
	Quad D: 27 Debitage, Hozomeen Chert, Metasediment	7264
	Quad C: 7 Debitage, Metasediment	7265
L:2 (10-20 cm BS)	0 Collections	
	Quad D: 2 Debitage, Hozomeen Chert	7266
test unit: 5 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	2 Debitage, Quartz Crystal, Metasediment	7267
L:2 (10-20 cm BS)	1 Flake, Quartz Crystal	7268
L:3-6 (20-60 cm BS)	0 Collections	

Site Chronology

No charcoal considered reliable for radiocarbon dating purposes was encountered during the test excavations. Small, scattered pockets of a silty, light gray tephra were noted in two of the test units. A sample from one of these was collected and submitted for electron microprobe analysis to identify its source. This sample was located 5-10 cm below the eroded alluvial fan surface within the top of the soil B-horizon. The glass chemistry of the sample matches closely the signature for Mt. Mazama tephra layer O, from about 6,800 years BP (Table 11.5). From this same level four pieces of debitage were recovered, and in the next level below, a granitic hammerstone and four more pieces of debitage were recovered. The sample appeared to be clean and unmixed, but it was not removed from a continuous, well-defined tephra layer. As a consequence, it is uncertain if the tephra was in a primary or secondary depositional context. Based on this identification of the tephra sample and its geological context, all that can be concluded is that the debitage from under the tephra sample may be older or younger than 6,800 years BP.

Table 11.5 Table Of Identified Tephra from 45WH227

test unit	LEVEL	NOCA	VENT	AGE YBP
TU3	L-1	7710	Mazama O	6,800

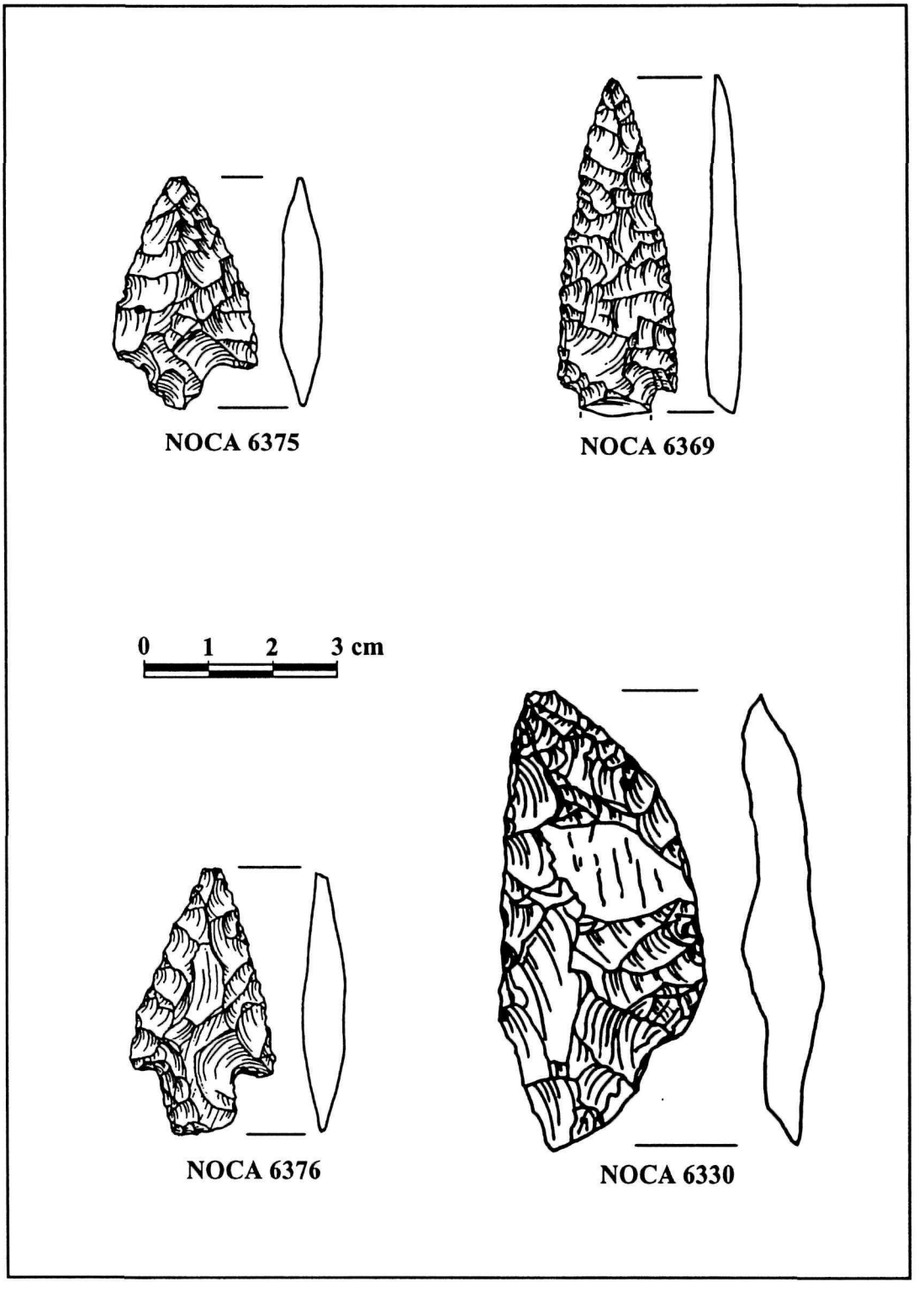


Figure 11.3 Artifact illustrations from 45WH227 (FS#44)

Another age estimate for the site is based on chronologically sensitive artifact morphologies. As noted earlier, one of the points is classified as Type 3B ("Cascade/Olcott") which dates between 9,000 and 4,000 years BP and three of them are classified as Types 10A (Rabbit Island Stemmed), 11A (Columbia Corner-Notched), and 11B (Quilomene Bar Corner-Notched), which date between 4,000 and 1,200 years BP (Figure 11.3 and Appendix D). Given the lack of precision inherent in interpreting the tephra sample, the probable age of the site is between 9,000 and 1,200 years BP.

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 11.4. Across most of the site area the ground surface consists of a sandy reservoir deposit (modern in age, no older than about 50 years). The artifacts resting on and in this deposit remained here after the fine-grained sedimentary matrix that once supported them was removed by wave erosion. As a result, these artifacts lack integrity of location and association. This reservoir deposit is discontinuously distributed across the alluvial fan surface, and it ranges from nonexistent to 20 cm thick in test excavation units. In some parts of the site, erosion has partially removed and exposed the soil B-horizon at the ground surface.

Discontinuously scattered below the reservoir deposit is an organic layer, consisting of charred wood fragments and forest litter, that marks the original ground surface prior to reservoir clearing. In most areas this layer has been stripped by erosion which has proceeded some depth into the weathered, reddish brown, sandy soil B-horizon. As noted above, within this B-horizon are scattered lenses of Mt. Mazama O tephra. The next underlying stratum is the BC-horizon which contains lenses of alluvial fan gravels, as does the underlying C-horizon. The lowermost stratigraphic unit consists of river cobbles. Cultural material was found only on the surface, throughout the reservoir deposits, and in the top of the B-horizon.

A generalized depositional history of the alluvial fan can be inferred from the stratigraphic sequence exposed in the test units. Initial building of the alluvial fan occurred by the rapid deposition of cobble-size river gravels, presumably from an early Holocene, ancestral channel of Hozomeen Cr.. Subsequently, as the creek channel braided across the fan surface, finer gravels and sands alternately accreted. Sometime later, during the mid-Holocene, sands and silts, including tephra from a 6,800 BP eruption of Mt. Mazama, were deposited on the fan surface by airfall deposition, and perhaps initially, by overbank deposition of Hozomeen Cr. However, fluvial deposition by the last of these processes is uncertain because sometime during the mid to late-Holocene, Hozomeen Cr. lowered its channel by downcutting into the alluvial fan deposits and abandoning the fan's upper surface.

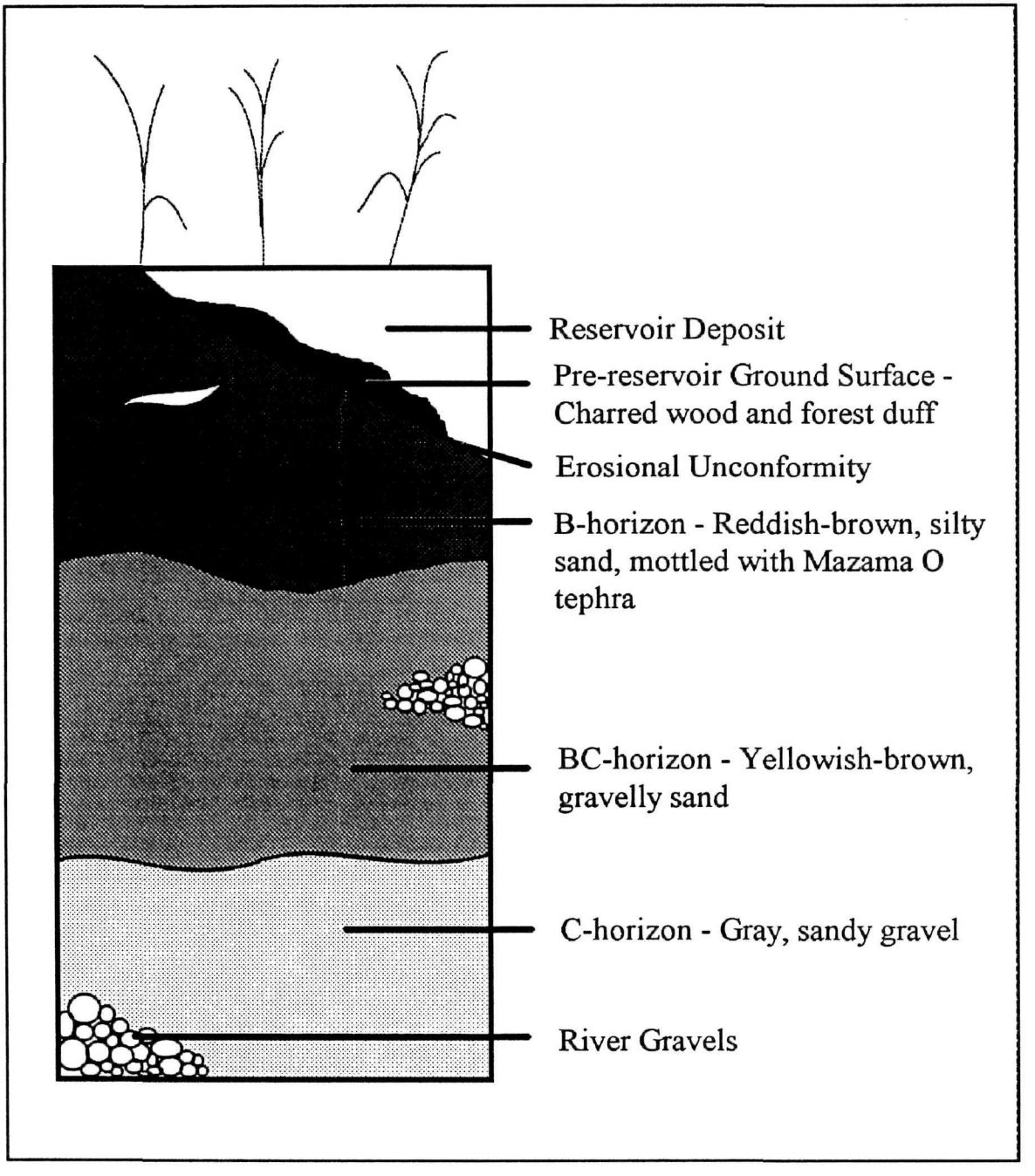


Figure 11.4 Generalized schematic of stratigraphy at 45WH227 (FS#44)

Conclusions and Assessment

The site appears to have served as a hunting camp during much of the Holocene (9,000 to 1,500 years ago). The periods of occupation were probably intermittent and of short duration, involving only a few individuals. The artifact assemblage is dominated by piercing, cutting, and scraping tools, which were used to kill and butcher game and to cure their hides. The flaking debris indicates that use was made of local metasediment and Hozomeen chert rocks to fashion some of the stone tools. One tool, a knife, was made of Allenby chert, which outcrops in the upper Similkameen River valley east of the crest of the Cascade Range and the project area. There exists little if any evidence to infer cooking of food.

The cultural deposits and artifacts at site 45WH227 appear to lack integrity of location and association. Cultural remains have been removed from their original context by logging activities associated with reservoir clearing, by wave erosion in a high energy, reservoir shoreline environment, and by the natural process of tree root disturbance. The site sediments have sustained massive disturbance from the effects of wind-generated waves breaking against the alluvial fan surface whenever the reservoir level has been at or near full pool elevation. The site is assessed as ineligible for inclusion in the National Register of Historic Places. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest. No additional work is recommended for this site.

11.2.3 45WH228 (FS#45) Hozomeen Cr. #2

Site Setting

This site is located a short distance south of 45WH228 on the same alluvial fan surface, but on the opposite (southern) side of Hozomeen Cr.. It is approximately 30 m northwest of Government Dock (Hozomeen Cr. Campground boat ramp). The elevation of the site is 485 m (1590 ft) asl and the alluvial fan surface has a gentle (0-3%) slope. Like the northern segment of the fan, dam construction including clearing of vegetation on land that was to be inundated and logging haul road construction along the eastern edge of the site are the primary sources of disturbance. Subsequent construction of a boat launch ramp at the eastern edge of the fan resulted in additional disturbances to the site. The pre-reservoir vegetation, as evident from the remaining stumps and historic photographs of the area, consisted of a mature conifer forest.

The artifact scatter defining the site is roughly oblong and conforms to a remnant of the southern half of the bisected alluvial fan surface. The site is bordered on the west by the erosional escarpment of the distal end of the alluvial fan, on the north by Hozomeen Cr., on the east by an abandoned logging haul road, and on the south by a

shallow, abandoned channel of Hozomeen Cr. The alluvial fan surface is elevated about 6 m above the adjacent Skagit River flood plain.

General Site Description

The site dimensions are 100 m east-west and 30 m north-south, encompassing an area of 3,000 m^2. Artifact depth, determined during testing, ranged from 0 cm (top of ground) to 60 cm below ground surface, with an average depth of about 25 cm. The estimated volume of artifact-bearing deposits across the entire site is 750 m^3. Artifacts recovered to a depth of 10 cm below surface are in a disturbed context within reservoir deposits. The site is characterized as a moderate-density scatter of lithics and burned bone fragments. The types of artifacts present are formed tools, debitage, hammerstones, cores, and fire-modified rock fragments. The lithic raw material types range from a high proportion of locally available metasediments and Hozomeen chert to minor proportions of exotic jasper, chalcedony, and an igneous (probably basalt) material. Tephra and charcoal samples were collected during excavation and one of each was submitted for analysis.

Testing Methods and Rationale

This site was recorded during a reconnaissance survey conducted in April of 1987 (Mierendorf 1987a). The site was more thoroughly documented by project crew members in 1988 during the survey portion of this project. As part of this documentation, the site was mapped and three artifacts were collected from the surface. Four artifact clusters were identified at this time. The site was again surface collected in 1989, when exotic lithic debitage, diagnostic and formed tools, and faunal remains were found (Table 11.6). Also in 1989, six 1x1 m test units were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. One test unit was placed within a scatter of calcined bone to determine the stratigraphic context and extent of disturbance to this feature. Other test units were placed to locate undisturbed cultural deposits and to determine the horizontal and vertical boundaries of the site.

Table 11.6 Inventory of Surface Collections from 45WH228

	NCCA
1 Preform, Allenby Chert	6361
1 Flake, Vitrophyre	6365
1 Projectile Point, Metasediment	6378
1 Flake, Quartz Crystal	7045
1 Flake, Quartz Crystal	7046
1 Debitage, Jasper	7047
1 Biface, Metasediment	7048
1 Scraper, Allenby Chert	7049

1 Flake, Edge Modified, Hozomeen Chert	7050
1 Projectile Point, Metasediment	7051
1 Flake, Quartz Crystal	7052
1 Flake, Quartz Crystal	7053
1 Flake, Quartz Crystal	7054
1 Flake, Quartz Crystal	7055
1 Flake, Edge Modified, Hozomeen Chert	7056
1 Flake, Quartz Crystal	7057
1 Flake, Edge Modified, Hozomeen Chert	7617
1 Bone, Medium Mammal, Calcined, Ulnar Notch	7671
1 Bone, Beaver (*Castor canadensis*)	7672

Description of Testing Results

Cultural remains from the site consist of chipped stone flaking debris, formed tools, diagnostic artifacts, a hammerstone, and small fragments of calcined mammal bone. A total of 26 chipped stone artifacts and 71 bone fragments was recovered from excavation units. Most were found on the eroded site surface or were incorporated within the thin mantle of reservoir deposits. About 8 flakes and 16 bone fragments were recovered from within the top of the soil B-horizon, but given the high degree of disturbance in the site deposits, some of the B-horizon remnants are likely to have been displaced from their original location. The site sediments have sustained massive disturbance from the effects of wind-generated waves breaking against the alluvial fan surface whenever the reservoir level has been at or near full pool elevation. The original (pre-logging) depth of most of the artifacts below the ground surface is unknown, but the few artifacts recovered from *in situ* deposits suggest they were shallowly buried under the layer of forest duff and woody debris. The evidence also suggests that the artifact-bearing deposits may have been massively disturbed prior to reservoir effects by natural processes. No features, clearly-defined cultural strata, or strata of prehistoric cultural origin were observed.

Three diagnostic artifacts were recovered from the site surface. These consisted of a Type 3B (Cascade/Olcott) point and a Type 11B (Quilomene Bar Corner-Notched) (Figure 11.5), both manufactured of a locally available variety of metasediment. The third item consists of a microblade core manufactured from a quartz crystal excavated from reservoir deposits. Other artifacts include one biface/preform and a crescent shaped scraper made of Allenby chert.

Exotic (nonlocal) raw material types were analyzed to determine source location. One vitrophyre flake (NOCA 6365) was collected from the surface and was submitted for XRF analysis. A chemical signature from the flake did not match any known source; however, it did match the signature derived from three other flakes which came from sites 45WH79, 45WH234, and 45WH255. The macroscopic characteristics of these

specimens closely resemble those reported for a vitrophyre source in North Cascades National Park (Mierendorf 1987b). Other as yet unknown sources are also suspected. Detailed results of this analysis is reported in section 10.7 and Appendix G of this report. As noted earlier, two artifacts from the site assemblage were manufactured of Allenby chert, which comes from a source in the upper Similkameen River drainage to the northeast (Vivian 1989).

Test unit 2 was excavated within a scatter of calcined mammal bone fragments. Although severely disturbed by reservoir wave action, this scatter marks the approximate location of a food processing feature. Due to the fragmentary nature of the of the faunal remains, few pieces were identifiable. Skeletal elements and identified parts included skull fragments of a small mammal, three incisor teeth fragments of a rodent, three small mammal bone fragments, and three hypsodont teeth fragments. Teeth with hypsodont morphology are characteristic of ungulates such as mountain goat and mountain sheep, among others. The only identifiable bone fragment from the site was a broken, calcined epiphysis attached to the shaft and found on the surface. This bone was identified as the left metatarsal of a beaver (*Castor canadensis*). The fragmentary nature of the bones may be evidence that they were intentionally crushed in order to extract the marrow and to boil out and collect bone grease. If the teeth were brought to the site without first being removed from the jaw, it would indicate that the animal skull was also brought to the site, which in turn suggests that the animal was killed nearby, or at least had not been transported a long distance from the kill site.

Table 11.7 shows all cultural material collected from excavation units, by level, from the site.

Table 11.7 Cultural Material From Excavation Units at 45WH228

test unit: 1 (1x1 m)		NCCA
L:S (surface)	2 Bone Fragments, Unidentifiable	7675
	2 Debitage, Quartz Crystal	7223
L:1 (10-20 cm BD)	2 Debitage, Quartz Crystal, Metasediment	7220
	1 Microblade Core, Quartz Crystal	7219
L:2-3 (20-40 cm BD)	0 Collections	
L:4 (40-50 cm BD)	1 Flake, Quartz Crystal	7221
L:5 (50-60 cm BD)	0 Collections	
L:6 (60-70 cm BD)	1 Flake, Quartz Crystal	7222
L:7 (70-80 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	28 Bone Fragments: 21 Unidentifiable; 1 Skull Fragment, Small Mammal; 3 Incisor Fragments, Rodent; 3 Fragments, Hypsodont	

	Teeth	7678
	11 Bone Fragments, Unidentifiable	7679
L:1 (10-20 cm BD)	2 Debitage, Hozomeen Chert	7225
	14 Bone Fragments, Unidentifiable	7677
L:2 (20-30 cm BD)	1 Flake, Chalcedony	7224
	16 Bone Fragments: 13 Unidentifiable; 3 Small Mammal	7676
L:3-6 (30-70 cm BD)	0 Collections	
test unit: 3 (1x1 m)		
L:S (surface)	1 Biface, Metasediment	7227
	1 Flake, Edge modified, Hozomeen Chert	7228
L:1 (10-20 cm BD)	2 Debitage, Hozomeen Chert	7230
	1 Hammerstone, Andesite	7226
L:2 (20-30 cm BD)	1 Flake, Metasediment	7229
	1 Flake, Hozomeen Chert	7231
	1 Tephra, Source Unknown	7711
	Tephra, Mt. St. Helens W	7712
L:3 (40-50 cm BD)	^{14}C, 310±70 BP, Beta 33508	
test unit: 4 (1x1 m)		
L:S (surface)	2 Debitage, Hozomeen Chert	7234
L:1 (10-20 cm BD)	4 Debitage, Hozomeen Chert	7235
L:2 (20-30 cm BD)	1 Flake, Unknown	7233
L:3-4 (30-50 cm BD)	0 Collections	
L:5 (50-60 cm BD)	1 Flake, Edge Modified, Metasediment	7232
test unit: 5 (1x1 m)		
L:S (surface)	1 Tephra, Source Unknown	7716
L:1-4 (10-50 cm BD)	0 Collections	
test unit: 6 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Flake, Metasediment	7236
L:2-4 (20-50 cm BD)	0 Collections	

Site Chronology

Three independent techniques were used in an attempt to date the artifact assemblage and the periods of site use. The first consists of the age estimates from the chronologically sensitive projectile points. These consisted of a Type 3B (Cascade/Olcott) point, with an age range of 9,000-4,000 years BP, and a Type 11B (Quilomene Bar Corner-Notched), which has an age range of 3,000-2,000 years in the

Columbia Plateau of eastern and central Washington and a range of 2,400-1,200 in the Canadian Plateau.

A sample of charcoal excavated from test unit 3 was submitted for radiocarbon dating. No cultural material was found in the same level as the sample, but some was found on the test unit surface and in levels 1 and 2 above the sample. The sample is not known to be cultural in origin. It was removed from a layer of burned organic debris mixed with a yellowish-brown, gravelly silt soil B-horizon. The date is given in Table 11.8.

Table 11.8 Table Of ^{14}C Dates from 45WH228

test unit	LEVEL	LAB #	UNCORRECTED DATE YBP
TU3	L-3	Beta 33508	310±70

Discontinuous lenses and mottles of a light gray, silty volcanic ash were found scattered within the upper B-horizon in test unit 3. A sample of this tephra excavated from level 2 of the test unit was submitted for electron microprobe analysis with the results as shown in the table below. Although the sample appeared to be clean and unmixed, it did not form a continuous, well-defined layer. It is therefore uncertain if the tephra was in a primary depositional context.

Table 11.9 Table Of Identified Tephra from 45WH228

TU	Level	NOCA#	Vent	AGE YBP
TU3	L-2	7712	St. Helens W	500

The Mt. St. Helens W tephra sample was removed from 10 cm below the ground surface, while the 310±70 BP radiocarbon sample was removed from 24 cm below the ground surface. It was stratigraphically below the mottles of tephra. Because younger material should overlie older material, these two dates appear to be in reversed order. Any number of occurrences or conditions could explain this result. For example, the ash may be a secondary deposit that postdates 310 radiocarbon years ago, or the ash could be a primary deposit, with the radiocarbon date representing a tree root that had grown under the ash and burned. Whatever the explanation, the reversal of the dates supports the stratigraphic evidence for a disturbed and mixed soil profile for most of the site. Neither the tephra date nor the radiocarbon date appear to be useful for dating the cultural occupations of the site. Based on the time-sensitive projectile point

morphologies, the site appears to have been occupied sometime between 9,000 and 1,200 years ago, and possibly even later.

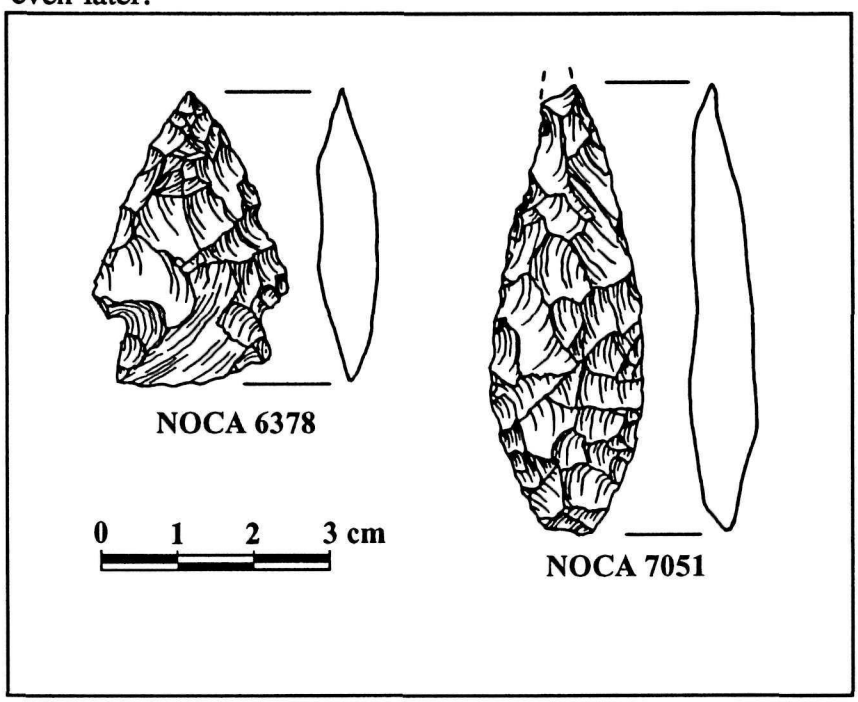


Figure 11.5 Artifact illustrations from 45WH228 (FS#45)

Site Stratigraphy

The generalized site stratigraphic sequence is as follows: the uppermost stratum is a dark yellow-brown (10 YR 3/6 m), weakly stratified to massive, sandy loam reservoir deposit that is about 10 cm thick. It overlies a mottled, black (10 YR 2/0 m), dark brown (7.5 YR 3/4 m), and dark yellowish brown (10 YR 4/4 m) silt loam mixed with charred bark, branches, and duff. Underlying this layer, in turn, is a mottled, mixed B-horizon consisting of silt loam to fine sandy loam with charcoal chunks and flecks. The mixing agent appears to be tree root penetration and tree tip-ups. Beneath the mixed, disturbed B-horizon are grayish brown, poorly sorted gravelly sands which constitute the soil C-horizon. The gravel fraction in the stratigraphic sequence was contributed by Hozomeen Cr. during accretion of the alluvial fan. Such alluvial fan growth often occurs as the stream channel braids across the fan surface and is accompanied by channel cutting, bank erosion, and channel filling and abandonment. This natural process may also contribute to the shifting and displacement of soil horizons and to the erosion and redeposition of volcanic ashes. It thus appears that a variety of modern cultural and natural factors have combined to disturb the physical integrity of the artifact-bearing deposits at the site.

The depositional history of the alluvial fan is as has been described for site 45WH227. The artifacts resting on the surface of 45WH228 and within the reservoir deposits were eroded from the fine-grained sedimentary matrix that once supported them. As a result, these artifacts lack integrity of location and association.

Conclusions and Assessment

Like site 45WH227, located on the other side of Hozomeen Cr. on the same alluvial fan surface (but possibly an older part of it), 45WH228 appears to have served as a hunting camp for people in this part of the valley during the early to late Holocene (1,200 to 9,000 years ago). Site occupations were probably intermittent and of short duration and involved only a few individuals. The artifact assemblage is dominated by piercing, cutting, and scraping tools used to kill and butcher game and to cure hides. The flaking debris indicates that use was made of local metasediment and Hozomeen chert rocks to fashion some of the stone tools. Tools made of Allenby chert, which outcrops in the upper Similkameen River valley to the northeast, suggest that people who occupied the site traded for this lithic material or traveled there for some part of the year. The use of vitrophyre as a lithic raw material suggests also that the people who occupied the site traveled through the more rugged portion of the North Cascades located west of this part of the Skagit River valley, the suspected source of this material. The presence of calcined bone fragments indicates that mammals were butchered, cooked, and possibly consumed at this site; however, the artifact assemblage from the site is too small to draw conclusions with confidence.

The cultural deposits and artifacts at site 45WH228 lack integrity of location and association. Cultural remains have been removed from their original context by logging activities associated with reservoir clearing (possibly including brush piling and burning), by wave erosion in a high energy, reservoir shoreline environment, by the natural process of tree root disturbance, and possibly by stream erosion. The site is assessed as ineligible for inclusion in the National Register of Historic Places. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest. No additional work is recommended for this site.

11.2.4 45WH229 (FS#46) Three Rocks

Site Setting

This site is located on the east side of the valley, at the north end of the project area near Hozomeen Creek Campground. It is approximately 350 m north of a log cribbed structure known as East Landing. The site is situated on a small, nearly flat (0-3% slope) terrace remnant at an elevation of about 482 m (1,580 ft) asl. It is elevated about 9 m (30 ft) above the Skagit River flood plain. The landform has a western solar exposure which faces toward the flat flood plain of the Skagit River and beyond to the western valley wall. This wall is bisected by the broad tributary valley of Silver Cr. where it joins the main Skagit River valley. The site is bordered on the west by a steep erosional escarpment, on the north and east by sloping escarpments that rise to the next higher terrace level, and on the south by a seasonal snowmelt gully.

Logging of the drawdown area and reservoir erosion have been the primary sources of historic disturbance to the site. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of a mature stand of conifers with some stumps measuring 1 m dbh. A notable feature of the site is three large angular boulder blocks resting adjacent to each other on the landform surface.

General Site Description

The site dimensions are 100 m north-south and 20 m east-west, covering an area of 2,000 m^2. Artifact depth, determined during testing, ranged from 0 cm to 40 cm below the surface (only in one test unit did artifacts extend to 40 cm in depth). The average depth of artifacts is estimated at 10 cm. The estimated volume of cultural deposits at the site is 200 m^3. Artifacts excavated from the upper 10 cm of the deposits are disturbed and have been incorporated within a reservoir deposited layer. The site is characterized as a moderate-density lithic scatter, and at the time of discovery had four prominent fire-modified rock clusters visible on the eroded site surface. Artifact categories present at the site are projectile points, formed tools, debitage, cores, fire-modified rocks, and calcined faunal remains. The lithic material types in the chipped stone assemblage consist of a high proportion of locally available Hozomeen chert, Hozomeen chalcedony, and metasediment. A small proportion of exotic chalcedony, basalt, and obsidian also occur.

Testing Methods and Rationale

This site was first recorded during a reconnaissance survey conducted in April, 1987 (Mierendorf 1987a). Three artifacts were collected from the surface at this time. Surface collections were made again and the site tested in the 1989 and 1991 field seasons, followed by additional surface collections in 1990 and 1992. During the 1989 field season a 1x1 m test unit, a 2x2 m unit, and a large block shovel skim area comprised of 15 1x1 m test units were excavated. Excavation was by 10 cm levels and sediments were screened through 1/4 in wire mesh. Artifacts on the surface were collected and their provenience recorded on the block area grid. Each 1x1 m unit within the grid was excavated to 10 cm below ground surface. The test excavations during the 1991 field season were specifically designed to locate any undisturbed cultural deposits and tephra layers that may have been preserved in locations immediately adjacent to the three boulders. Two excavation units (test units 4 and 5, each 1x0.5 m) were placed alongside the boulders in locations that appeared to be protected from reservoir erosion processes. One poorly preserved lens of tephra was recognized at 25-30 cm below surface, but this ash was not submitted for identification. No artifacts were recovered from these test units.

Table 11.10 Inventory of Surface Collections from 45WH229

	NOCA
1 Blade, Exotic Chalcedony	6333
1 Projectile Point, Basalt	6334
1 Projectile Point, Metasediment	6335
1 Scraper, Exotic Chalcedony	7036
1 Projectile Point, Metasediment	7037
1 Projectile Point, Metasediment	7923
1 Biface, Hozomeen Chert	10374
1 Biface, Hozomeen Chert	10445
1 Biface, Hozomeen Chert	10446

Description of Testing Results

Cultural remains from the site consist of chipped stone flaking debris, formed tools, diagnostic artifacts, and charred bone fragments. A total of 2,128 artifacts was recovered from excavation units: 1,984 of these are chipped stone remains comprised almost entirely of debitage, and 144 of these are burned animal bone fragments. Almost all of these were found on the eroded surface or were incorporated into the thin mantle of reservoir deposits; only 15 pieces of flaked stone were recovered from intact sediments below the reservoir deposits. The site surface, particularly the leading (western) edge of the terrace, has sustained extensive disturbance from the effects of wind-generated waves breaking against the sloping terrace edge during annual lowering and raising of the reservoir level. The erosive effects of the waves are exacerbated by the site's location on an unprotected landform, one that is exposed to unabated wind and waves. Although the original (pre-logging) depth below ground of the eroded artifacts is unknown, some of the artifacts are likely to have been buried more than 50 cm below the duff layer.

No clearly-defined prehistoric artifact layers or strata of prehistoric cultural origin were observed. Test unit 6 was positioned so that it could sample a pie-shaped quarter of the most prominent and dense fire-modified rock cluster observed at the site. All of the rocks defining the feature had eroded from their *in situ* matrix, presumably the reddish-brown B-horizon. They formed a lag deposit that rested on the soil BC-horizon. All excavated sediments in the feature were screened through 1/8 in mesh, but no artifacts other than fire-modified rocks were found. The locational and associational integrity of the feature has been destroyed.

Four projectile points constitute the assemblage of diagnostic artifacts from this site. One is a Type 3A made of basalt, the other a Type 3B made of metasediment (Cascade or Olcott) and both date between 4,000 and 9,000 years old. The other two

projectiles are arrow points manufactured from locally-available metasedimentary rock. They are classified as Type 15 (Columbia Plateau Side-Notched or Kamloops Side-Notched) which dates between 150 and 1,200 years ago.

Two unifacially flaked tools from the site surface are made of a milky white, lustrous, translucent chalcedony mottled with opaque brown bands. This lithic material is not locally available and was brought into the valley from another area. Chalcedonies of this color and quality are common in archeological sites along the Columbia River of central and southern Washington. Both items are blades, and the tool edge was made by steeply beveling one margin on the dorsal side of the blade. The majority of the flaked stone debitage at the site consists of small tertiary and pressure flakes of high quality Hozomeen chert and chalcedony.

The 144 calcined mammal bone fragments were found scattered across the eroded site surface and within the reservoir deposits; none were associated with a feature. Most were too fragmentary to retain articulating surfaces or other diagnostic morphology useful for identification of species or body part (Table 11.11). Two bones, however, were identifiable as to species. The first, NOCA 7670, is from test unit 1A of the block area excavation. Based on the morphology of the articular surface of the proximal end of a second phalanx, this is from a mountain goat (*Oreamnos americanus*). The other, NOCA 7669, is from test unit 1L and is a right proximal first phalanx, also of a mountain goat. In both pieces, the epiphysis was severed from the shaft after fusion, indicating that these bones were deliberately broken as part of the butchering process. The other bone fragments can be identified only as long bones from a medium-sized mammal.

Table 11.11 Cultural Material From Excavation Units at 45WH229

test unit 1 Dimensions: 5x3 m area grid with 15 1x1 m sections labeled alphabetically		**NOCA#**
subunit 1A: (1x1 m)		
L:1 (10-20 cm BD)	116 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7216
	6 Mammal bone, including 1 Oreamnos americanus	7670
L:2 (20-30 cm BD)	0 Collections	
L:3 (30-40 cm BD)	1 Biface, Hozomeen Chalcedony	7197
	1 Flake, Hozomeen Chalcedony	7198
	3 Debitage, Hozomeen Chert, Chalcedony	7199
	1 Flake, Hozomeen Chalcedony	7203
	1 Flake, Hozomeen Chalcedony	7204
	1 Flake, Hozomeen Chalcedony	7205
L:4 (40-50 cm BD)	6 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7202
L:5 (50-60 cm BD)	0 Collections	
L:6 (60-70 cm BD)	0 Collections	

subunit 1B: (1x1 m)		
L:1 (0-10 cm BS)	169 Debitage, Hozomeen Chert, Hozomeen Chalcedony,	
	12 Bone Fragments, Unidentifiable	7209
subunit 1C: (1x1 m)		
L:1 (0-10 cm BS)	167 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7218
	17 Bone Fragments, Unidentifiable	7694
subunit 1D: (1x1 m)		
L:1 (0-10 cm BS)	43 Debitage, Hozomeen Chert, Chalcedony, Metasediment	7194
	7 Bone fragments: 2 Unidentifiable; 5 Long Bone, Medium Mammal	7688
subunit 1E: (1x1 m)		
L:1 (0-10 cm BS)	40 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7210
	6 Bone Fragments, Unidentifiable	7692
subunit 1F: (1x1 m)		
L:1 (0-10 cm BS)	181 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7206
	14 Bone Fragments: 11 Unidentifiable; 3 Long Bone, Medium Mammal, Calcined	7684
subunit 1G: (1x1 m)		
L:1 (0-10 cm BS)	204 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7215
	26 Bone Fragments: 10 Unidentifiable; 16 Long Bone, Medium Mammal	7693
	1 Tephra Sample, Source Unknown	7713
subunit 1H: (1x1 m)		
L:1 (0-10 cm BS)	124 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7208
	14 Bone Fragments: 12 Unidentifiable; 2 Long Bone, Small to Medium Mammal	7682
subunit 1I: (1x1 m)		
L:1 (0-10 cm BS)	128 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7213
	1 Bone Fragment, Long Bone, Medium Mammal	7686
subunit 1J: (1x1 m)		
L:1 (0-10 cm BS)	156 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7214
	7 Bone Fragments: 5 Unidentifiable; 2 Long Bone, Medium Mammal	7689
subunit 1K: (1x1 m)		
L:1 (0-10 cm BS)	104 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7211
	1 Flake, Edge Modified, Hozomeen Chert	7212
	6 Bone Fragments, Unidentifiable	7687
subunit 1L: (1x1 m)		
L:1 (0-10 cm BS)	156 Debitage, Hozomeen Chert, Chalcedony	7195
	1 Core, Metasediment	7193
	7 Bone Fragments: 5 Unidentifiable; 1 Goat; 1 Long Bone, Medium Mammal	7669
subunit 1M: (1x1 m)		
L:1 (0-10 cm BS)	158 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7207

	13 Bone Fragments: 8 Unidentifiable; 5 Long Bone, Medium Mammal	7685
subunit 1N: (1x1 m)		
L:1 (0-10 cm BS)	138 Debitage, Hozomeen Chert, Hozomeen Chalcedony	7217
	1 Bone Fragment, Medium Mammal	7690
subunit 1O: (1x1 m)		
L:1 (0-10 cm BS)	79 Debitage, Hozomeen Chert, Chalcedony	7201
	5 Bone Fragments, Unidentifiable	7691
test unit 2: (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	5 Debitage, Hozomeen Chert	7200
	2 Bone, Unidentifiable	7680
	Tephra, Mazama O, Glacier Peak B, M, or G	7714
L:2-4 (20-50 cm BD)	0 Collections	
test unit 3: (L:1-10 1x1 m, L:11 1x0.4 m)		
L:S (surface)	0 Collections	
L:1-3 (10-40 cm BD)	0 Collections	
L:4 (40-50 cm BD)	Tephra, St. Helens Y, Glacier Peak B, M, or G, Mazama O	7726
L:5-11 (50-140 cm BD)	0 Collections	
test unit 4: (1x0.5 m)		
L:S (surface)	1 Tephra Sample, Source Unknown	10410
L:1 (0-10 cm BS)	0 Collections	
L:2 (10-20 cm BS)	1 Tephra Sample, Source Unknown	10411
	1 Tephra Sample, Source Unknown	10412
L:3-4 (20-40 cm BS)	0 Collections	
test unit 5: (1x0.5 m)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	0 Collections	
L:2 (5-10 cm BS)	1 Tephra Sample, Source Unknown	10413
	1 Tephra Sample, Source Unknown	10414
L:3-6 (10-45 cm BS)	0 Collections	
test unit 6: (L:S 2x2 m, L:1 1x1 m) Feature Present		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	0 Collections	

Site Chronology

No charcoal was encountered during excavation. The fire-modified rock cluster that was excavated in test unit 6 was entirely deflated onto the eroded site surface, where it rested as a lag concentrate by the time of the site's discovery and recording. No charcoal was found associated with this feature.

Of the eight tephra samples collected during excavation, two were submitted for identification based on the likelihood that they were primary deposits. The results of the electron microprobe analysis is given in Table 11.12.

The first sample (NOCA 7714) appears to be tephra layer O from a 6,800 BP eruption of Mt. Mazama in Oregon. The sample was removed from just below a thin, discontinuous, and mottled charcoal and organic lens, which lay under the reservoir deposits. As shown in the table, 2 of the 19 glass shards analyzed matched the chemical signature of Glacier Pk. tephra layers B, M, or G. The other sample (NOCA 7726) appears to be tephra layer Y from a ca. 3,500 BP eruption of Mt. St. Helens, although 2 of the 25 glass shards analyzed match Glacier Pk. tephra and 2 match Mt. Mazama tephra. This latter deposit occurred as a discontinuous lens mixed with soil B-horizon sediments. The mixing of glass shards from temporally and geographically

Table 11.12 Table Of Identified Tephra from 45WH229

TU	Level	NOCA#	Bulk Glass	Glass 1	Glass 2	Glass 3
TU2	L-1	7714	Mazama O	Glacier Pk B,M,G	N/A	N/A
Number of shards analyzed			17	2	-	-
TU3	L-4	7726	St.Helens Y	Glacier Pk B,M,G	Mazama O	
Number of shards analyzed			21	2	2	-

separate volcanic eruptions may be evidence that the tephra had been eroded from another location and redeposited at the site; however, this seems unlikely. Both tephra deposits, especially the one from which sample NOCA 7714 was removed, formed a discrete layer that was without doubt in a primary depositional context. At the same time, this layer has been mixed with underlying soil B-horizon sediments through bioturbation processes, the most obvious of these being small root penetration from trees and shrubs, and the filling in of voids in the soil matrix left after the decay of roots. Because this soil has developed in a loess deposit that mantles the glacial terrace, it is suspected that particles of glass from earlier volcanic eruptions have added to the loess

accumulation after being carried and dropped by wind currents. The extraneous tephra particles were mixed into the layer through bioturbation, and the tephra samples, however carefully they are collected, are likely to contain a very small proportion of such secondary ash particles.

The four diagnostic projectile points constitute the other source of data for

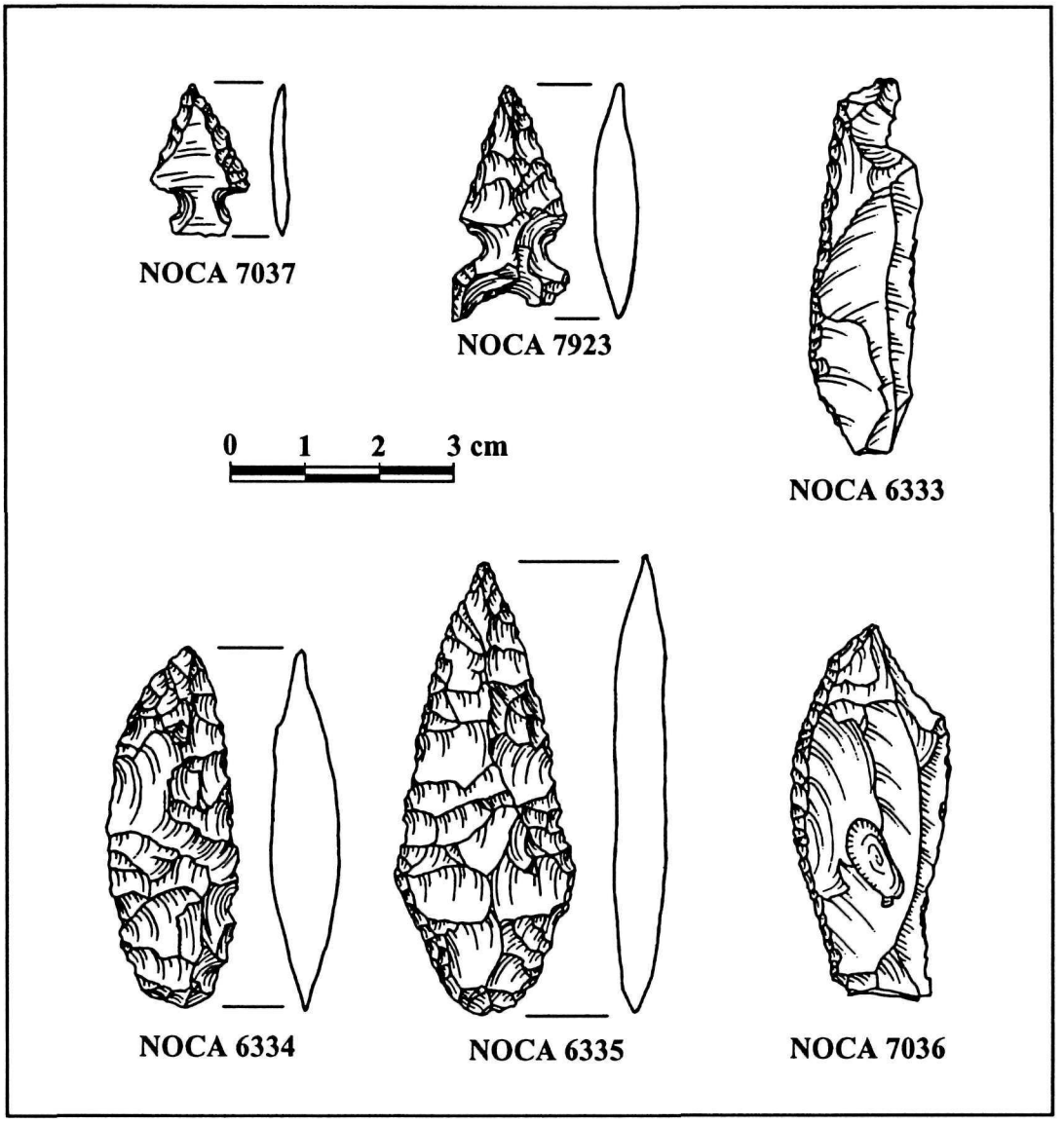


Figure 11.6 Artifact illustrations from 45WH229 (FS#46)

estimating the site's age (Figure 11.6). The Type 3 projectile points (Cascade or Olcott) suggest an occupation range between 4,000 and 9,000 years ago. The Type 15 arrow

points (Columbia Plateau Side-Notched or Kamloops Side-Notched) suggest an occupation range between 150 and 1,200 years ago. The latter of the two time periods agree with the excavation results, which showed that artifacts were deposited stratigraphically above the two identified volcanic ashes. These findings suggest that the site is younger than 3,500 years old. This is not necessarily in disagreement with the Type 15 projectiles, which may date to Middle prehistoric time periods (Appendix D).

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 11.7. Most of the site surface is covered by a thin, sandy reservoir deposit. Near the top of the landform, adjacent to the sloping terrace edge where southwesterly winds have caused the greatest erosion, upper soil horizons have been stripped away and the subsurface soil BC-horizon is exposed. The eroded soils have formed a wave-wave-deposited berm a few meters inland from these locations. Most of the debitage collected from the block area shovel skim units was concentrated in such shoreline berms.

In a few locations underlying the reservoir deposits is a discontinuous, dark brown to black lens consisting of forest duff, decayed vegetation, and charcoal. Beneath this unit, scattered across the site, are discontinuous lenses and mottles of at least two different tephra. One such tephra sample is tentatively assignable to the 6,800 BP eruption of Mt. Mazama. Another tephra sample, from a different part of the site, was interbedded within the upper B-horizon material and is tentatively assigned to the ca. 3,500 BP eruption of Mt. St. Helens. The tephra are interbedded within a dark yellowish-brown, silty sand soil B-horizon. The relatively high chroma and reddish hues of this soil suggest that the terrace surface possesses great age. The lowest stratigraphic unit at the site is a gray to olive-brown, gravelly, silty sand. The gravel fraction consists of pebbles and cobbles supported in the finer matrix.

Only the upper stratigraphic layers and deposits of the landform were sectioned in the excavated units. Based on the evidence, including the topographic and geomorphic setting of the landform, it appears that the terrace is the eroded remnant of what once was a much larger glacial landform. Following the disappearance of glacial ice from the valley and incision of the glacial valley fill by an ancestral Skagit River, the remnant terrace surface became somewhat stabilized. Soils began to develop and thicken through the slow accretion of silts and very fine sands suspended in air currents. At least three Cascade volcanos (Glacier Pk., Mt. Mazama, and Mt. St. Helens), either through primary or secondary airfall, contributed silt to very fine sand-sized tephra. The possible existence of a temporary, late-glacial or early Holocene lake in this part of the valley (see 45WH79 stratigraphy) and any associated lake deposits also may be a source of wind-worked dust. Finally, the flood plain and channel-marginal bars and islands of the braiding Skagit River provided silt and fine sand particles that were transported by wind to the top of the terrace. It was during this accretion of the fine-grained soil cap that

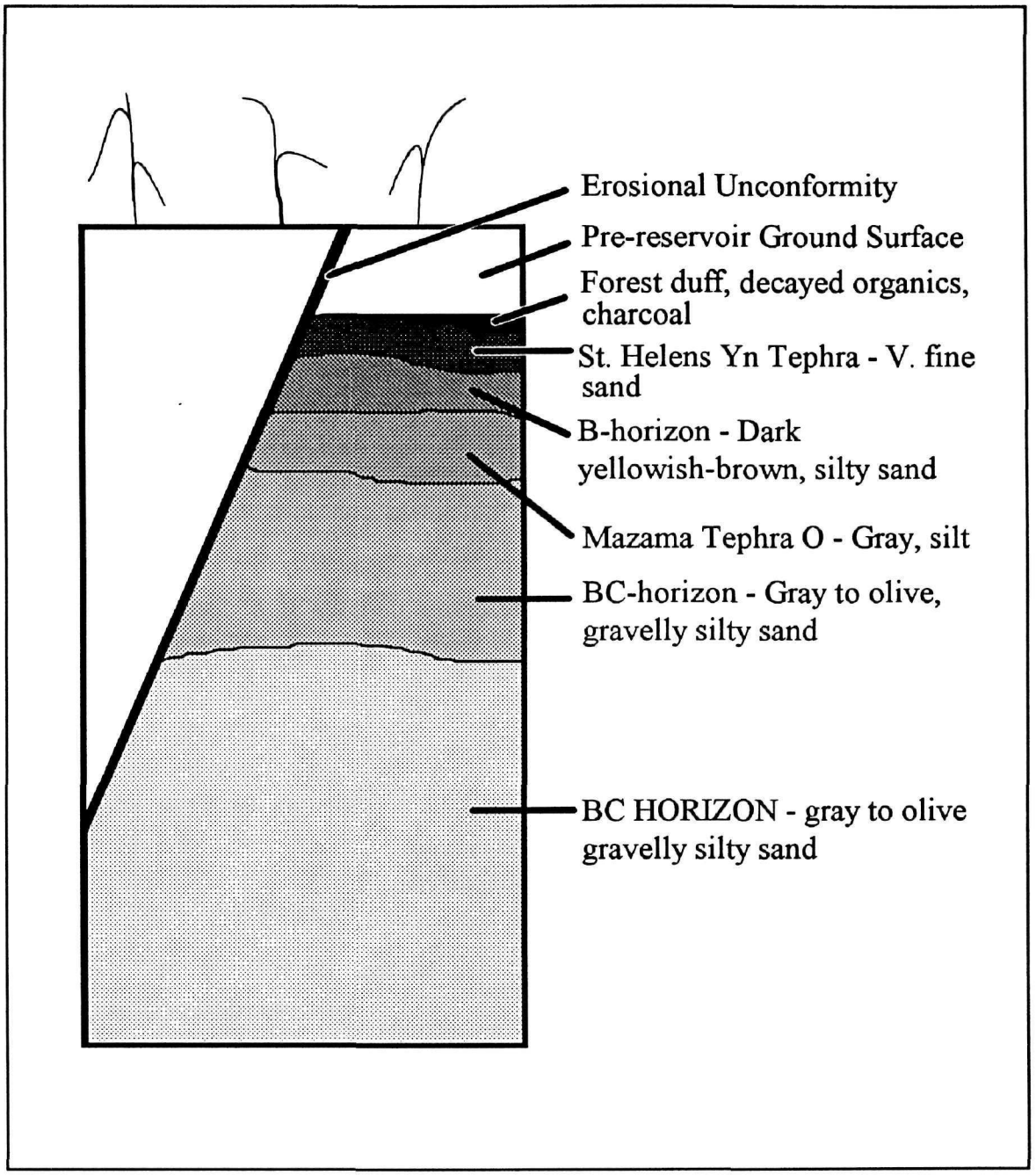


Figure 11.7 Generalized schematic of stratigraphy of 45WH229 (FS#46)

prehistoric people occupied the site, beginning in the mid-Holocene.

Conclusions and Assessment

Site 45WH229 appears to have been used as a base camp during hunting forays in this part of the Skagit River valley during the mid- to late-Holocene, most frequently, over the last ca. 4,000 years. The periods of occupation were probably intermittent and of short duration. The artifact assemblage is dominated by piercing, cutting, and scraping tools used to kill and butcher game and to prepare and cure hides. The flaking debris indicates the sharpening and possibly manufacturing of stone tools, especially those made of the locally abundant Hozomeen chert and chalcedony. Tools made of exotic raw materials, particularly basalt and chalcedony, may have been traded from or brought into the valley by people from east or north of this part of the Cascade Range. The presence of calcined bone fragments and the identification of two mountain goat (*Oreamnos americanus*) toe bones suggests that these animals were procured from nearby. The rock faces and cliffs of Little Jackass Mountain and both summits of Hozomeen Mountain are the closest goat habitat to the site and may have been where the animals were hunted.

Cultural deposits and artifacts at site 45WH229 lack integrity of location and association. Cultural remains have been removed from their original context by logging activities associated with reservoir clearing. By far the most destructive force on the site deposits and landform is wind-generated waves, which at lowered reservoir levels break against the sloping terrace escarpment and surface, deeply eroding and removing soil particles and the artifacts they contain. The fine-grained nature of the soils further increases the ease and rate of erosion. Bioturbation through root penetration, burrowing animals, fires, and other natural processes also have contributed to the loss of site integrity. The site is assessed as ineligible for inclusion in the National Register of Historic Places. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest. No additional work is recommended for this site.

11.2.5 45WH230 (FS#47) Boundary Bay #1

Site Setting

This site is located approximately 100 m north of Boundary Bay campground. It is in the northern part of the project area on the east side of the valley, about 1.2 km (0.75 mi) east of the historic main channel of the Skagit River. The site is situated on a small glacial terrace remnant elevated 9 m (30 ft) above the Skagit River flood plain. The terrace surface is nearly flat (0-5% slope) and is about 466 m (1530 ft) asl. The site has a western solar exposure facing across the broad, flat flood plain to the steep western valley wall, and beyond to high summits at the headwaters of Little Beaver Cr. Immediately to the east a slope rises steeply to a ridgeline that connects the summits of Desolation and Little Jackass Mtns. The moderate-density artifact scatter that comprises

the site is oblong in shape and conforms neatly to the landform boundaries. The southern, western, and northern boundaries are defined by the slope of the eroded terrace escarpment, while the eastern boundary is marked by a logging haul road that was used during tree removal in the reservoir drawdown zone.

The primary sources of disturbance to the site are wave-induced erosion and historic logging of the drawdown, which include the construction of a logging haul road across the site and tree removal. Erosion is most severe along the sloping terrace edges where the force of waves are dissipated at lowered reservoir levels. The degree of erosion is exacerbated by the fine-grained soil and sediment matrix that caps the terrace. The pre-reservoir tree cover, evident from the remaining stumps, consisted of a closed-canopy, mature, mixed conifer and deciduous forest.

General Site Description

The site dimensions are 35 m north-south and 15 m east-west, covering an area of 525 m^2. Artifact depth, determined during testing, ranged from the surface to 20 cm below the surface. The estimated volume of artifact-bearing deposits at the site is 52.5 m^3. The site is characterized as a moderate-density lithic scatter. Artifact types observed include flaked stone, an abrading stone, charred animal bones, and fire-modified rocks. The stone raw material types in the chipped stone assemblage consist of a high proportion of locally available Hozomeen chert and metasediment, along with minor amounts of quartz crystal, an exotic basalt, jasper, and quartzite. The artifacts are generally restricted to the upper 10 cm of the site sediments.

Testing Methods and Rationale

This site was first recorded during a reconnaissance survey conducted in April of 1987 (Mierendorf 1987a). At this time three artifacts were collected from the surface. The site was further documented in 1989 during the survey portion of the project. Additional surface collection was performed in 1993 during the excavation of 12 1X1 m test units. All site sediments were excavated in 10 cm levels and screened through 1/4" wire mesh. Test excavation units were positioned in order to locate undisturbed cultural deposits and to determine horizontal and vertical site boundaries. Test units 1, 5, and 10 were placed immediately west of the haul road in order to assess its effects on the site. Test units 3, 4, 7, 8, and 9 formed a contiguous block area excavation to test for the presence of a locus reflecting quartz crystal microblade technology. Test unit 11 was placed in a fire-modified rock concentration to test for the presence of an undisturbed feature.

Table 11.13 Inventory of Surface Collections from 45WH230

	NOCA
1 Flake, Metasediment	6342
1 Flake, Metasediment	6343
1 Flake, Metasediment	6344
1 Projectile Point, Metasediment	10690
1 Projectile Point, Metasediment	10691
1 Wedge, Metasediment	10692
1 Abrading Stone, Sandstone	10693
1 Flake, Jasper	10694
1 Flake, Metasediment (river cobble cortex)	10695
1 Scraper, Metasediment	10696
1 Bone Fragment, Mammal	10697
1 Bone Fragment, Mammal	10698

Description of Testing Results

The assemblage of artifacts observed at the site includes projectile points, formed tools, debitage, cores, an abrading stone, a flaked cobble, charred animal bones, and scattered concentrations of fire-modified rocks. Cultural remains excavated from the site consist of flaked stone debitage (predominately broken flakes and shatter). A total of 85 artifacts was recovered from excavation units. All but three of these were excavated from the disturbed reservoir deposits capping the top of the terrace. These three pieces of Hozomeen chert debitage were recovered from soil B-horizon deposits within a mixed stratigraphic unit interbedded with lenses of volcanic ash and other soil horizons. The top of the terrace and its sloping edges have sustained massive soil erosion from wind-generated waves breaking against the shorelines created by fluctuating reservoir levels. Although the original (pre-logging) depth of the artifacts below the ground surface is unknown, the few artifacts recovered from *in situ* suggest they were shallowly buried under the layer of forest duff and woody debris. No clearly-defined cultural strata or strata of prehistoric cultural origin were observed. Prior to reservoir erosion, scattered concentrations of fire-modified rocks may have formed discrete features, but none were found in the test excavations.

The only two diagnostic artifacts are projectile points found on the eroded site surface. One is classified as a Type 3A which dates between 9,000 and 4,000 years BP and the other is a Type 10C which dates between 4,000 and 1,500 years BP. The three formed tools from the site also were from the eroded site surface. The wedge (NOCA 10692) tapers rapidly from a blunt and flat end, which is smooth river-cortex, to a sharply acute, flaked bit; it appears to have been split out of a larger cobble using the bipolar technique. The abrader (NOCA 10693) is a 1.2 cm thick tabular-shaped piece

having 6 (2 sets of 3 each) prominent, parallel, V-shaped and U-shaped grooves incised into one face. The area between these grooves is very smooth, almost polished in the form of a circular, shallow depression. The scraper (NOCA 10696) exhibits a unifacially-flaked, steeply-beveled tool edge along two lateral flake margins. A microblade and a quartz crystal microblade core were recorded on the site during field inventory of artifacts, but were not collected.

Table 11.14 Cultural Material From Excavation Units at 45WH230

		NOCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	7 Flakes, Hozomeen Chert, Metasediment	10701
L:2 (10-20 cm BS)	1 Cobble, Unifacially Flaked, Metasediment	10700
	1 Debitage, Hozomeen Chert	10699
L:3-4 (20-40 cm BS)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	4 Flakes, Hozomeen Chert	10703
L:1 (0-10 cm BS)	8 Flakes, Hozomeen Chert, Metasediment	10702
L:2-5 (10-50 cm BS)	0 Collections	
test unit: 3 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	5 Flakes, Metasediment	10704
test unit: 4 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	4 Debitage, Hozomeen Chert, Metasediment, Quartz	10705
L:2 (10-20 cm BS)	0 Collections	
test unit: 5 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	3 Flakes, Hozomeen Chert, Unknown	10707
	1 Flake, Hozomeen Chert	10706
	1 Tephra Sample, Source Unknown	10826
L:2 (10-20 cm BS)	0 Collections	
test unit: 6 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Flake, Metasediment	10708
	1 Flake, Metasediment	10709
	10 Debitage, Metasediment, Hozomeen Chert, Quartz Crystal	10710

L:2 (10-20 cm BS)	1 Bipolar Flake, Hozomeen Chert	10711
	1 Bipolar Core, Hozomeen Chert	10712
	1 Flake, Hozomeen Chert	10713
	1 Tephra Sample, Source Unknown	10827
L:3 (20-30 cm BS)	^{14}C, 580±120 BP, Beta 64820	
L:4 (30-40 cm BS)	0 Collections	
test unit: 7 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	2 Debitage, Metasediment	10714
test unit: 8 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	4 Debitage, Quartz Crystal, Hozomeen Chert	10715
test unit: 9 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	6 Debitage, Hozomeen Chert, Metasediment, Quartz	10716
test unit: 10 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	3 Flakes, Metasediment	10717
L:2 (10-20 cm BS)	1 Tephra Sample, Source Unknown	10828
L:3 (20-30 cm BS)	0 Collections	
test unit: 11 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	0 Collections	
test unit: 12 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	23 Debitage, Hozomeen Chert, Metasediment	10718
	1 Flake, Hozomeen Chert	10719
	1 Flake, Metasediment	10720
	1 Flake, Hozomeen Chert	10721
	1 Flake, Hozomeen Chert	10722
L:2 (10-20 cm BS)	0 Collections	
L:3 (20-30 cm BS)	0 Collections	

Site Chronology

A charcoal sample from test unit 6 was submitted for radiocarbon dating. The sample was removed from the north wall of the unit from a discrete pocket of charcoal that appeared uncontaminated. The sample lay stratigraphically and physically under the three Hozomeen chert artifacts recovered from the B-horizon in level 2 of the test unit, and was found within a volcanic ash layer. The charcoal may or may not be of cultural origin. No artifacts were found in sediment matrices below this sample. As suggested by the age estimate of the sample, the chipped stone remains above it are less than 580 radiocarbon years old.

Table 11.15 Table Of ^{14}C Dates from 45WH230

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TU6	L-3	Beta 64820	580±120

Two tephra samples were collected during testing, but they were not submitted for source identification because both appeared to be a secondary deposits.

Additional age estimates are provided by the two projectile points found on the eroded site surface (Figure 11.8). One is classified as a Type 3A (NOCA 10691) which dates between 9,000 and 4,000 years BP, and the other is a Type 10C (NOCA 10690) which dates between 4,000 and 1,500 years BP. From this data no firm or reliable conclusions regarding the site age or periods of occupation can be made. The two techniques used for age estimation may be accurate, but the mixed and disturbed nature of the site deposits renders dating of any excavated assemblage questionable. All that can be said is that use of the site may date anytime between 9,000 to a few hundred years ago.

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 11.9. Much of the site is capped by a sandy loam reservoir deposit which is up to 25 cm thick and laminated with dark brown to black organic layers. Immediately beneath the reservoir deposit, especially where it is thickest, are remnants of the pre-reservoir forest duff and litter (soil O-horizon), including charred wood and woody debris. In other parts of the site, the bottom of the reservoir deposits marks an erosional unconformity indicating that upper soil horizons have been stripped away by reservoir erosion. In the most severely eroded parts of the site, there are no reservoir deposits and subsoil horizons are exposed on the landform surface.

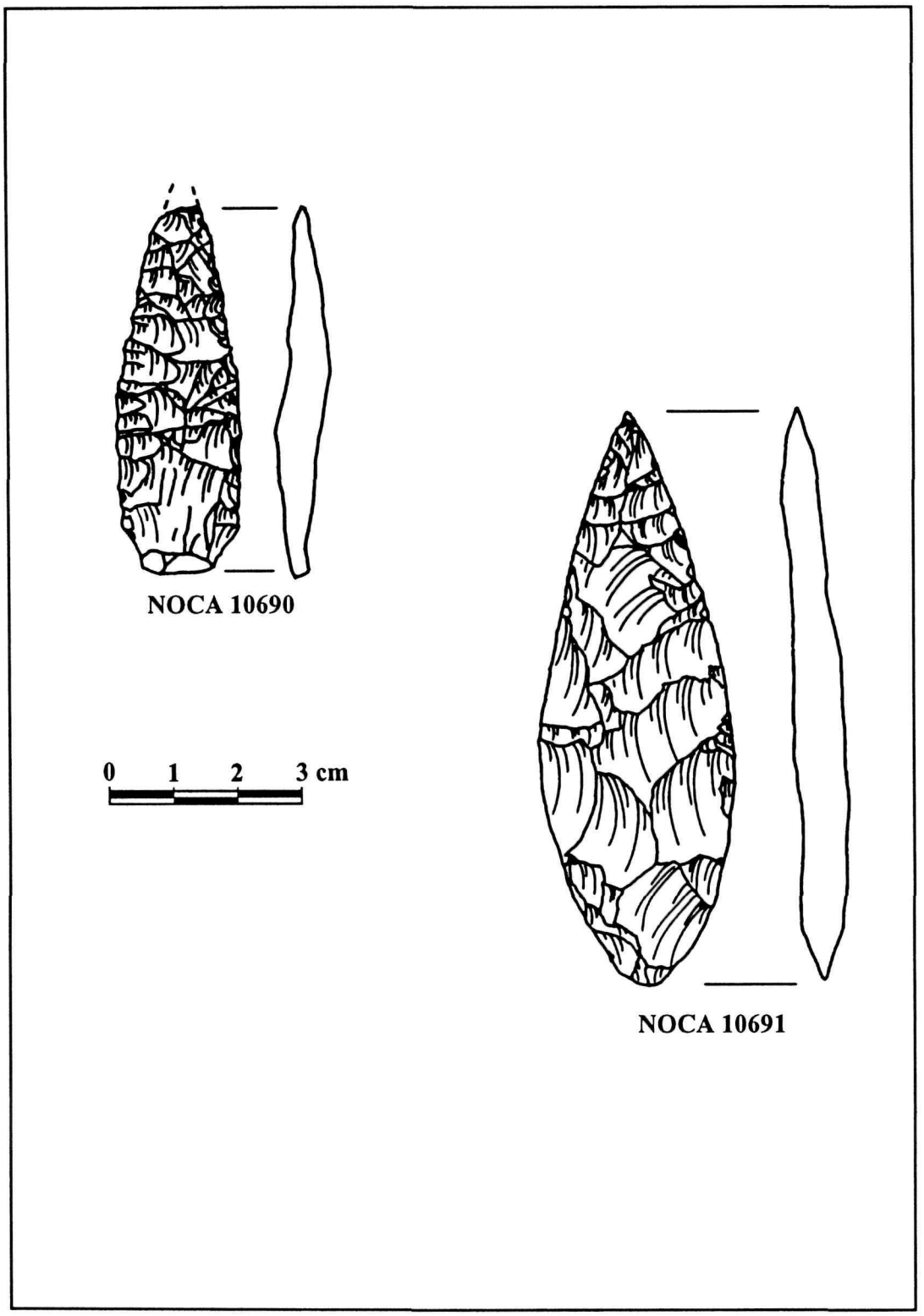


Figure 11.8 Artifact illustrations from 45WH230 (FS#47)

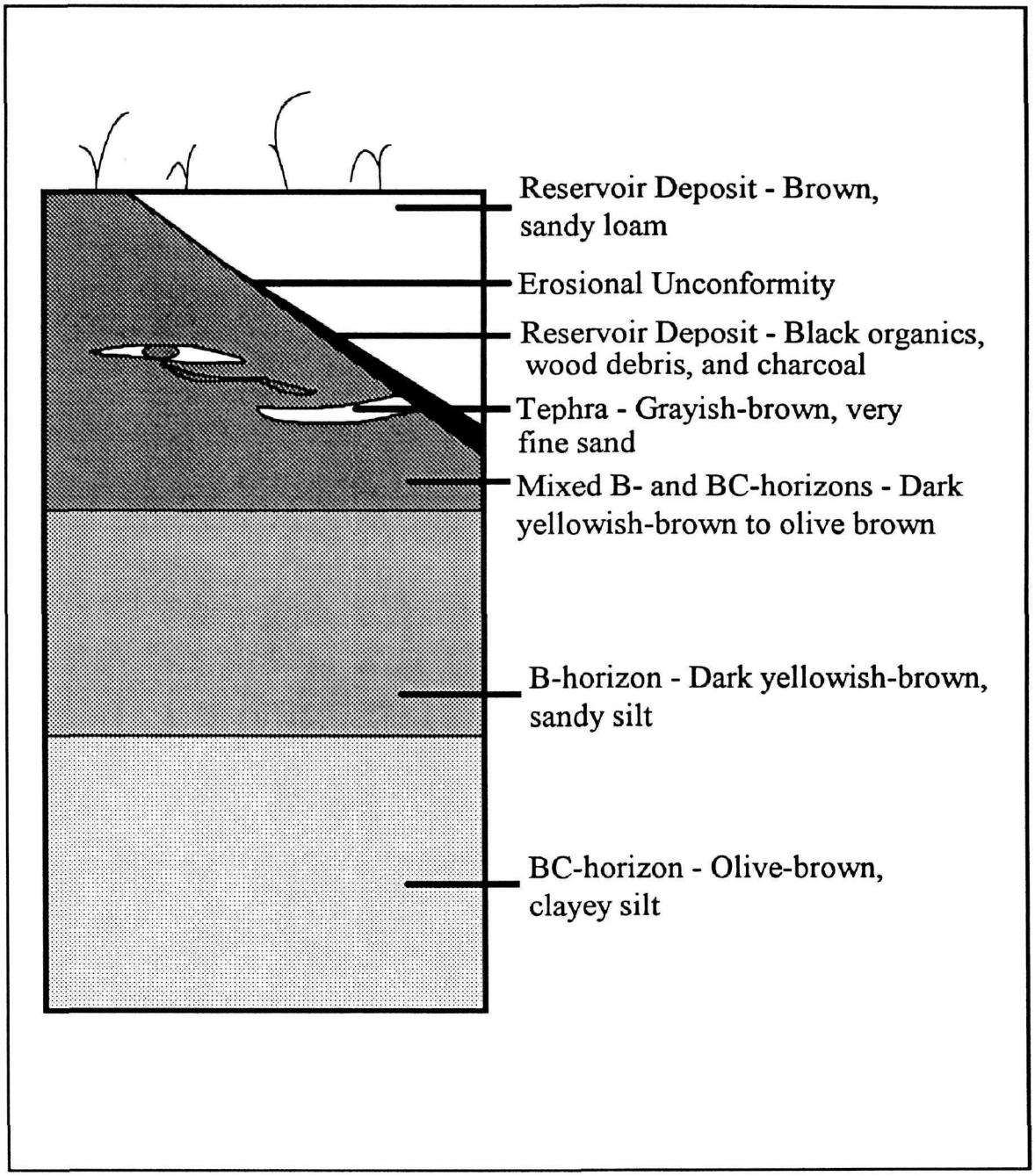


Figure 11.9 Generalized schematic of stratigraphy at 45WH230 (FS#47)

Underlying the forest duff and the reservoir deposits is a stratigraphic unit that consists of a complex mixture of different soil horizons and other deposits. These include a grayish-brown, discontinuous, poorly preserved lens of unidentified tephra (volcanic ash), dark yellowish-brown soil B-horizon, olive-brown soil BC horizon, and black charcoal and decayed, woody tree roots. Although artifacts were recovered from

within lenses of the soil B-horizon, these lenses lack depositional integrity because they have been physically displaced, probably by tree root tip-up or by tree root penetration during growth followed by decay or burning. In some test units, thin remnants of the undisturbed soil B-horizon were encountered, but these were sterile of artifacts. Underlying the above sequence is an olive-brown, clayey silt or fine sand and silt soil BC- and C-horizon.

The stratigraphic record from the site as revealed in test unit excavation relates only to the upper depositional cap of the landform. The lowermost, clayey sediments encountered at the site suggest that the terrace may initially have formed as part of a lake deposit. Subsequent to this phase, the landform surface grew vertically through the slow accretion of wind-blown silts and fine sands (including wind-blown volcanic ashes), with the attendant development of soil horizons as these accretional deposits weathered. The mixed character and appearance of the upper part of this fine-grained cap is a consequence of a long history of forest growth and succession. Throughout the landform's history, it has been subject to one or more episodes of erosion by the laterally-migrating channel of the Skagit River or by steep-gradient mountain run-off streams. The landform's present shape is a product of such erosional sculpturing.

Conclusions and Assessment

Site 45WH230 appears to have served as a hunting camp used intermittently over an uncertain span of time. The small but relatively diverse artifact assemblage includes projectiles used in hunting and scraping tools for processing hides. The flaked stone debitage indicates that while here, the occupants sharpened their stone tools and possibly shaped some of the locally available metasediments and Hozomeen chert into tools. The presence of fire-modified rocks and the very few charred animal bones indicates that animals were cooked and probably consumed on-site. The association of quartz crystal flaking--including microblade technology--with a wedge and a sandstone abrader, provides good evidence for the working of wood, antler, bone, and possibly other materials. This association of tools would provide the capability to cut out and split long, narrow splints of antler and bone, which could be subsequently smoothed, rounded, and pointed. This general manufacturing sequence is used in the preparation of awls, harpoons, needles, blanket pins, fish hooks, and similar tools.

The cultural deposits and artifacts at site 45WH230 lack integrity of location and association. Cultural remains have been removed from their original context by logging activities and road construction associated with reservoir clearing. By far the most destructive agent to the site and landform is wind-generated waves which, at lowered reservoir levels, break against the sloping terrace escarpment and surface, deeply eroding and removing soil particles and the artifacts they contain. The fine-grained nature of the soils further increases the ease and rate of erosion. The long history of forest growth and succession also constitutes an agent of site disturbance, particularly from bioturbation through root penetration, tree tip-up, burrowing animals, and other natural processes.

The site deposits and artifacts lack integrity. This site is assessed as ineligible for inclusion in the National Register of Historic Places. No additional work is recommended. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

11.2.6 45WH232 (FS#50) North Lightning Cr. #2

Site Setting

This site is located near the central portion of the project area on the east side of the valley, approximately 85 m west of Lightning Cr. Campground. The site is situated at 482 m (1,580 ft) elevation on a small alluvial fan deposited by an intermittent stream. This small fan is, in turn, built on top of a massive alluvial fan, the largest in the project area, formed by Lightning Cr.. The landform has a gentle (0-5%) gradient and a southwestern to western solar exposure. The site is positioned 37 m (120 ft) in elevation above and 1.4 km (.9 mi) east of the Skagit River channel. It faces the broad flats of the alluvial fan surface to the steep rock walls that form the western valley walls 1.9 km (1.1 mi) distant. East of the site is the rocky and dry eastern valley wall, deeply incised by the V-shaped lower gorge of Lightning Cr. The artifact scatter that comprises the site is oblong in shape and lacks clearly-defined boundaries, which have been assigned on the basis of discontinuities in surface artifact distribution.

Reservoir-related erosion has been the primary source of disturbance to the site, while rodent burrowing and logging of the drawdown have been secondary sources. The site is in an exposed location that receives the full force of waves generated by winds having a long north and south fetch. A high energy beach zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds. The erosion, transportation, and redeposition of small particles, including artifacts, into a series of beach ridges results. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a patchy, open-canopy, mixed conifer and hardwood forest intermixed with brushy expanses. The relatively few sawn tree stumps observed on the site have small diameters. Prior to impoundment of waters behind Ross Dam in the late 1940s, this portion of the valley was locally referred to as "Little Sahara," in recognition of its relatively xeric climate. At that time, portions of the Lightning Cr. area supported brushy stands of wild cherry (*Prunus* sp.).

General Site Description

The site dimensions are approximately 100 m north-south and 30 m east-west. The site area is 3,000 m^2. Artifact depth, determined during testing, ranged from the surface to 20 cm below the surface. The estimated volume of artifact-bearing deposits at the site is 300 m^3. The site is characterized as a medium to low-density lithic scatter. The types of artifacts present at the site are projectile points, bifaces, and debitage. The

lithic material types in the chipped stone assemblage consist of a high proportion of locally available Hozomeen chert and metasediment with minor amounts of exotic chalcedony and obsidian.

Testing Methods and Rationale

This site was added to the park inventory after it was recognized and preliminary notes were recorded regarding its location and content (Mierendorf 1987a). One projectile point was collected at that time. The site was fully recorded and documented during the 1988 field season at which time two more projectile points were collected from the surface. The site was tested in 1990 with the excavation of two 1x1 m test units and the collection of more artifacts from the eroded site surface. All deposits from the test units were excavated in 10 cm levels and screened through 1/4 in wire mesh.

From the time of discovery of the site, and throughout the series of site visits, the field evidence suggested loss of site integrity through excessive erosion. Based on exposure of tree roots, some parts of the site experienced the removal of 40 cm or more of soil. Furthermore, much of the site surface is covered by a series of beach ridges composed of redeposited soil B-horizon particles eroded from other parts of the landform. The testing strategy was designed to confirm this assessment and to locate any undisturbed cultural deposits. Both test units were placed in low-lying areas between beach ridges that potentially offered protection from shoreline wave erosion.

Description of Testing Results

The total assemblage of artifacts observed at the site includes projectile points, bifaces, and flaking debris. Twenty-two artifacts were recovered from test excavations, and all but one or two were from the disturbed reservoir deposits. The possible

Table 11.16 Inventory of Surface Collections from 45WH232

	NOCA
1 Projectile Point, Basalt	6341
1 Biface, Obsidian	6372
1 Projectile Point, Chalcedony	6379
1 Biface, Hozomeen Chert	7910
1 Projectile Point, Metasediment	7919
1 Projectile Point, Hozomeen Chert	7920
1 Projectile Point, Metasediment	7921
1 Projectile Point, Metasediment	7922

exceptions are one piece of metasediment debitage from level 2 of test unit 1 and one metasediment flake from level 7 of test unit 2. The latter was apparently brought to this level by rodent burrowing activity. In level 4 of test unit 2, a small squirrel cache of Hazel nuts (*Corylus cornuta*) was excavated from a filled-in rodent burrow. No recognizable cultural strata or features of cultural origin were observed at the site.

Five diagnostic projectile points were recovered from the eroded site surface. One is classified as a Type 2B (Windust) and three others are Types 3B or 3C (Cascade or Olcott) manufactured on metasediment. The fifth point is a Type 11B (Quilomene Bar Corner-Notched) made of basalt. The quartz crystal pressure flake (NOCA 7912) is a bifacial thinning flake. A broken, Stage IV biface (NOCA 7910) is made from Hozomeen chert. The two fragments fit together and the smaller of the two is a heat spall. This characteristic, in combination with the glossy interior of the biface and its reddish, oxidized color suggest that the biface was heat treated. Another biface, a broken projectile point (NOCA 7920) consists of blade segment manufactured of Hozomeen chert.

Two clearly exotic lithic raw materials were found at the site. One obsidian biface from the site (NOCA 6372) was submitted for XRF analysis in order to determine the source location. The biface is neither culturally nor temporally diagnostic. It consists of a small flake that is bifacially worked, but which retains much of the original ventral flake surface. The chemical signature from this flake matches an obsidian source at Sugar Mtn., located in the southern Cascade Range of northeastern California. More detailed results of the XRF analysis are reported in section 12.7 and Appendix G of this report. The other exotic material is a translucent, white chalcedony mottled with opaque brown lines (NOCA 6379). Although the source is unknown, it resembles raw materials that are common in archeological assemblages east of the Cascade Range. The basalt material (NOCA 6341) closely resembles Cache Cr. basalt from southern interior British Columbia.

Table 11.17 Cultural Material From Excavation Units at 45WH232

test unit: 1 (L:S-L:3 1x1 m, L:4 1x0.5 m)		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	15 Debitage, Metasediment	7911
	1 Biface, Chert	7910
L:2 (20-30 cm BD)	1 Debitage, Metasediment	7916
L:3-4 (30-50 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	2 Debitage, Hozomeen Chert	7914
L:2 (20-30 cm BD)	1 Flake, Quartz Crystal	7912
L:3 (30-40 cm BD)	0 Collections	
L:4 (40-50 cm BD)	1 Debitage, Hozomeen Chert	7913
L:5-6 (50-70 cm BD)	0 Collections	
L:7 (70-80 cm BD)	1 Debitage, Metasediment	7915

Site Chronology

No charcoal or tephra samples were collected from the site. Small charcoal flecks were noted in the sedimentary matrix, as were diffuse patches that possibly contained secondary volcanic ashes.

An estimate of the site age is based on time-sensitive projectile point morphology (Figure 11.10). The oldest point is classified as a Type 2B (NOCA 6379). Stemmed points of this type (Windust) are among some of the oldest dated in the Pacific Northwest. They have been found in association with radiocarbon dated materials between 8,200 and 10,800 years old. Three other points are Types 3B (NOCA 7922) and 3C (NOCA 7919 and 7921). These Cascade or Olcott points have been assigned to the 9,000 to 4,000 year BP timespan. The last point, Type 11B (NOCA 6341) is called a Quilomene Bar Corner-Notched and has been dated in eastern Washington between 3,000 and 2,000 BP. Based on these age criteria, 45WH232 could date between about 2,000 and 10,800 years old. This finding is not incompatible with the estimated age of the massive alluvial fan on which the site is located, which potentially dates to the late Pleistocene.

Site Stratigraphy

A schematic diagram of the generalized site stratigraphic sequence is shown in Figure 11.11. The site surface is capped by a gravelly, sandy reservoir deposit in the form of beach ridges or thin sheets. In locations where there are no reservoir deposits,

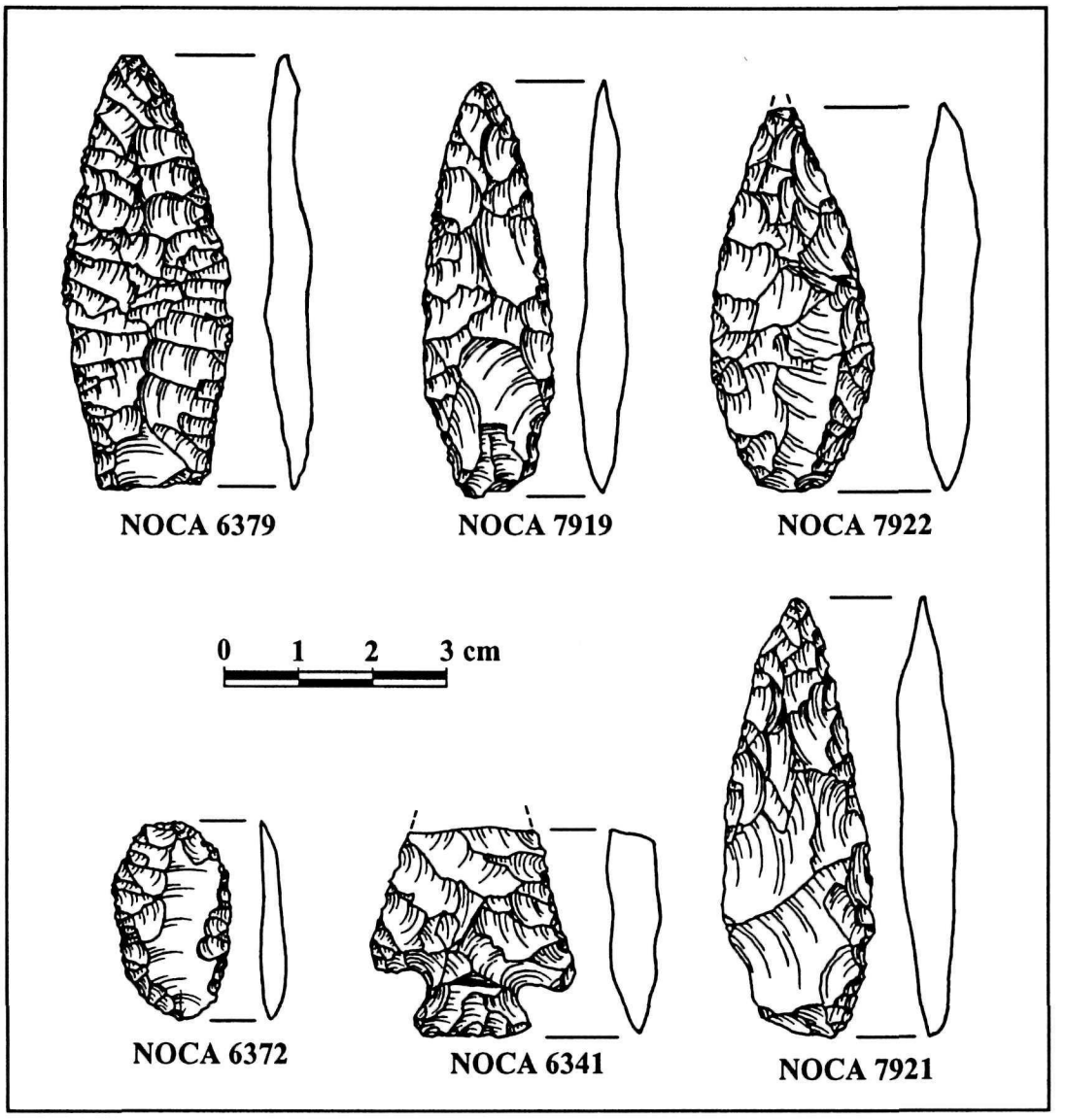


Figure 11.10 Artifact illustrations from 45WH232 (FS#50)

the tops of eroded soil horizons outcrop on the site surface. In test unit 2, the reservoir deposit was differentiated into an upper, gravelly high energy deposit and a lower, sandy, low energy deposit interbedded with clayey silt. Also in test unit 2 a remnant of the of the pre-reservoir forest duff and litter, including charred woody debris was observed. An erosional unconformity occurs wherever this organic layer has been eroded to expose lower soil horizons.

Underlying the forest duff or reservoir deposits is a reddened soil B-horizon that exhibits properties suggesting a long period of development compared to most other soil B-horizons in the drawdown. In test unit 1, much of this horizon has been stripped by

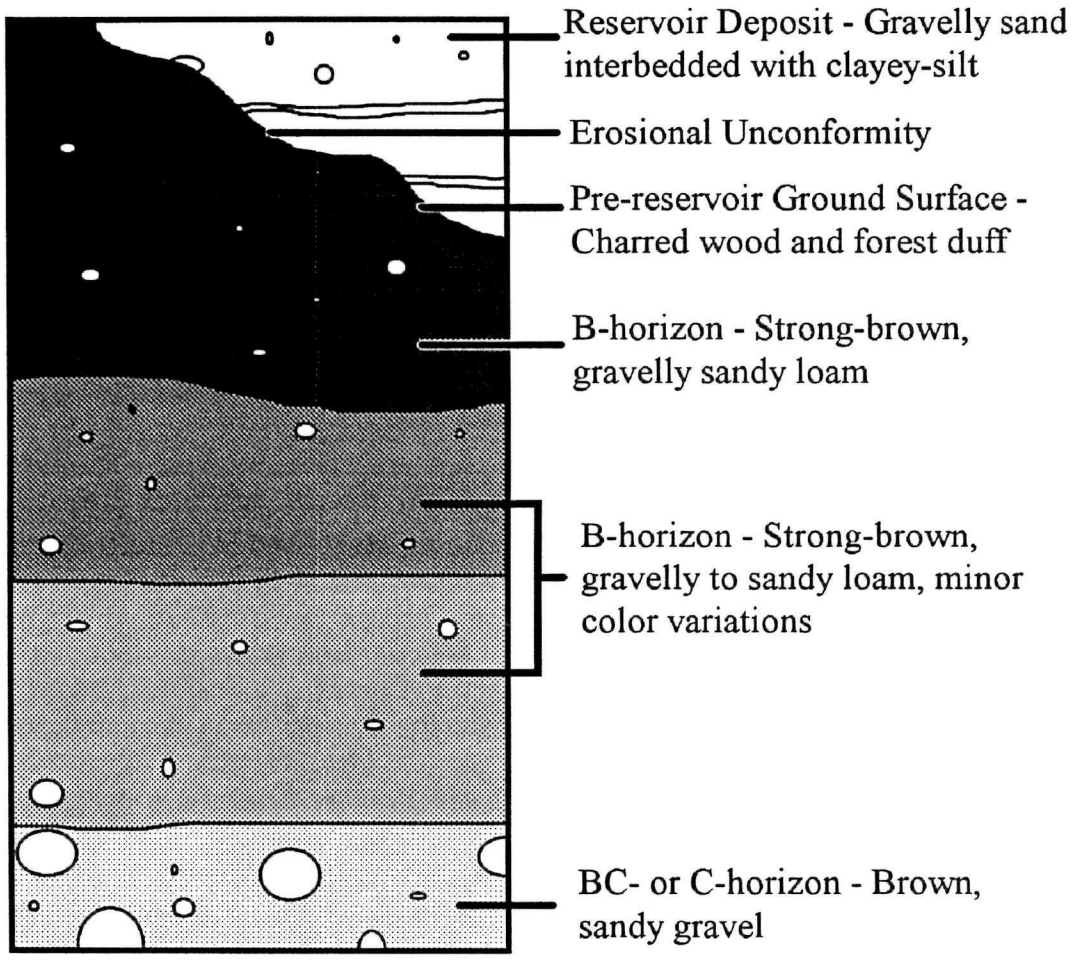


Figure 11.11 Generalized schematic of stratigraphy at 45WH232 (FS#50)

erosion. In test unit 2 it is uneroded and measures 45 cm thick. In both test units the color of the B-horizon is strongly reddened. In test unit 1 the hue is 5YR to 7.5YR, and in test unit 2 it is 7.5YR to 10YR. The strongest chromas of the respective test units are 5 and 6. These color measures are a rough indicator of a high degree of weathering as expressed by iron oxide accumulation.

The lowest stratum encountered in the excavations was a sandy gravel alluvial fan deposit in which was developed the soil BC- or C-horizon. Excavations were terminated upon contact with this layer. Prehistoric artifacts were recovered predominately from the reservoir deposits, and possibly from the upper portion of the soil B-horizon.

The depositional history of the landform can be inferred from surficial and morphological characteristics, from the weathering profile of the soil that caps it, and from its geomorphic position in the Skagit River valley. The alluvial fan formed from what may have been the catastrophic drainage of waters discharged from the canyon mouth of Lightning Cr.. Aerial photographs clearly show a complex pattern of braiding streams emanating from the fan apex. All of the stream channels exhibit a uniform degree of weathering and incision into the fan surface. Boulders resting on the fan surface near the canyon mouth measure upwards of 1 m in diameter, indicating a high discharge. The fan appears to have accreted rapidly, and as it did, it pushed the Skagit River across the valley and against the western valley wall. After its growth, the fan extended for 1.6 km (1 mi) on either side of the mouth of Lightning Cr. and for 1.9 km (1.2 mi) across the Skagit River Valley. A large, spectacular kettle (and possibly a smaller one) on the fan surface marks where a large block of glacial ice became stagnant and was engulfed by the fan deposits. Aerial photographs clearly show stream channels braiding around the sides of the kettle, and a series of concentric terraces surrounding the kettle record the stages of ice block melting. The presence of the kettle dates the alluvial fan formation to the period of late-glacial melting and retreat of the Cordilleran ice sheet approximately 11,000 years ago.

With continued melting of the ice sheet in Canada, the Skagit River incised its channel into the distal end of the fan while Lightning Cr. incised its channel through the deepest (proximal) part of the fan deposit where the creek emanated from its bedrock canyon. This incision continued to the southwest through the distal portion of the fan deposits until it met the Skagit River. Once abandoned by Lightning Cr., the surface of the fan became relatively stable as it slowly accreted vertically through the deposition of fine, wind-blown deposits and gravelly sands washed down the steep eastern valley walls to build a small, low-gradient alluvial fan on the larger fan surface. After abandonment, soils began to form on the fan surface. It was sometime during this stage of fan growth that the landform was first visited and utilized by prehistoric hunters.

Conclusions and Assessments

Site 45WH232 appears to have served as a short-term hunting camp during the early Holocene, possibly from 10,000 years ago into the Middle and Late prehistoric periods, as recently as 2,000 years ago. The very small artifact assemblage consists of little more than projectile points and generalized bifaces used in hunting and butchering animals. These early hunters carried tools made of stone materials from distant locations, most likely from the eastern and southern Cascades. The obsidian biface from

the extreme southern Cascades of California is not necessarily associated with the earliest site use.

The cultural deposits and artifacts at 45WH232 lack integrity of location and association. Cultural remains have been removed from their original context by reservoir-related shoreline erosion. The most destructive agent to the site is wind generated waves, which at lowered reservoir levels break against the sloping alluvial fan surface, transporting soil particles and the artifacts they contain, and redepositing them in linear beach ridges. Remnants of intact, weathered soil horizons were found at the site, but they were mostly devoid of artifacts. The activity of burrowing rodents and clearing of native vegetation in the drawdown also contribute to the loss of site integrity. Because the site's deposits and artifacts lack integrity, it is assessed ineligible for inclusion in the National Register of Historic Places. No additional work is recommended. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

11.2.7 45WH246 (FS#66) Little Jerusalem Island

Site Setting

The site is located within an area known as Spencer Bay, which is in the southern part of the project area, on the east side of the valley. A rise of the land projecting above the reservoir at full pool is called Little Jerusalem Island. The site is located near the southwest end of Little Jerusalem Island between the island and Roland Point. The elevation is 485 m (1,590 ft) asl. The site is situated on the gently sloping (0-5% slope) top of a glacial bench, which has a steep western side (90% slope). The landform has a northwest solar exposure which provides a view up the Skagit River Valley. Other views are restricted by adjacent glacially scoured hills, including Roland Point to the south and west. To the east, the valley wall rises steeply to the summit of Jack Mtn. (9,063 ft; 2,763 m).

Logging of the drawdown zone has been the primary source of historic disturbance to the site. Its location in an embayment on the leeward side of an island has protected it from extreme erosion. The west side of the site drops steeply into a small drainage and has sustained a moderate amount of erosion. The site has had some disturbance from contemporary visitors who build fires and camp there when the reservoir is not at full pool. The pre-reservoir vegetation, evident from the remaining stumps, consisted of open-canopy conifer forest.

General Site Description

The site is a low-density lithic scatter whose dimensions are 55 m northwest-southeast and 40 m northeast-southwest, covering an area 2,200 m^2. No buried artifacts

were found during testing. Two rock rings and one possible rock cairn were inventoried. The two rock rings were determined to be post-reservoir in age. The age of the rock cairn was undetermined, but likely postdates the impoundment of the valley. Some possible historic artifacts were noted, which may relate to the nearby Roland homestead. During initial recording of the site in 1988, 14 lithic artifacts were noted, including two bifaces, one core, and eleven flakes. The lithic material types predominantly consist of locally available Hozomeen chert, some metasediment, and a single quartzite item.

Testing Methods and Rationale

The site was test excavated in 1993 with nine 50x50 cm test pits, which were placed systematically along a single north-south transect at 5 m intervals. Site sediments were excavated in 10 cm arbitrary levels to a depth of 50 to 60 cm below the surface, and they were screened through 1/4 in wire mesh. The placement of test pits was designed to locate any undisturbed artifact-bearing deposits or features. One artifact was collected from the surface during testing in 1993 and is listed in Table 11.18.

Table 11.18 Inventory of Surface Collections from 45WH246

	NCCA
1 Biface Fragment, Quartzite	10681

Description of Testing Results

No cultural material was found below the surface. At the highest portion of the site, deposition of fine reservoir sediments has occurred. This was the area that had the highest potential for undisturbed cultural deposits, yet none could be located. The medial portion of a quartzite biface was the only formed tool found at the site during testing. The small artifact assemblage suggests that collection or processing of some resource was conducted at the site and that Hozomeen chert was flaked, probably to make expedient tools.

Table 11.19 Cultural Material From Excavation Units at 45WH246

test pit: 1 (50x50 cm)		NCCA
L:S (surface)	0 Collections	
L:1-5 (0-50 cm BS)	0 Collections	
test pit: 2 (50x50 cm)		
L:S (surface)	0 Collections	
L:1-6 (0-60 cm BS)	0 Collections	

test pit: 3 (50x50 cm)	
L:S (surface)	0 Collections
L:1-5 (0-50 cm BS)	0 Collections
test pit: 4 (50x50 cm)	
L:S (surface)	0 Collections
L:1-5 (0-50 cm BS)	0 Collections
test pit: 5 (50x50 cm)	
L:S (surface)	0 Collections
L:1-6 (0-60 cm BS)	0 Collections
test pit: 6 (50x50 cm)	
L:S (surface)	0 Collections
L:1-5 (0-50 cm BS)	0 Collections
test pit: 7 (50x50 cm)	
L:S (surface)	0 Collections
L:1-5 (0-50 cm BS)	0 Collections
test pit: 8 (50x50 cm)	
L:S (surface)	0 Collections
L:1-6 (0-60 cm BS)	0 Collections
test pit: 9 (50x50 cm)	
L:S (surface)	0 Collections
L:1-6 (0-60 cm BS)	0 Collections

Site Chronology

Charcoal observed in the test pits was from reservoir clearing and burning, so none was collected. No chronologically diagnostic artifacts are known from the site.

Site Stratigraphy

The bench and east slope of the site are covered with a brown, well-sorted, sandy reservoir deposit. The west slope is a lag deposit remaining after erosion of the upper portion of the B-horizon, and consists of a coarse sandy gravel. Beneath this deposit is a reddish yellow-brown, poorly sorted B-horizon. Underlying the B-horizon is a yellow-brown to olive BC or C horizon developed in poorly sorted coarse sand and gravel. Bedrock was encountered in some of the excavation units.

Conclusions and Assessment

The site is assessed ineligible for the National Register of Historic Places because the artifacts and artifact-bearing deposits lack integrity of location and association. Subsurface testing yielded no artifacts, nor was there evidence of intact cultural deposits. Cultural material at the site resides on the surface as a lag deposit. The site has a very low density of Hozomeen chert debitage and one exotic quartzite biface fragment. Three rock features were present at the site, two rock rings and one rock pile or cairn. These features were investigated and found to be modern in age. Such features are commonly built in years when the pool elevation of the reservoir remains below full, and visitors camp in the upper portions of the drawdown. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

11.2.8 45WH247 (FS#67) South Tenmile Island #1

Site Setting

The site is located on the south side of Ten Mile Island, which is on the east side of the valley in the center of the project area. It extends south from the south slope of Ten Mile Island for 200 m. The site is situated on a large, glacial outwash terrace on the east bank of the pre-reservoir Skagit River channel. The landform has a southern solar exposure and a 0-90% slope. The site elevation is 470 m (1,540 ft) asl. From it is a full view of the Skagit River Valley to the south and southwest. To the west the landform drops to the main channel of the Skagit River, which provided access to the site; in the distance is the western valley wall cut by the narrow canyon of Skymo Cr. To the north the terrace rises gently at first, then steeply to a glacially-scoured knob (Ten Mile Island). To the east is a gently sloping expanse of glacial terrace the abuts the steep eastern valley wall.

Reservoir erosion and logging have been the primary sources of historic disturbance to the site. The site is in an exposed location that receives the full force of waves generated by winds having a long fetch up the valley. A high energy beach zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds, which causes excessive erosion. One grouping of large standing tree stumps on the site have 2 m of their root systems exposed, indicating erosion of at least this much sediment from the top of the landform. The pre-reservoir vegetation, evident from the remaining stumps, consisted of an open-canopy conifer forest.

General Site Description

The site is characterized as high-density lithic scatter whose dimensions are 220 m northwest-southeast and 170 m northeast-southwest, covering an area 37,400 m^2.

Depth of artifact-bearing deposits extended to 10 cm below the surface. The estimated maximum volume of artifact-bearing deposits is 3,740 m^3. Twelve high-density clusters of lithic artifacts were recorded and 593 artifacts were inventoried, including formed tools, debitage, cores, and one fragmented mammal bone. The chipped stone assemblage consists almost entirely of locally available Hozomeen chert, Hozomeen chalcedony, and metasediment. Quartz crystal from an unknown source is also present in the lithic assemblage. The site was visited and surface-collected a second time in 1989.

Testing Methods and Rationale

The site was recorded in 1988 and artifacts collections made from the surface in 1988, 1989, 1990, and 1993 (Table 11.20). It was test excavated in 1990 with two 1x1 m test units. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of excavation units was intended to locate undisturbed artifact-bearing deposits and features. The site was chosen for test excavation because of the relatively large assemblage of artifacts recorded at the site and the variety of different lithic materials present.

Table 11.20 Inventory of Surface Collections from 45WH247

	NOCA
1 Projectile Point, Hozomeen Chalcedony	7038
1 Biface, Hozomeen Chert	7039
1 Projectile Point, Metasediment	7040
1 Core, Hozomeen Chalcedony	7041
1 Biface, Hozomeen Chalcedony	7042
1 Biface, Hozomeen Chert	7043
1 Projectile Point, Allenby Chert	7044
1 Biface, Hozomeen Chert	7929
1 Biface, Hozomeen Chert	7930
1 Biface, Hozomeen Chert	10666
1 Biface, Quartz Crystal	10667
1 Biface, Hozomeen Chalcedony	10668

Description of Testing Results

A total of six artifacts was recovered from excavation, all from within the disturbed reservoir deposit. Table 11.21 lists these artifacts and the excavation unit and level from which they were recovered. The lithic raw material used for the manufacture of projectile points and bifaces was primarily Hozomeen chert and Hozomeen chalcedony. Quartz crystal and metasediment appear to have been used less frequently. One item was made of a lithic material tentatively identified as Allenby chert, which is

from a source area to the northeast of the project area. The total chipped stone assemblage at the site indicates the reduction of locally available lithic materials into flake cores and bifaces and the use or manufacture of projectile points.

Table 11.21 Cultural Material From Excavation Units at 45WH247

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (0-10 cm BD)	1 Quartz Crystal, Modified	7992
	1 Core, Hozomeen Chalcedony	7993
L:2 (10-30 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	4 Debitage, Hozomeen Chert	7994
	2 Bone Fragments, Medium Mammal	10114
L:2-4 (20-50 cm BD)	0 Collections	

Site Chronology

No tephra or charcoal was collected during testing; however, three time-sensitive projectile points were recovered from the surface (Figure 11.12). One projectile point (NOCA 7038) is classified as Type 10C, another (NOCA 7040) as Type 10B, and the third (NOCA 7044) as Type 3A. Both Type 10B and 10C ("Rabbit Island Stemmed") date between 4,000 and 1,500 BP. Type 3A (Olcott or Cascade) dates between 9,000 and 4,000 BP. The site age is estimated between 1,500 and 5,000 years old.

Site Stratigraphy

The generalized stratigraphic sequence consists of a reservoir deposit capping eroded soil horizons. The reservoir deposit is composed of a light brownish-gray to dark brown sandy loam 2-3 cm thick. This deposit is composed of sediments and soils eroded from the landform by reservoir wave action. Based on the height of tree root exposure on standing stumps, up to 50 cm of soil B-horizon has been removed. Underlying the reservoir deposit is a reddish-brown, well-sorted, sandy loam B-horizon remnant. Below this matrix is a yellowish-brown to brown, well-sorted silt loam BC-horizon, followed by a dark brown, very poorly-sorted, coarse deposit of boulders, cobbles, gravel and coarse sand deposited as glacial outwash.

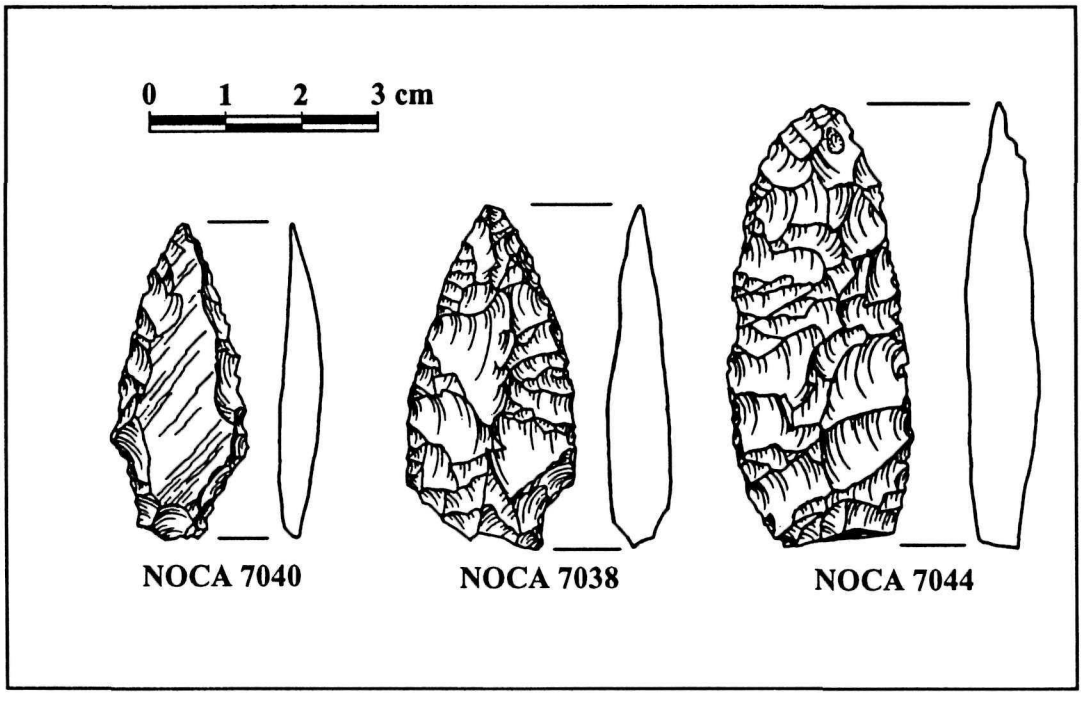


Figure 11.12 Artifact illustrations from 45WH247 (FS#67)

Conclusions and Assessment

Site 45WH247 probably functioned as a short-term, seasonal hunting camp during the Late-Middle prehistoric period (4,000-2,000 BP). Site 45WH247 is ineligible for the National Register of Historic Places. Artifacts at the site have no integrity of location or association. Test excavations yielded only six artifacts, all from a mixed reservoir deposit. The remaining nine artifacts were collected from the surface. Much of the original land surface at the site appears to have been stripped by wave erosion. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

11.2.9 45WH250 (FS#70) Spencer Bay #1

Site Setting

The site is located on the east side of Little Jerusalem Island which is on the east side of the valley, at the southern end of the project area. The site is situated on a glacial terrace at the base of the eastern valley wall, near the confluence of several intermittent snowmelt streams. The landform has a northwestern solar exposure and a 10% slope. Site elevation is approximately 479 m (1,570 ft) asl. Site 45WH250 is a

few hundred meters northeast of 45WH246 and has a comparable setting and views of the valley.

Reservoir erosion and logging have been the primary sources of historic disturbance to the site. The site receives the full force of waves generated by winds having a long fetch down the valley. A high energy beach zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds, which causes excessive erosion. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a mature closed-canopy conifer forest.

General Site Description

The site is a moderate to high-density lithic scatter. The dimensions are 70 m northwest-southeast and 30 m northeast-southwest, covering a site area 2,100 m^2. Artifacts extended to 10 cm below the surface. An exception to this was in test unit 1 where one flake was found 30-40 cm below the surface, but there was evidence to suggest that it was moved to this level by burrowing rodents. The estimated maximum volume of artifact-bearing deposits is 60 m^3. More than 62 lithic artifacts were inventoried: all consisted of debitage except for one biface. Three artifact clusters were mapped. Two of the clusters (clusters B and C) contained mostly decortication flakes, while the remaining cluster (cluster A) contained mostly tertiary flakes. The site represents a lithic reduction of Hozomeen chert and metasediment cobbles. These are the only lithic material types observed at the site.

Testing Methods and Rationale

The site was recorded in 1988 and test excavated in 1991 with five 1x0.5 m test units. Sediments were excavated in both 5 and 10 cm arbitrary levels and screened through 1/8 in and 1/4 in wire mesh. The placement of excavation units was intended to locate undisturbed artifact-bearing deposits and features. One artifact was collected from the surface during testing and is listed in Table 11.22.

Table 11.22 Inventory of Surface Collections from 45WH250

	NOCA
1 Biface, Hozomeen Chert	10354

Description of Testing Results

A total 83 artifacts was observed at the site, 63 on the surface and 21 collected during testing. The large proportion of metasediment river cobble cores (11 or 13%) and flakes with river cobble cortex indicates use of the site for production of flakes.

Weathered cortex on about half of the Hozomeen chert flakes also indicates reduction of cobbles. Both types of cobbles were probably procured in the immediate vicinity. The function or use of the flakes is unknown.

Artifacts were recovered from two of the five test units. Nearly all were from disturbed reservoir deposits. All 20 artifacts from the test units consisted of Hozomeen chert and metasediment flaking debris. Table 11.23 shows all cultural material collected from excavation units by level.

Table 11.23 Cultural Material From Excavation Units at 45WH250

test unit 1 (1x0.5 m)		NOCA
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	5 Debitage, Metasediment	10358
	1 Tephra, Source Unknown	10409
L:2-4 (5-30 cm BS)	0 Collections	
L:5 (30-40 cm BS)	1 Debitage, Metasediment	10356
L:6 (40-50 cm BS)	0 Collections	
test unit 2 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	10 Debitage, Hozomeen Chert	10357
L:2 (5-10 cm BS)	2 Debitage, Hozomeen Chert	10359
	1 Tephra, Source Unknown	10408
L:3-6 (10-45 cm BS)	0 Collections	
L:7 (45-55 cm BS)	2 Debitage, Metasediment	10355
test unit 3 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-5 (0-61 cm BS)	0 Collections	
test unit 4 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-3 (0-30 cm BS)	0 Collections	
test unit 5 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-5 (0-45 cm BS)	0 Collections	

Site Chronology

No charcoal was collected during excavation. Four tephra samples were collected but none were selected for identification because they appeared to come from a disturbed or secondary depositional context. No chronologically diagnostic artifacts were recovered.

Site Stratigraphy

The uppermost deposit is a dark brown, poorly to well-sorted loamy sand laminated with organic matter. It was deposited by the reservoir. Underlying the reservoir deposit was a dark brown to black pre-reservoir A-horizon which was rich in organic matter. Below the A-horizon was a gray, tephra-rich layer followed by a reddish-brown B-horizon of well-sorted loamy sand. Beneath this unit was a C-horizon developed in a brown to pale brown, very poorly sorted, gravelly sand.

Conclusions and Assessment

Site 45WH250 appears to have been used to reduce metasediment and Hozomeen chert cobbles for the production of flakes or to make cobble tools; however, only one possible tool, a biface, was found. These materials were probably procured on-site or nearby.

The site is ineligible for inclusion in the National Register of Historic Places because artifacts lack integrity of location and association. Erosion has removed the upper portions of the B-horizon, which held the majority of artifacts, and concentrated them as a lag concentration on the surface or incorporated into the reservoir deposit. Two pieces of flaked debitage came from 44 to 55 cm below the surface in test unit 2, but no other evidence for cultural activity was found at this level. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest.

11.2.10 45WH263 (FS#83) Dry Creek #1

Site Setting

Site 45WH263 is located on the east side of the valley in the middle portion of the project area, about 100 m north of Dry Creek. It is on a high terrace at approximately 483 m (1585 ft) elevation asl. The site is situated on late Pleistocene glacial till that has been incised by the Skagit River and Dry Creek. The landform has a southeastern solar exposure and a 0-20% slope. Because the site is located a few hundred meters north of site 45WH255, it has a similar setting and view of the valley.

Reservoir erosion and logging of the drawdown have been the primary sources of historic disturbance to the site. The site is in an exposed location that receives the full force of waves generated by winds having a long fetch up the valley. A high energy beach zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds, which causes excessive erosion. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open-canopy conifer forest.

General Site Description

The site is characterized as a low-density lithic and calcined bone scatter. The dimensions are 15 m north-south and 50 m east-west, covering a site area 750 m^2. Artifacts extend to 10 cm below the surface. The maximum estimated volume of artifact-bearing deposits is 75 m^3. The site was recorded during the survey portion of the project in 1988, and 65 lithic artifacts, including two bifaces and debitage, were inventoried but not collected. The site was extensively eroded. A large circular depression 12 m in diameter and 1 m deep is present at the site.

Testing Methods and Rationale

Six 1x1 m test units were excavated in 1990 and 1991. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of excavation units was intended to locate undisturbed cultural deposits and features and to determine the origin of the large depression. Test unit 1 was located outside of the depression and test units 2-6 were located with it.

Description of Testing Results

Twenty-four lithic artifacts, mostly debitage, and 15 fragmented and calcined mammal bones were recovered from three of the six test units. One tool, a modified flake (NOCA 10014) of Hozomeen chert, was found. The great majority of flakes are made of Hozomeen chert. Activities at the site appear to have been production of Hozomeen chert flakes from nodules or cores, and the cooking of mammals. The site probably served as a short-term, seasonal campsite.

Nearly all of the excavated artifacts are from sediments that have been disturbed by reservoir wave action. The large round depression was found to be a natural feature. No artifacts were found within this feature and no evidence was recovered suggesting it was used or created by people.

Table 11.24 shows all cultural material collected from excavation units by level.

Table 11.24 Cultural Material From Excavation Units at 45WH263

		NCCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Flake, Edge Modified, Hozomeen Chert	10014
	22 Debitage, Hozomeen Chert, Metasediment	10033
L:2 (20-30 cm BD)	0 Collections	
test unit: 2 (L:S-L:4 1x1 m, L:5-L:7 1x0.5 m)		
L:S (surface)	0 Collections	
L:1-7 (0-65 cm BS)	0 Collections	
test unit 3 (L:S-L:1 1x1 m, L:2-L:6 1x0.5 m)		
L:S (surface)	0 Collections	
L:1-6 (0-50 cm BS)	0 Collections	
test unit 4 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	16 Bone Fragments, Unidentifiable	10397
L:2-9 (5-55 cm BS)	0 Collections	
test unit 5 (L:S-L:3 1x1 m, L:4-L:7 1x0.5 m)		
L:S (surface)	0 Collections	
L:1-7 (0-30 cm BS)	0 Collections	
test unit 6 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	1 Debitage, Hozomeen Chert	10373
L:2-5 (5-25 cm BS)	0 Collections	

Site Chronology

No tephra or charcoal samples were collected. Tephra observed in test units appeared to have been redeposited. Charcoal was present, but probably originated from the clearing and burning of the drawdown prior to impoundment of the river or from natural forest fires. No chronologically diagnostic artifacts were recovered.

Site Stratigraphy

The generalized stratigraphic sequence consists a reservoir deposit over a remnant soil B-horizon developed in coarse, bouldery glacial till. A thin, sandy reservoir deposit mixed with boulders caps the site. A thin, discontinuous reddish-brown B-horizon has

formed in the top of the bouldery glacial till, but the top of it has been truncated by erosion. Below the soil is a dark brown, unweathered glacial till. Artifacts were found only in the reservoir deposit and the top of the B-horizon.

Conclusions and Assessment

Site 45WH263 appears to have been used for the production of Hozomeen chert flakes from nodules or cores, and as a short-term, seasonal campsite where game animals were cooked. The flakes may have been used to make expedient tools, such as the modified flake, that could have been used to butcher animals or prepare hides.

The site is assessed ineligible for inclusion in the National Register of Historic Places because artifacts and cultural deposits lack integrity of location and association. Based on the test excavation, the artifact-bearing deposits at the site have been completely disturbed by shoreline processes of the reservoir. Scientific excavation and study of the site is not likely to contribute new and important information to the understanding of the prehistory of the upper Skagit River Valley, the northern Cascade Range, and the Pacific Northwest. No further treatment of the site is recommended.

11.2.11 45WH264 (FS#84) Devil's Junction Creek #3

Site Setting

The site is located on the east side of the valley in the middle portion of the project area, about 300 m north of Devil's Junction Campground. The site is situated on a flat terrace that is west, and on the next terrace below the one where site 45WH262 is located. At an elevation of 467 m (1565 ft), the site has a southwest to west solar exposure and a 0-3% slope. The views and site setting are as described for site 45WH262.

Reservoir erosion and logging of the drawdown have been the primary sources of historic disturbance to the site. During lowered reservoir levels the site is excessively eroded by surf breaking against the landform. Erosion of 45WH262 may resulted in transportation of artifacts down the steep terrace and their deposition on the surface of 45WH264. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open-canopy conifer forest.

General Site Description

The site is a moderate-density lithic scatter with dimensions of 90 m north-south and 20 m east-west, covering an area 1,800 m^2. Artifacts extended to 20 cm below the surface. The estimated maximum site volume is 360 m^3. The artifact density on the surface is low at the southern end of the site and moderate at the northern end. Eighty-eight lithic artifacts were inventoried on the surface at the time of recording. The

majority of items inventoried (94%) were of locally available Hozomeen chert, and the remaining were of metasediment.

Testing Methods and Rationale

The site was inventoried and recorded in 1988. Three 1x1 m test units were excavated in 1990. One artifact was collected from the surface at the southern end of the site during testing (see Table 11.25). Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of test units was intended to locate any undisturbed artifact-bearing deposits or features.

Table 11.25 Inventory of Surface Collections from 45WH264

	NOCA
1 Pestle, Andesite	7937

Description of Testing Results

Artifact categories recorded at the site include pestle, flake, shatter, and biface. Artifacts were scattered across the surface of the site and incorporated into the reservoir deposit. A total of nine artifacts was recovered during testing from the three test units. Test unit 3 was the only one where artifacts were found below the disturbed surface sediments. Three flakes were recovered from just below the reservoir deposits in sediments altered by plant root activity.

The pestle is the largest and most massive found in the project area (Figure 11.13). The sides are modified, but for what purpose is uncertain. The modification could be the result of pecking to make the shape more regular or it could be from grinding of another material. The distal end has been crushed and blunted by contact against a hard material, suggesting that it was used to crush another material. The chipped stone remains indicate reduction of local lithic materials, possibly related to the intensive biface production that occurred at adjacent 45WH262. Table 11.26 shows all cultural material collected from excavation units by level.

Table 11.26 Cultural Material From Excavation Units at 45WH264

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	0 Collections	
L:2 (20-30 cm BD)	1 Debitage, Hozomeen Chert	10015
	Strat Unit 3: 1 Tephra Sample, Source Unknown	10193

L:3 (20-30 cm BD)	Strat Unit 7: 1 Tephra Sample, Source Unknown	10194
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Flake, Hozomeen Chert	10016
	1 Flake, Metasediment	
L:2 (20-30 cm BD)	1 Tephra Sample, Source Unknown	10195
L:3-4 (30-50 cm BD)	0 Collections	
test unit: 3 (1x1 m)		
L:S (surface)	1 Biface, Hozomeen Chert	10017
	1 Biface, Metasediment	10018
L:1 (10-20 cm BD)	1 Debitage, Metasediment	10019
L:2 (20-30 cm BD)	3 Debitage, Hozomeen Chert, Metasediment	10020
L:3 (30-40 cm BD)	^{14}C, 430±100 BP, Beta 40700	
L:4 (40-50 cm BD)	0 Collections	

Site Chronology

Three tephra samples were collected during testing, but none were analyzed. One charcoal sample was estimated to be 430±100 BP (Table 11.27). Artifacts were recovered from the levels above the sample, but none in or below the level from which the sample came. The charcoal was collected from a small pocket in the southwest quadrant of the unit in level 3 and was not associated with a feature. The pocket of charcoal extends through three levels (levels 1-3). Numerous other pockets of charcoal within the test unit are related to burned roots, as may be the charcoal in this sample.

Table 11.27 Table Of ^{14}C Dates from 45WH264

test unit	LEVEL	LAB #	UNCORRECTED DATE YBP
TU3	L-3	Beta 40700	430±100

Site Stratigraphy

The generalized stratigraphic sequence begins with a dark yellowish-brown, poorly-sorted, gravelly sand reservoir deposit at the surface. Below it is a dark brown, well-sorted and laminated sand that was also deposited by reservoir processes. Underlying this is a light grey, pre-reservoir O-horizon mixed with sandy tephra. Below this deposit is a dark brown, poorly-sorted, gravelly sand which has developed into a

weak B-horizon. The basal deposit is a poorly-sorted, gravelly sand glacial till which has weathered to BC-horizon.

Conclusions and Assessment

Site 45WH264 may be an extension of site 45WH262. It may have functioned as a biface reduction site and as a temporary camp. The pestle found at the site suggests that materials were crushed or pulverized, but the nature of such materials is unknown. Inferences regarding the site's function and relationship to 45WH262 is clouded by the likelihood that artifacts on the site surface have been eroded from 45WH262 above and rolled down the steep terrace escarpment separating the two sites, and coming to rest on 45WH264.

Site 45WH264 is assessed ineligible for inclusion in the National Register of Historic Places because artifacts and cultural deposits lack integrity of location and association. The artifact-bearing strata appear to have been completely disrupted by shoreline processes.

11.2.12 45WH273 (FS#93) North Cat Island #1

Site Setting

Site 45WH273 is located on the east side of the valley in the middle portion of the project area, about 70 m from the northwest corner of Cat Island. The site is atop a bedrock bench overlooking a bend in the former Skagit River channel. The landform has a western exposure and a slope of 0-35%. The site elevation is approximately 467 m (1,530 ft) asl. The views and site setting are as described for site 45WH473, located a few hundred meters to the south.

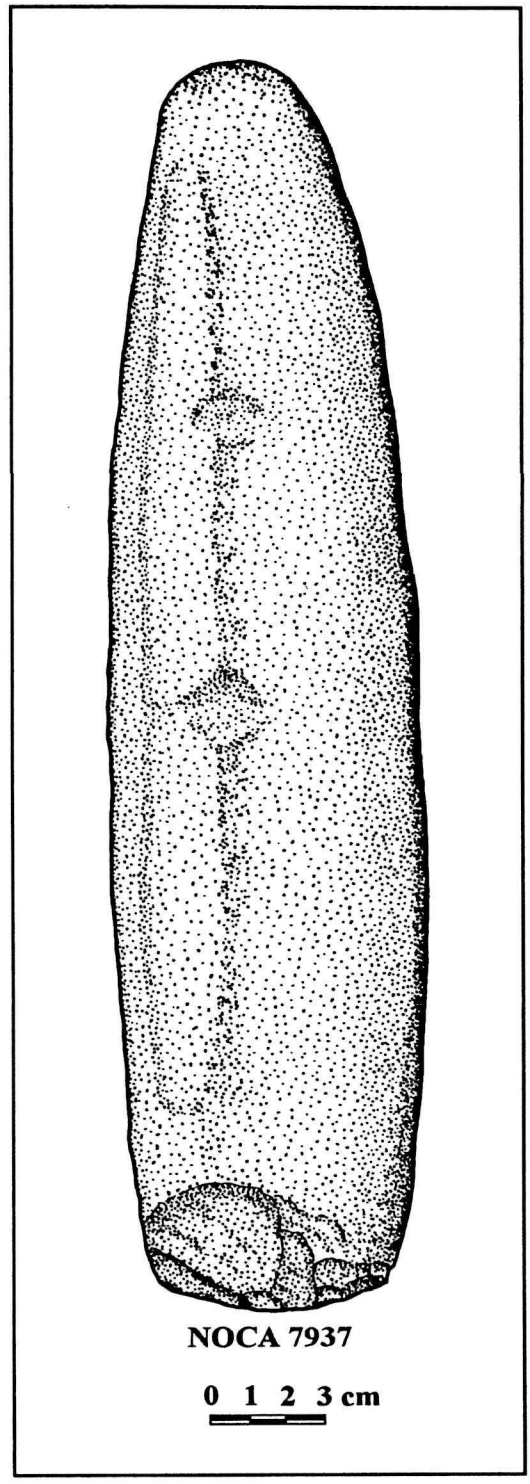


Figure 11.13 Artifact illustrations from Site 45WH264 (FS# 84)

Logging of the drawdown area and reservoir erosion have been the primary sources of historic disturbance at the site. The western, southern, and northern margins of the bench are exposed to erosional force of waves generated by winds having a long, uninterrupted fetch along the length of the valley. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of an open- canopy conifer forest.

General Site Description

The site is a high-density lithic scatter. Its dimensions are 40 m north-south and 20 m east-west, covering an area 800 m^2. Artifacts extended to 40 cm below the surface. From these dimensions the maximum volume of artifact-bearing deposits is estimated to be 80 m^3. The site consists of four high-density clusters of artifacts within a moderately high-density scatter. More than 293 lithic artifacts were inventoried 1988 and 1989, including a projectile point, bifaces, cores, debitage, and a groundstone knife. Two items were collected from the surface (Table 11.28). Lithic materials types are primarily Hozomeen chert, metasediment, slate, with a small amount of exotic chalcedony. Two possible features were recorded: a large depression measuring 24 m north-south and 5 m east-west and FMR rock cluster.

Testing Methods and Rationale

The site was recorded in 1988 and monitored in 1989. It was test excavated in 1991 using four 1x0.5 m test units and one 50x50 cm test pit. Site sediments were excavated in 5 cm and 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of excavation units was intended to locate any undisturbed artifact-bearing deposits or features and to determine whether the large depression was cultural in origin. The FMR rock cluster was not tested because it appeared to have been eroded from the soil matrix.

Table 11.28 Inventory of Surface Collections from 45WH273

	NOCA
1 Knife, Slate	6364
1 Projectile Point, Metasediment	7090

Description of Testing Results

Artifact categories recovered in testing include knife, projectile point, flake, and shatter. The slate knife (NOCA 6364; Figure 11.14) is thin, with a bi-bevelled cutting edge. The slate is relatively soft and if the sharp edge was used to cut, the material must have been soft. The projectile point (NOCA 7090) probably tipped a spear, although it

could have been used as a knife. Given that metasediment is difficult to flake, the thinness and regular shape of the point are extraordinary.

Most excavated artifacts were recovered from the uppermost, eroded soil near the top of test unit 2. Some flakes and shatter were from what appeared to be undisturbed deposits. The mostly noncortex flakes suggest that secondary reduction of Hozomeen chert, and possibly metasediment, took place at the site. Due to the eroded condition of the site, the restricted distribution of undisturbed deposits, and the low density of artifacts within these deposits, little can be inferred regarding site function and occupational history.

A geologic trench excavated into the large depression revealed a stratified sequence of loess with two interbedded tephra layers. No charcoal layers, FMR concentrations, or other possible cultural remains were observed. Although its origin is uncertain, it probably is related to glacial erosion and resembles other depressions observed on glacially-scoured benches in the drawdown.

Table 11.29 shows all artifacts collected from excavation units by level.

Table 11.29 Cultural Material From Excavation Units at 45WH273

test unit 1 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-7 (0-35 cm BS)	0 Collections	
test unit 2 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	9 Debitage, Hozomeen Chert	10337
L:2 (5-10 cm BS)	9 Debitage, Metasediment	10341
	1 ^{14}C	
L:3 (10-15 cm BS)	3 Debitage, Hozomeen Chert, Metasediment	10340
L:4 (15-20 cm BS)	Red Matrix: 2 Debitage, Hozomeen Chert, Metasediment	10344
	Green Matrix: 4 Debitage, Hozomeen Chert, Metasediment	10339
	Disturbed Matrix: 3 Debitage, Hozomeen Chert, Metasediment	10338
L:5 (20-25 cm BS)	Green Matrix: 1 Debitage, Metasediment	10345
L:6 (25-30 cm BS)	Red Matrix: 1 Debitage, Metasediment	10342
L:7 (30-35 cm BS)	0 Collections	
L:8 (35-40 cm BS)	3 Debitage, Hozomeen Chert	10343
L:9-11 (40-55 cm BS)	0 Collections	
test unit 3 (1x0.5 m)		
L:S (surface)	4 Debitage, Hozomeen Chert	10335

L:1 (0-5 cm BS)	5 Debitage, Hozomeen Chert	10333
L:2-6 (5-30 cm BS)	0 Collections	
test unit 4 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-2 (0-20 cm BS)	0 Collections	
test unit 5 (50x50 cm)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	2 Debitage, Hozomeen Chert	10334
L:2 (5-10 cm BS)	0 Collections	
L:3 (10-15 cm BS)	4 Debitage, Hozomeen Chert	10336
L:4-6 (15-30 cm BS)	0 Collections	

Site Chronology

Dating of the site is based on two time-sensitive artifacts. The lanceolate projectile point (NOCA 7090) has been assigned to Type 1 based on overall morphology and workmanship (Appendix D). This type may date to between 10,000 and 12,000 years ago and represents the only possible Paleoindian point from the drawdown. It is possible that this "point" may, alternatively, have functioned as knife during a more recent time period. Until this type is corroborated by other examples from the project area, its assignment to the Paleoindian period will remain tentative. The ground slate knife, by comparison, is likely to date after about 4,000 years ago, the approximate time that ground slate technology was employed to make tools in parts of the Pacific Northwest (Fladmark 1982). Based on these two artifact types, it is possible that the site dates from less than 4,000 years ago to more than 10,000 ago.

One charcoal sample was collected during testing but is of questionable value for dating the site. No tephra samples were collected during testing, although a tephra was observed in the depression.

Site Stratigraphy

The generalized stratigraphic sequence begins with a dark brown, silty sand, reservoir deposit. It is underlain by a dark gray to black, pre-reservoir forest duff layer that has been eroded logging or reservoir waters. Below the remnant of the duff is a thin, light gray tephra. Underlying the tephra is a reddish-brown, very well sorted, loamy B-horizon. Below the B-horizon is a brown, well-sorted silt loam BC-horizon.

Due to excessive erosion across most of the site, the soil B- and BC-horizons outcrop at the site surface. In these areas, the upper soil horizons have been eroded and transported. Also, in some site areas (test unit 2) soil B-horizon matrix was mixed with

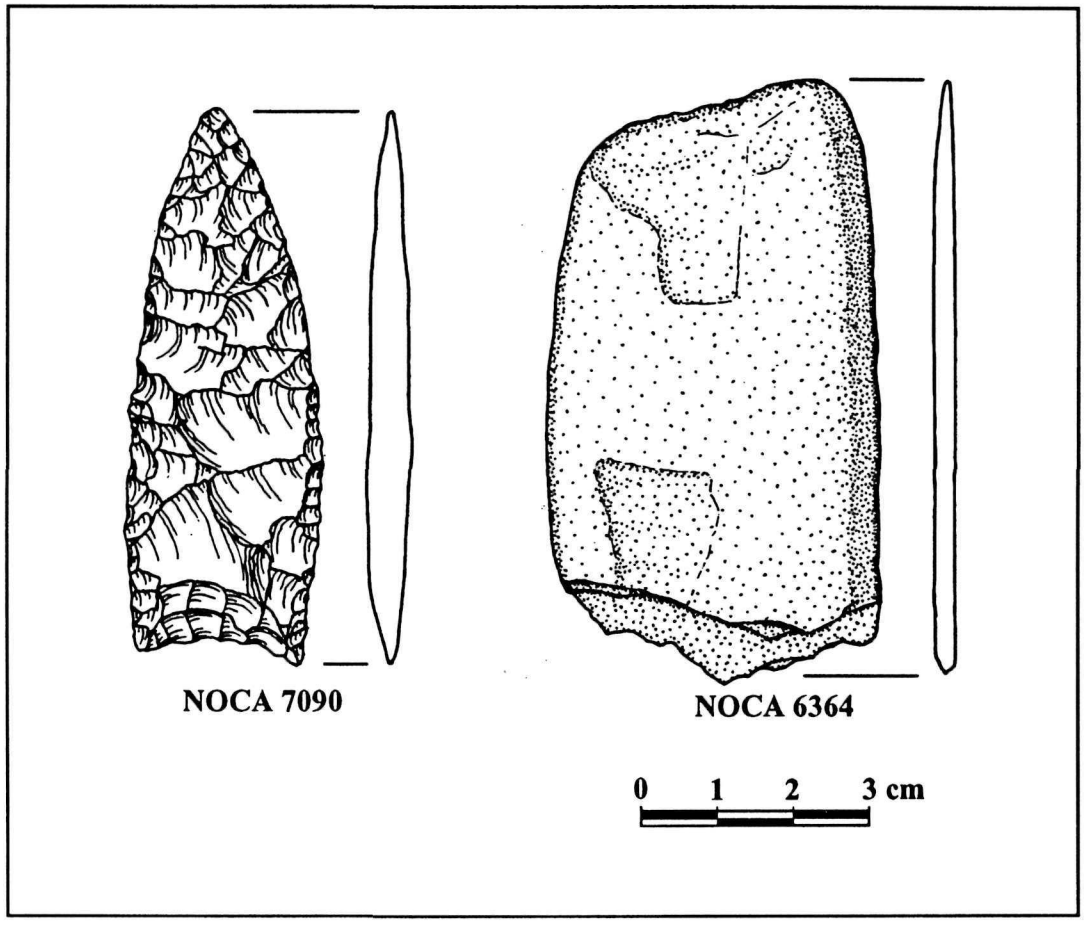


Figure 11.14 Artifact illustrations from Site 45WH273 (FS#93)

BC-horizon matrix, forming a complex color mottled pattern. Such mixing probably resulted from bioturbation caused by large tree roots in the prehistoric past.

Conclusions and Assessment

Site 45WH273 probably served as a temporary camp where local chert and metasediment flakes were produced from cores and other artifacts were manufactured. In addition, presence of the ground slate knife suggests that other materials were processed, but what these are is unknown. Site 45WH273 probably dates to the last ca. 4,000 years, but it could be older. More detailed characteristics of the site cannot be specified due to the high degree of site disturbance.

Site 45WH273 is assessed ineligible for inclusion in the National Register of Historic Places. The artifacts and cultural deposits lack integrity of location and association. The artifact-bearing deposits at the site appear to have been almost completely disrupted by shoreline processes. No further treatment of the site is

recommended.

11.2.13 45WH277 (FS#97) North Lightning Creek #8

Site Setting

Site 45WH277 is located on the north side of Lightning Cr. along the extreme distal end of the alluvial fan. The site is situated above the former Skagit River channel near the west side of the valley in the middle portion of the project area. The site has a north-northeastern solar exposure and a <5% slope. At approximately 1,510 ft (460 m) elevation, the site is about 15 m (50 ft) above the Skagit River. The landform here provides clear views up (north) the Skagit River valley. To the northeast is Desolation Peak (6,102 ft; 1,860 m) and to the east is the valley wall, bisected by the narrow gorge of Lightning Cr. To the south is Jack Mtn. (9,063 ft; 2763 m) and Nahokameen glacier. About 400 m to the west of the site, the western valley wall rises in a series of cliffs gullied by avalanche chutes. The artifact scatter defining the site is linear, and it follows the abrupt edge of the Lightning Cr. alluvial fan, which was created by the erosional force of the Skagit River.

Construction of a logging haul road, logging, and reservoir erosion have been the primary sources of historic disturbance to the site. Much of the site was disturbed by blading during haul road construction. The site is in a location that receives the full force of waves generated by winds blowing up and down the valley. A high energy surf zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds, which causes excessive erosion. The pre-reservoir vegetation, evident from the remaining stumps, consisted of open-canopy lodgepole pine and shrubs.

General Site Description

The site is characterized as a low-density lithic scatter. The site dimensions are 550 m north-south and 15 m east-west, covering an area 8,250 m^2. Artifacts extended to 20 cm below the surface. The estimated maximum volume of artifact-bearing deposits is 825 m^3. Seven concentrations of artifacts (labeled clusters A through G) were inventoried, including a low-density scatter of artifacts between them. A total of 147 lithic artifacts and more than 80 calcined bone fragments were counted. The lithic assemblage includes projectile points, bifaces, edge-modified flakes, cobble tool, cores, and debitage. The lithic material types present in the artifact assemblage include locally available Hozomeen chert and metasediment, and exotic chalcedony and jasper. Artifacts collected from the site surface are shown in Table 11.30.

Testing Methods and Rationale

The site was recorded in 1988 and revisited in 1989, at which time the boundary was extended north. It was test excavated in 1990 using one 1x1 m test unit placed

approximately 39 m south-southwest of cluster D, away from the haul road. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of the test unit was intended to locate any undisturbed artifact-bearing deposits or features. Portions of the site recorded in 1989 were unavailable for excavation during testing due to higher lake levels, which inundated clusters E, F, and G.

Table 11.30 Inventory of Surface Collections from 45WH277

	NCCA
Cluster F: 1 Projectile Point, Hozomeen Chert	7030
Cluster F: 1 Projectile Point, Metasediment	7031
Cluster F: 1 Projectile Point, Metasediment	7032
Cluster F: 1 Projectile Point, Metasediment	7033
Surface: 1 Core, Hozomeen Chalcedony	7034
Cluster F: 1 Biface, Metasediment	7035

Description of Testing Results

Eleven pieces of flaked Hozomeen chert and metasediment debitage were recovered. They were incorporated into the reservoir deposit and present in the soil B-horizon. The upper portions of the B-horizon showed evidence of being reddened by an intense surface fire, possibly from burning of slash before impoundment. The locational integrity of artifacts in this matrix appeared to be disturbed by roots of trees or shrubs. The total artifact assemblage from this site indicates the reduction of locally available lithic material, primarily Hozomeen chert, but also Hozomeen chalcedony and metasediment. Only one artifact of exotic material was observed at the site. This artifact, located in cluster C, was a red jasper core and was not collected. Table 11.31 lists all artifacts collected from excavation units by level.

Of the artifacts inventoried on the site surface, 94% consisted of noncortex flakes of Hozomeen chert, 7% noncortex shatter of Hozomeen chert, 7% cortex shatter of Hozomeen chert, 7% noncortex metasediment shatter, and minor percentages of other debitage or tool categories made of these materials. The site appears to have functioned as a temporary camp where mammals were cooked and where local stone materials were fashioned into tools. It is unlikely that the entire site was occupied contemporaneously. Rather, it is likely that the different artifact clusters represent camps, each with a unique occupational history that may overlap in time with any other in the site.

Table 11.31 Cultural Material From Excavation Units at 45WH277

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	6 Debitage, Hozomeen Chert, Metasediment	10044
L:2 (20-30 cm BD)	1 Debitage, Hozomeen Chert	10045
L:3 (30-40 cm BD)	4 Debitage, Hozomeen Chert, Metasediment	10046
L:4 (40-50 cm BD)	1 Material Sample, Chert	10125

Site Chronology

Site chronology is estimated on the basis of time-sensitive artifacts (Figure 11.15). Four projectile points were collected from the surface of Cluster F. These have been assigned to types using the projectile point chronology in Appendix D. One item, NOCA 7030, was assigned to Type 3A, in the Cascade or Olcott series. This type has been estimated to span from 9,000 to 4,000 BP. Two points, NOCA 7032 and 7033, were assigned to Type 14A (Columbia Plateau Corner-Notched or Plateau Horizon), dating between 2,000 and 150 BP. Finally, NOCA 7031 was assigned to Type 15 (Columbia Plateau Side-Notched or Kamloops Side-Notched), dating between 1,200 and

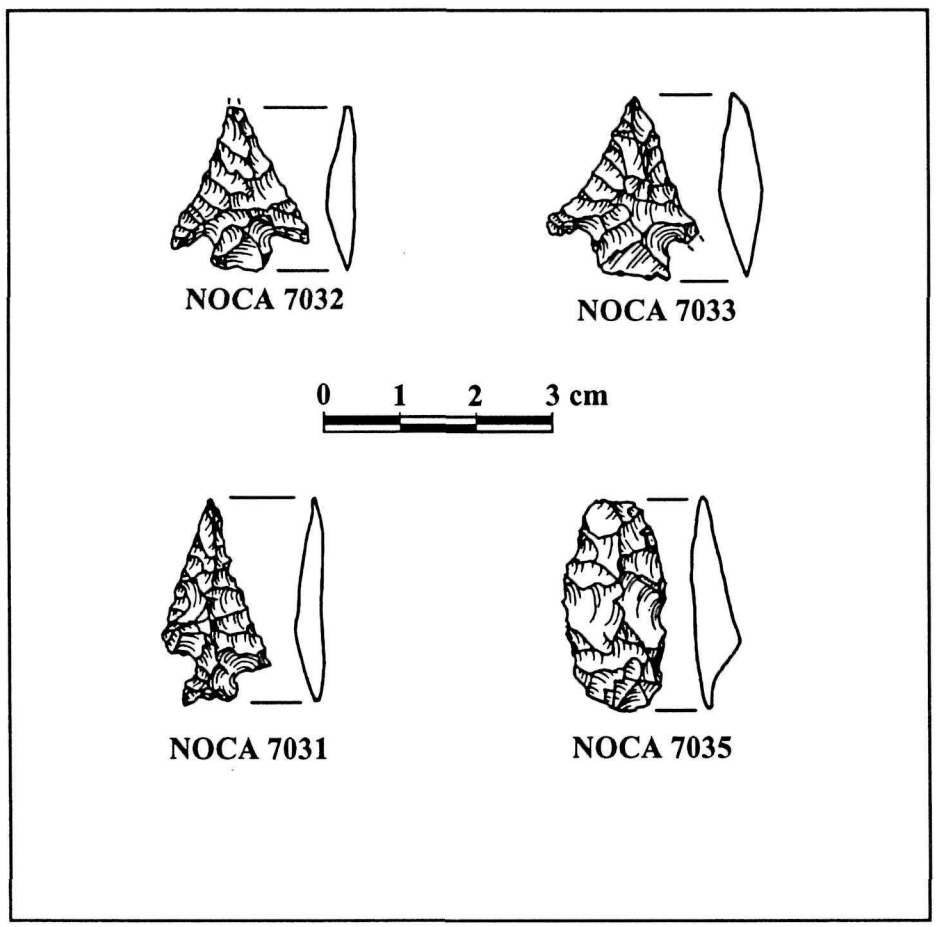


Figure 11.15 Artifact illustrations from Site 45WH277 (FS#97)

150 BP. Although the site may have been used initially in the Early or Middle prehistoric period, it was most intensively used in the Late period (the last 2,000 years).

Site Stratigraphy

The generalized stratigraphic sequence begins with a thin, dark brown reservoir deposit capping the landform. In some locations, waves breaking against the landform edge have built a gravelly beach berm. The underlying stratum is a dark brown, moderately well-sorted, gravelly sandy loam. It is underlain by a dark yellowish-brown, B-horizon formed in a poorly sorted, gravelly sand. The basal unit is a dark yellowish-brown, BC-horizon formed in a poorly sorted, bouldery sandy clay.

Conclusions and Assessment

Site 45WH277 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts and cultural deposits lack integrity of location and association. The artifact-bearing deposits at the site appear to have been partially or completely eroded and disturbed by shoreline erosion and historic logging activities. Cluster A is the only artifact cluster that was not affected by the construction of the historic logging haul road. This portion of the landform has been stable during the Holocene, with a slow rate of deposition. Prior to reservoir construction, cultural material extended to ca. 30 cm below the ground surface. Reservoir erosion along the distal end of this landform has been and is extensive. The cumulative effect of these disturbances has been the loss of integrity of the artifact-bearing deposits. No further treatment of this site is recommended.

11.2.14 45WH281 (FS#101) Boundary Bay #3

Site Setting

Site 45WH281 is located about 300 m south of Boundary Bay Campground on the east side of the valley in the northern portion of the project area. The site is situated on an alluvial fan of an unnamed intermittent stream. The landform has a western solar exposure and a 0-20% slope. The site elevation is approximately 1,530 ft (467 m) asl. The site setting and landscape views are as described for site 45WH230.

Logging of the drawdown area and reservoir erosion have been the primary sources of historic disturbance to the site. A high energy surf zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds, which causes excessive erosion. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a mature, open-canopy conifer forest.

General Site Description

The site is a moderately high-density lithic scatter. Dimensions are 75 m north-south and 30 m east-west, covering an 2,250 m^2. Artifacts extended to 20 cm below the surface. The estimated maximum volume of artifact-bearing deposits is 450 m^3. A total of 73 lithic artifacts was inventoried on the site surface. Artifact categories include projectile point, microblade and microblade core, ground uniface, scraper, core and debitage. Three artifact clusters were surrounded by lower density scatters. Lithic material present is predominantly Hozomeen chert, Hozomeen chalcedony, and metasediment.

Testing Methods and Rationale

The site was inventoried in 1988 and 1989. Four artifacts were collected from the surface of the site in 1989 (see Table 11.32). It was tested in 1993 through excavation of two 1x1 m test units. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of excavation units was intended to locate undisturbed cultural deposits or features. One artifact, a metasediment hammerstone, was collected from the surface during testing.

Table 11.32 Inventory of Surface Collections from 45WH281

	NOCA
1 Microblade, Hozomeen Chert	7068
1 Ground Stone, Steatite	7069
1 Projectile Point, Basalt	7070
1 Microblade Core, Hozomeen Chert	7071
1 Hammerstone, Metasediment	10774

Description of Testing Results

From the inventory of artifacts on the site surface, Hozomeen chert flake (37%) and shatter (34%) constitute the predominate artifact categories. Hozomeen chert core (10%), metasediment flake (7%), and other flaked stone categories constitute a minor proportion of the assemblage. One piece of soapstone had been ground on one face. The presence of a microblade and a microblade core indicates use or manufacture of microblades at the site.

A total of 25 lithic pieces of flaked debitage was recovered from both test units from a remnant of the soil B-horizon. The forest duff layer and upper portions of the B-horizon had been removed by erosion. Like the assemblage of surface artifacts, the chipped stone assemblage from the test units indicates reduction of locally available lithic

raw materials, including Hozomeen chert, metasediment, and quartz crystal. One vitrophyre flake, NOCA 10777, was recovered from level 2 of test unit 1 was selected for x-ray fluorescence (XRF) analysis to determine it's geologic source. The vitrophyre produced a chemical signature that does not match any presently known source and was assigned to "Unknown Vitrophyre Source 2" (see section 10.3.7 and Appendix). No features were encountered.

Site 45WH281 may have been used as a temporary camp, although there is no evidence that food or other resources were cooked. The main use of the site appears to have been the manufacture of expedient tools from local lithic materials.

Table 11.33 Cultural Material From Excavation Units at 45WH281

test unit: 1 (1x1 m)		
L:S (surface)	1 Cobble, Flaked, Metasediment	10775
L:1 (0-10 cm BS)	2 Debitage, Hozomeen Chert, Metasediment	10776
L:2 (10-20 cm BS)	3 Flake, Hozomeen Chert, Vitrophyre, Metasediment	10777
	1 Flake, Hozomeen Chert	10778
L:3 (20-30 cm BS)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	15 Debitage, Metasediment, Hozomeen Chalcedony, Hozomeen Chert, Quartz Crystal	10779
	1 Flake, Hozomeen Chert	10780
L:2 (10-20 cm BS)	2 Debitage, Metasediment, Hozomeen Chert	10781
L:3-4 (20-40 cm BS)	0 Collections	

Site Chronology

No charcoal or tephra was observed in the site sediments during testing. An age estimate for the site is based on one projectile point, NOCA 7070 (Figure 11.16). It is classified as a Type 3B (Cascade or Olcott) which is dated between ca. 9,000 and 4,000 BP.

Site Stratigraphy

The generalized stratigraphic sequence begins with a dark brown, poorly-sorted, gravelly sand reservoir deposit on the surface. Below this is a yellowish-brown, B-horizon weakly developed in a gravelly sandy silt. It is underlain by a strong brown, B-horizon developed in gravelly sandy silt. The basal stratum is a dark yellowish-brown BC-horizon developed in sandy gravels of the alluvial fan.

Conclusions and Assessment

Site 45WH281 may have been used as a temporary campsite or to manufacture expedient tools from local materials. Site occupation may date to the Early-Middle period.

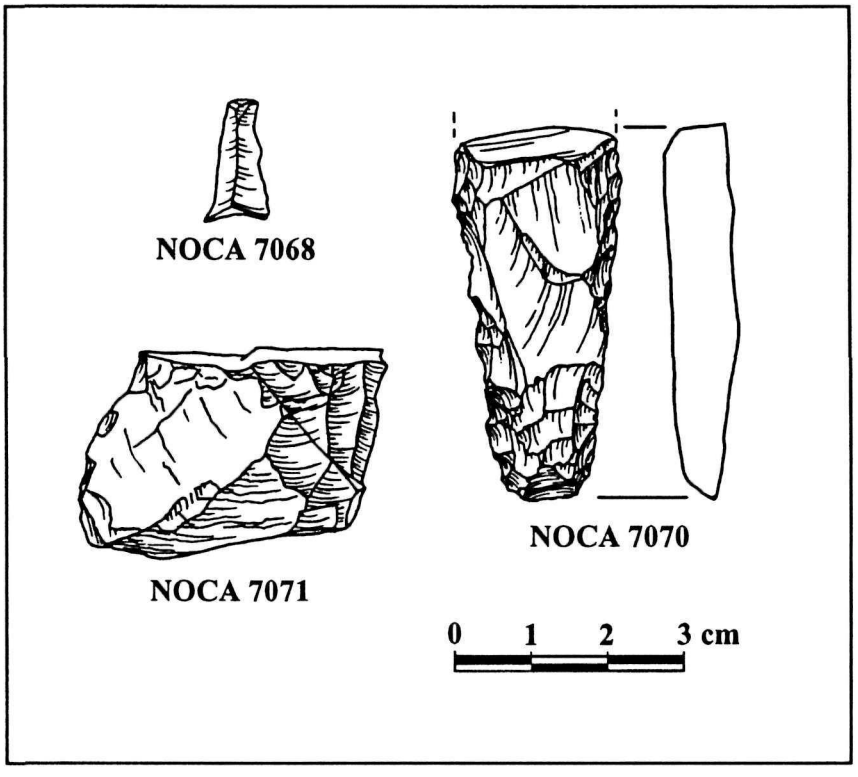


Figure 11.16 Artifact illustrations from Site 45WH281 (FS#101)

Site 45WH281 is assessed as ineligible for inclusion in the National Register of Historic Places. Artifacts and cultural deposits lack integrity of location and association. The artifact-bearing deposits have been almost completely eroded by shoreline processes. No further treatment of the site is recommended.

11.2.15 45WH282 (FS#102) North Cat Island #6

Site Setting

Site 45WH282 is located on the east side of the valley in the middle portion of the project area. It is at the distal (northwest) end of a moderate-sized alluvial fan formed by Cat Cr., a small but permanent stream. The landform has a western solar exposure and a 3-5% slope. At about 1,551 ft (473 m) elevation, the site is 24.4 m (80 ft) above the Skagit River, which flowed a few hundred meters to the northwest. From the site, one looks west, across the flood plain of the Skagit River, to the steep western valley wall. To the north and east are the steep slopes of the eastern valley wall. To the south is the low, glacially-scoured bedrock knob that is today known as Cat Island.

Logging, haul road construction, and reservoir erosion have been the primary sources of historic disturbance to the site. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a mature, open-canopy conifer forest.

General Site Description

The site is characterized as a moderately high-density lithic scatter. Its dimensions are 90 m north-south and 50 m east-west, covering an area 4,500 m^2. Artifacts extended to 30 cm below the surface. The maximum volume of artifact-bearing deposits is estimated to be 450 m^3. A total of 138 lithic artifacts was inventoried, consisting of these artifact categories: biface, scraper, utilized flake, and core. In 1989 another cluster of more than 300 flakes and biface fragments were found on the north side of an abandoned creek channel that bisects the site into north and south artifact clusters. Nearly all items were of Hozomeen chert. Nodules of Hozomeen chert are abundant in the alluvial fan gravels.

Testing Methods and Rationale

The site was inventoried in 1988 and 1989. It was tested in 1991 through excavation of six 1 x 0.5 m test units. Site sediments were excavated in 5 cm and 10 cm arbitrary levels and screened through 1/8 in and 1/4 in wire mesh. The placement of test units was intended to locate any undisturbed artifact-bearing deposits or features. All test units were placed in the southern artifact cluster.

Description of Testing Results

From the inventory of artifacts on the site surface, Hozomeen chert flake constitutes the largest category (73%). Lesser proportions are comprised of shatter (14%), core (5%), and biface (3%). This assemblage suggests that the primary use of the site was the production of flakes from cores, and possibly the manufacture of bifaces. The Hozomeen chert used in these technologies could have been procured on-site or nearby.

A total of 27 artifacts was excavated from test units 4 and 5. Artifacts from test unit 4 were from reservoir-disturbed deposits; one Hozomeen chert flake from test unit 5 was from an isolated pocket of B-horizon matrix. An edge-modified flake from a mixed stratum of test unit 4 was the only tool recovered. The remainder of the assemblage consists of flakes and shatter. All artifacts recovered during testing are of Hozomeen chert. No features or faunal remains were recovered. Table 11.34 lists all artifacts collected from excavation units by level.

Table 11.34 Cultural Material From Excavation Units at 45WH282

test unit 1 (1x0.5 m)		NOCA
L:S (surface)	0 Collections	
L:1-5 (0-50 cm BS)	0 Collections	

test unit 2 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-4 (0-40 cm BS)	0 Collections	
test unit 3 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-4 (0-47 cm BS)	0 Collections	
test unit 4 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1 (0-5 cm BS)	4 Debitage, Hozomeen Chert	10348
	1 Flake, Edge Modified, Hozomeen Chert	10347
L:2 (5-10 cm BS)	2 Debitage, Hozomeen Chert	10349
L:3 (10-15 cm BS)	10 Debitage, Hozomeen Chert	10350
L:4 (15-20 cm BS)	6 Debitage, Hozomeen Chert	10351
L:5-6 (20-30 cm BS)	0 Collections	
L:7 (30-40 cm BS)	1 Tephra Sample, Source Unknown	10400
L:8 (40-50 cm BS)	0 Collections	
test unit 5 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-2 (0-20 cm BS)	0 Collections	
L:3 (20-30 cm BS)	2 Debitage, Hozomeen Chert	10352
L:4-5 (30-50 cm BS)	0 Collections	
L:6 (50-60cm BS)	1 Tephra Sample, Source Unknown	10399
test unit 6 (1x0.5 m)		
L:S (surface)	1 Debitage, Hozomeen Chert	10353
L:1 (0-10 cm BS)	0 Collections	
L:2 (10-20 cm BS)	0 Collections	

Site Chronology

No charcoal samples suitable for dating were collected. Two tephra samples were collected, but none were submitted for analysis. No chronologically diagnostic artifacts were recovered from the site. Age of the site is unknown.

Site Stratigraphy

The generalized stratigraphic sequence begins with a brown reservoir deposit, consisting of either poorly sorted, gravelly sands or moderately sorted, sandy clayey silt. It is underlain in some locations by a dark brown to black, pre-reservoir forest duff. The next underlying stratum is a dark reddish-brown B-horizon developed in gravelly sand

of the alluvial fan. The basal stratum is a dark brown BC-horizon developed in the poorly-sorted, sandy gravel alluvial fan deposits.

Conclusions and Assessment

Site 45WH282 appears to have been a location used primarily for the production of flakes from cores, and possibly the manufacture of bifaces. The Hozomeen chert used in these technologies was found in local bedrock outcrops and on-site gravels, and both Hozomeen chert and metasediment are found in abundance in alluvial gravels and glacial deposits in the vicinity. Some of the Hozomeen chert may have been procured from the Desolation chert quarry (45WH224), located not far to the north. Age of 45WH282 is unknown.

Site 45WH282 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts and cultural deposits lack integrity of location and association. Artifact-bearing deposits at the site appear to have been almost completely eroded and disturbed by shoreline processes. No further treatment of the site is recommended.

11.2.16 45WH285 (FS#105) Boundary Bay #5

Site Setting

Site 45WH285 is located about 150 m south of Boundary Bay Campground on the east side of the valley in the northern portion of the project area. The scatter that defines the site is in the center of a moderate-sized alluvial fan with a western solar exposure and slopes of 5-50%. Site elevation is approximately 1,530 ft. (467 m) asl. The site setting and landscape views are as described for site 45WH230.

Logging, haul road construction (including the excavation of a deep borrow pit), and reservoir erosion have been the primary sources of historic disturbance to the site. A high energy surf zone migrates across the site when raising or lowering of reservoir levels is accompanied by high winds, which causes excessive erosion. The pre-reservoir vegetation, as evident from the remaining stumps, consisted of open- and closed-canopy, conifer forest.

General Site Description

The site is characterized as a low-density lithic scatter. Site dimensions are 140 m north-south and 50 m east-west, and it covers an area 7,000 m^2. Artifacts extended to 30 cm below the surface. The maximum volume of artifact-bearing deposits is estimated to be 1,400 m^3. Twenty-seven lithic artifacts were inventoried on the surface. Artifact categories include biface, scraper, edge-modified flake, microblade core, pestle, flake, and shatter. Most items were of Hozomeen chert, with one item each of Hozomeen jasper, andesite, and metasediment. These items are listed in Table 11.35.

Testing Methods and Rationale

The site was first recorded in 1988 and collections made in 1988 and 1989. Testing was done in 1993 by excavation of two 1x1 m test units. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of the test units was intended to locate undisturbed artifact-bearing deposits or features.

Table 11.35 Inventory of Surface Collections from 45WH285

	NCCA
1 Flake, Edge Modified, Hozomeen Jasper	6359
1 Biface, Hozomeen Chert	7125
1 Pestle, Andesite	7135

Description of Testing Results

Hozomeen chert flakes and shatter constitute the most abundant categories (37% each). The remaining assemblage consists of one Hozomeen chert microblade core, two bifaces, two modified flakes, and an Andesite pestle (Figure 11.17). This assemblage probably reflects the use of expedient tools to extract or process a locally-procured resource. The presence of the pestle may relate to use of plants.

A total of five artifacts, consisting of flakes and shatter, was recovered from both test units. They were from the reservoir deposit and the upper portions of the disturbed soil B-horizon. All were of the locally available Hozomeen chert and metasediment. No exotic lithic material types or diagnostic artifacts were recovered. Table 11.36 lists all artifacts collected from the excavation.

Site Chronology

No charcoal or tephra samples were collected from this site during testing. The age of the site is unknown.

Site Stratigraphy

The generalized stratigraphic sequence begins at the surface with a dark brown, sandy gravel reservoir deposit. In places it was mixed with eroded B-horizon. It was underlain by a mixed reservoir deposit and organic stratum. The next lower stratum

Table 11.36 Cultural Material From Excavation Units at 45WH285

		NCCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	2 Debitage, Hozomeen Chert	10734
L:2 (10-20 cm BS)	0 Collections	
L:3 (20-30 cm BS)	1 Debitage, Hozomeen Chert	10735
L:4 (30-40 cm BS)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	0 Collections	
L:2 (10-20 cm BS)	1 Flake, Hozomeen Chert	10736
L:3 (20-30 cm BS)	1 Flake, Metasediment	10737
L:4-5 (30-50 cm BS)	0 Collections	

consisted of a dark brown B-horizon developed in a gravelly sand. It was underlain by a dark yellow-brown BC-horizon developed in sandy gravels of the alluvial fan.

Conclusions and Assessment

Site 45WH285 appears to have been a location where expedient tools were used to extract or process a locally-procured resource, possibly including plants. Although other uses may have been made of the site, the disturbed character of the site deposits and the small number of intact artifacts restricts more detailed inferences.

Site 45WH285 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts and cultural deposits lack integrity of location and association. Artifact-bearing deposits appear to have been almost completely eroded and disrupted by shoreline processes. The potential for chronological data is low. No further treatment of the site is recommended.

11.2.17 45WH296 (FS#116) East Landing #2

Site Setting

Site 45WH296 is located on the east side of the valley in the northern portion of the project area, 180 m west of the north cribbing at East Landing. The site is situated on the flood plain near the east valley wall. The landform has a mostly southern, but also eastern and western solar exposures. The landform nearly flat, but some short slopes approach 5%. The site elevation is approximately 1,558 ft (475 m) asl. The floodplain setting is similar to that described for 45WH303 and the site views are as

described for 45WH234.

Logging activities including haul road construction, log landing construction, slash burning, as well as reservoir erosion are the primary sources of historic disturbance to the site. The southern end of the site is crossed by a logging haul road that served as the main stem for numerous spur roads in this part of the reservoir drawdown. Haul road construction at the site required grading, as did clearing for a log landing adjacent to the road. During lowered reservoir levels, especially when the reservoir shoreline migrates across the site surface during high winds, erosion caused by heavy surf is severe. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a mature closed-canopy conifer forest.

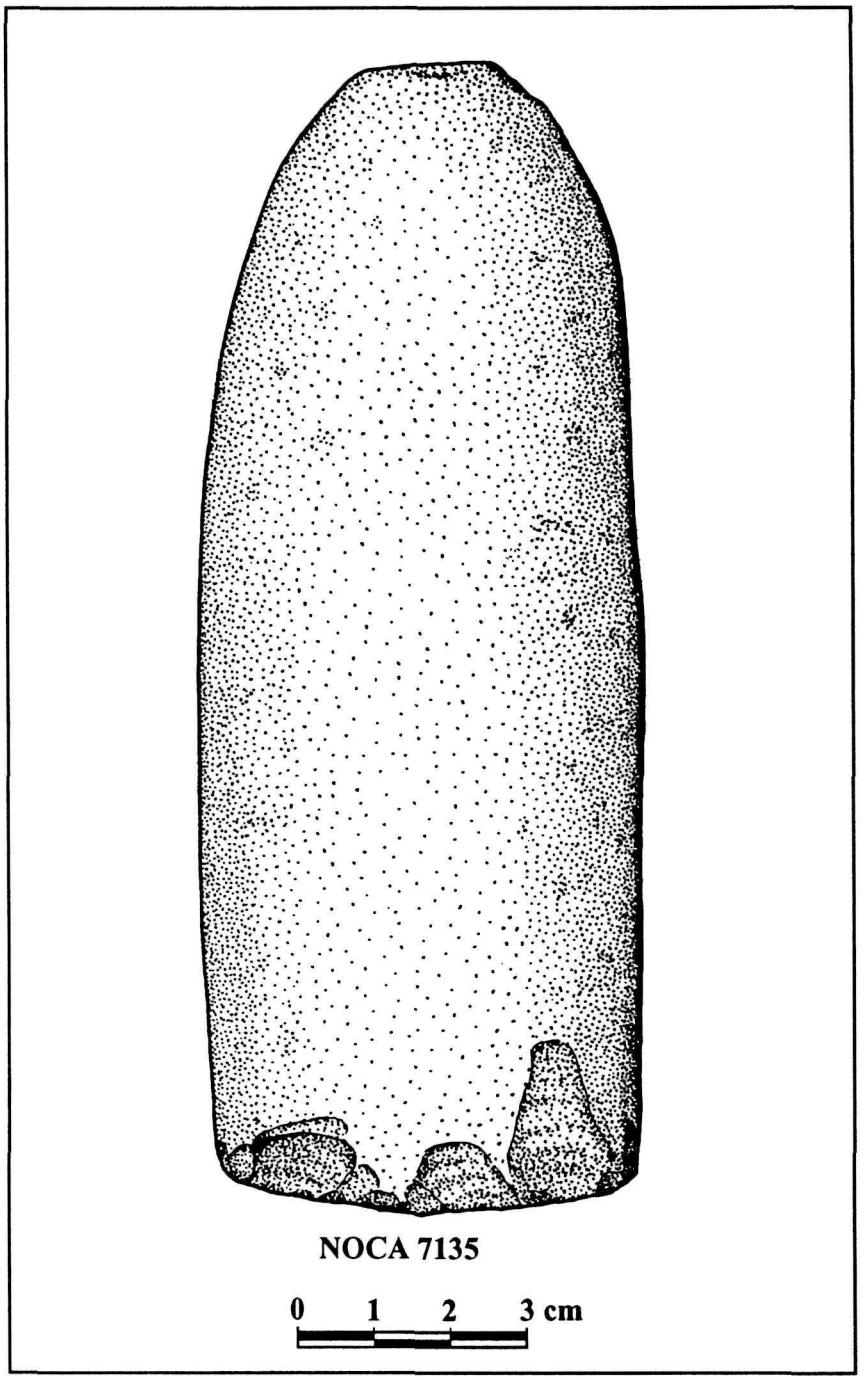


Figure 11.17 Artifact illustrations from Site 45WH285 (FS#105)

General Site Description

Site 45WH296 is characterized as a moderate-density lithic and calcined mammal bone scatter. Its dimensions are 160 m north-south and 220 m east-west, and it covers an area 35,200 m^2. Artifacts extended to 40 cm below the surface. The maximum volume of artifact-bearing deposits is estimated to be 3,520 m^3. Forty lithic artifacts and five calcined mammal bone fragments were inventoried on the site surface. Lithic artifact categories included projectile point, biface, core, burin or graver, edge-modified flake, and flake. A wide range of lithic material types was present, including Hozomeen chert, jasper and chalcedony, metasediment, exotic chalcedony, and vitrophyre (Table 11.37).

Testing Methods and Rationale

The site was recorded in 1988 and artifacts were collected from the surface in 1988 and 1989. It was tested in 1989 through the excavation of twelve 1x1 m test units and two 50x50 cm test pits. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/8 and 1/4 in wire mesh. The placement of test units was intended to locate any undisturbed artifact-bearing deposits or features.

Table 11.37 Inventory of Surface Collections from 45WH296

	NOCA
1 Graver, Hozomeen Chalcedony	6360
1 Flake, Vitrophyre	6366
1 Flake, Edge Modified, Hozomeen Chert	7058
25 Debitage, Hozomeen Chert, Chalcedony	7059
1 Flake, Edge Modified, Hozomeen Chert	7060
1 Biface, Heat Modified, Chalcedony	7061
1 Projectile Point, Metasediment	7062
1 Projectile Point, Metasediment	7063
1 Flake, Edge Modified, Metasediment	7150
1 Material Sample, Jasper	10161

Description of Testing Results

From the inventory of flaked stone on the site surface, the assemblage is dominated by flakes made of varieties of Hozomeen chert (68%) and edge-modified flake (10%), with minor percentages of other categories. The absence of cortex on flakes and the absence of shatter indicates that reduction of lithic materials was not conducted at the site. The presence of cutting, scraping, and grooving tools, combined with calcined,

fragmented mammal bones suggests use as a short-term hunting camp where animals were butchered, cooked, and their hides worked.

A total of 53 lithic artifacts and 49 pieces of bone was recovered from five test units (2, 5, 6, 8 and 9). Of the lithics, 51% are pressure flakes, 36% are flakes (debitage), and 4% are edge-modified flakes. The remaining 9% of the assemblage consists of one item each of drill, graver, and various technical flake categories. This assemblage suggests that tools at the site were sharpened or repaired, used, and discarded. Although lithic material types are primarily local to the valley, the presence of exotic vitrophyre, chalcedony, jasper, and obsidian indicates that tools made from these material were brought to the site from, perhaps, distant areas. Faunal remains were also recovered into the soil B-horizon in test unit 2 and within the reservoir deposits of test unit 8. None of the bone fragments was associated with a feature. Due to the fragmentary nature of the bone, it is known only that they were from a medium-sized mammal. The fragmentary and calcined condition of the bone indicates that animal parts were cooked on-site. Table 11.38 shows all cultural material collected from excavation units by level.

Most of the artifacts were found within the disturbed reservoir deposits, except in test units 2 and 9. Artifacts were found in discontinuous remnants of the soil B-horizon, to a depth of 40 cm below the surface in test unit 2 and 60 cm below the surface in test unit 9. In both units the sedimentary matrix was intruded by burned and unburned tree roots. No features or strata of cultural origin were encountered.

Table 11.38 Cultural Material From Excavation Units at 45WH296

		NCCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1-4 (10-50 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	1 Flake, Edge Modified, Chert	7144
	2 Bone Fragments, Unidentifiable	7708
L:1 (10-20 cm BD)	1 Flake, Heat Modified, Chalcedony	7146
	5 Pressure Flake, Chalcedony, Metasediment	7158
	12 Bone Fragments: 11 Unidentifiable; 1 Medium Mammal	7709
L:2 (20-30 cm BD)	2 Debitage, Hozomeen Chert	7145
	14 Pressure Flake, Chalcedony, Hozomeen Chert, Metasediment	7147
	22 Bone Fragments, Unidentifiable	7704
L:3 (30-40 cm BD)	10 Bone Fragments, Unidentifiable	7706
L:4 (40-50 cm BD)	2 Bone Fragments, Unidentifiable	7707

L:5 (50-60 cm BD)	1 Charcoal Sample	

test unit: 3 (1x1 m)

L:S (surface)	0 Collections	
L:1-5 (10-60 cm BD)	0 Collections	

test unit: 4 (1x1 m)

L:S (surface)	0 Collections	
L:1-4 (10-100 cm BD)	0 Collections	

test unit: 5 (1x1 m)

L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	0 Collections	
L:2 (20-30 cm BD)	1 Pressure Flake, Chalcedony	7148
L:3-4 (30-50 cm BD)	0 Collections	

test unit: 6 (1x1 m)

L:S (surface)	1 Flake, Metasediment	7149
	1 Flake, Edge Modified, Metasediment	7150
L:1-4 (10-50 cm BD)	0 Collections	

test unit: 7 (1x1 m)

L:S (surface)	0 Collections	
L:1-4 (10-50 cm BD)	0 Collections	

test unit: 8 (1x1 m)

L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Bone Fragment, Unidentifiable	7705
L:2-4 (20-50 cm BD)	0 Collections	

test unit: 9 (1x1 m)

L:S (surface)	3 Debitage, Hozomeen Chert, Chalcedony	7154
L:1 (10-20 cm BD)	0 Collections	
L:2 (20-30 cm BD)	12 Debitage, Hozomeen Chert, Chalcedony, Metasediment	7152
	1 Drill, Chalcedony	7153
	1 Graver, Metasediment	7159
L:3 (30-40 cm BD)	1 Flake, Hozomeen Chert	7157
L:4 (40-50 cm BD)	6 Pressure Flakes, Chalcedony, Metasediment	7156
L:5 (50-60 cm BD)	1 Pressure Flake, Obsidian	7151
L:6 (60-70 cm BD)	2 Debitage, Chalcedony, Metasediment	7155
L:7 (70-80 cm BD)	0 Collections	

test unit: 10 (1x1 m)

L:S (surface)	0 Collections	

L:1-4 (10-50 cm BD)	0 Collections
test unit: 11 (1x1 m)	
L:S (surface)	0 Collections
L:1-3 (10-40 cm BD)	0 Collections
test unit: 12 (1x1 m)	
L:S (surface)	0 Collections
L:1-5 (10-60 cm BD)	0 Collections
test pit: 1 (50x50 cm)	
L:1-9 (surface-100 cm BD)	0 Collections
L:10 (100-110 cm BD)	^{14}C, 2,670±70 BP, Beta 33509
test pit: 2 (50x50 cm)	
L:S (surface)	0 Collections
L:1-7 (10-80 cm BD)	0 Collections

Site Chronology

Site age is estimated from a time-sensitive projectile point (Figure 11.18) and a radiocarbon sample. One projectile point from the surface was assigned to Type 14B (Appendix D). This type (Columbia Plateau Corner-Notched or Plateau Horizon) has been dated between 2,000 and 150 BP. elsewhere in the Pacific Northwest.

One charcoal sample from test pit 1 was submitted for radiocarbon dating. The charcoal was first encountered at 90 cm below the surface and continued to 110 cm below the surface. The date was estimated at 2,670±70 BP. No artifacts were recovered from this test pit, but through stratigraphic correlation, the date provides a lower limit to the age of the site, indicating that it is younger than the dated sample. This inference is compatible with the Type 14B projectile point age. The site is estimated to be less than 2,000 years old.

Table 11.39 Table Of ^{14}C Dates from 45WH296

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TP1	L-10	Beta 33509	2,670±70

Site Stratigraphy

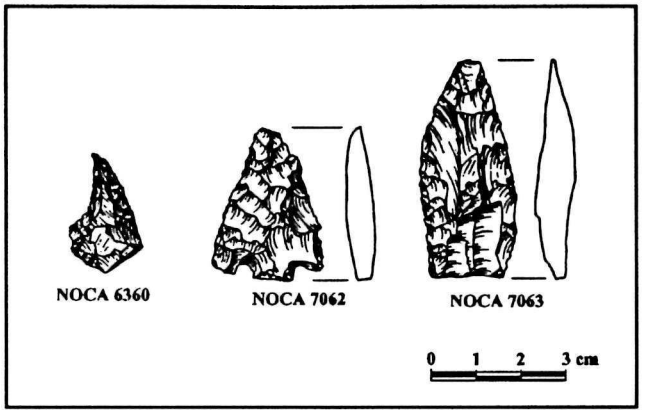


Figure 11.18 Artifact illustrations from site 45WH296 (FS#116)

The generalized stratigraphic sequence is capped by a brown to grayish-brown, poorly-sorted, gravelly silty sand reservoir deposit. The underlying stratum is a reddish-brown, compacted, and thermally altered B-horizon. These characteristics reflect the effects of heavy equipment and burning during drawdown clearing prior to inundation by reservoir waters. The next lower stratum is a brown, B-horizon developed in the top of well-stratified fluvial deposits. Individual strata in the fluvial deposits are parallel- and cross-bedded and vary from well-sorted sand to moderately sorted silty sand. The bottom of this fluvial sequence is a gray, poorly-sorted, gravelly coarse sand.

This sedimentary sequence reflects vertical accretion of the flood plain from stream-transported sediments. The gravelly coarse sand at the bottom was deposited as a stream gravel bar. The stratified and better sorted layers immediately above the bar accumulated later as channel-marginal and overbank deposits. An abandoned stream or flood channel is located 20 m east of the site and may have been the source of the deposits. The radiocarbon date of 2,670 years BP was in this stratified fluvial unit.

Conclusions and Assessment

Site 45WH296 was a short-term hunting camp on the flood plain of the Skagit River. It is inferred from the assemblage of tools and calcined mammal bone fragments that the prehistoric occupants butchered, cooked, and prepared hides or other parts of the animals for other uses. Both expedient tools made of local lithic types and curated tools made of exotic lithic types were used and sharpened on-site. The site was probably occupied intermittently, sometime during the last 2,000 years. Site 45WH296 is similar in age and artifact assemblage to sites 45WH303 and 45WH304. All three sites represent Late Period occupations that followed flood plain building during the pervious 3,000 or so years.

Site 45WH296 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts and cultural deposits lack integrity of location and association. Logging activities, reservoir erosion, tree root growth, and burrowing rodents have affected site deposits. Reservoir erosion and drawdown clearing have removed most of the artifacts from their original location in the upper subsoil and deposited them on the surface or in a reservoir deposit. No further treatment of this site is recommended.

11.2.18 45WH302 (FS#122) Hozomeen Creek #2

Site Setting

Site 45WH302 is located on the east side of the valley in the northern portion of the project area, 250 m north of Hozomeen Cr. It is situated on an eroded remnant of an alluvial fan located just north of and about 5 m (16 ft) lower in elevation than the fan containing site 45WH227. The landform offers mostly southern and western solar exposures and has slopes of 0-10%. Elevation is 483 m (1,585 ft). Site setting and views are as described for site 45WH227.

Logging, haul road construction, and reservoir erosion have been the primary sources of historic disturbance to the site. During lowered reservoir levels, when the reservoir shoreline migrates across the site surface during high winds, erosion caused by surf breaking against the landform surface is severe. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a mature conifer forest.

General Site Description

Site 45WH302 is a low-density lithic scatter associated with one high-density cluster of fire-modified rock (FMR) mixed with calcined bone fragments. Two other FMR concentrations occur without bone. Site dimensions are 22 m northeast-southwest and 32 m northwest-southeast, and it covers an area 704 m^2. Artifacts extended to 10 cm below the surface. The estimated maximum volume of artifact-bearing deposits is 70 m^3. Nine flaked stone artifacts were inventoried at the site. Artifact categories include biface, edge-modified flake, projectile point, flake, and shatter. Lithic material types are Hozomeen chert, metasediment, and basalt. More than 200 calcined bone fragments were inventoried.

Testing Methods and Rationale

Site 45WH302 was recorded and a surface collection made in 1988 (Table 11.40). It was assessed through excavation of six 2x2 m test units, one 1x1 m test unit, and one 1x.5 m test unit in 1991. Site sediments were excavated in 5 cm and 10 cm arbitrary levels and screened through 1/8 in and 1/4 in wire mesh. The placement of test units was intended to locate undisturbed artifact-bearing deposits and to determine the extent and integrity of the FMR and bone clusters.

Table 11.40 Inventory of Surface Collections from 45WH302

	NOCA
1 Biface, Metasediment	6373
1 Projectile Point, Metasediment	6374
1 Knife, Basalt	6377

Description of Testing Results

The small assemblage of flaked stone consists of 45% flakes and shatter and 54% tools. Half of the tools are edge-modified flakes that probably functioned as scrapers or knives; a third are generalized bifaces that probably functioned as knives. Based on the physical association of these tools with FMR and calcined bone fragments, the assemblage is inferred to represent butchering and cooking of one or more mammals that were probably hunted nearby. The small site size and meager assemblage suggest short-term use by a few individuals.

The only artifacts recovered during testing were 138 FMR from test units 2 and 6. Two of the three FMR clusters were excavated by test units. Fire-modified rocks in these clusters were on the surface and incorporated into the reservoir deposit. The clusters had been deflated by erosion and formed a lag deposit lacking stratigraphic integrity. The third FMR cluster, containing faunal remains and lithic artifacts, was investigated using towel-dug holes, and it too was found to be a lag deposit. Table 11.41 lists all artifacts collected from excavation units by level.

Table 11.41 Cultural Material From Excavation Units at 45WH302

test unit 1 (2x2 m)		NOCA
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	0 Collections	
test unit 2 (2x2 m) Feature #1		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	32 Fire Modified Rock	10389
L:2 (10-20 cm BS)	0 Collections	
L:3 (20-30 cm BS)	0 Collections	
L:4 (30-40 cm BS)	1 Tephra Sample, Source Unknown	10423
test unit 3 (2x2 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	0 Collections	

test unit 4 (2x2 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	0 Collections	
test unit 5 (L:S-L:1 2x2 m, L:2-L:7 1x1 m)		
L:S (surface)	0 Collections	
L:1-4 (0-40 cm BS)	0 Collections	
L:5 (40-50 cm BS)	Tephra: 15 shards St. Helens Yn, 2 shards Mazama, 1 shard ROLA89 220-2, T-B	10422
L:6-7 (50-70 cm BS)	0 Collections	
test unit 6 (2x2 m)		
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	North 1/2: 87 Fire Modified Rock	10390
	NE Quad: 18 Fire Modified Rock	10392
	1 Bulk Sample	10424
L:2 (10-20 cm BS)	1 Fire Modified Rock	10388
test unit 7 (1x1 m)		
L:S (surface)	0 Collections	
L:1-6 (0-85 cm BS)	0 Collections	
test unit 8 (1x0.5 m)		
L:S (surface)	0 Collections	
L:1-4 (0-40 cm BS)	0 Collections	

Site Chronology

Site age is estimated from one time-sensitive artifact and a tephra layer. The artifact (NOCA 6374) is a Type 15, small side-notched arrow point (Columbia Plateau Side-Notched or Kamloops Side-Notched) made of metasediment (Figure 11.19). This type dates between 1,200 and 150 years BP. In the park complex this type is associated with sites radiocarbon dated about 600 years or less.

Two tephra and two charcoal samples were collected. One of the tephra was submitted for identification. This tephra was found throughout level 5 of test unit 5 in the form of discontinuous lenses and pockets of clean ash. The enclosing matrix consisted of a mottled and mixed soil B-horizon. Although mixed with three glass shards from two other sources, the tephra layer is assigned to St. Helens Y, which dates to about 3,500 years ago. It matches the color (yellowish-brown) and texture (well-sorted, find sandy) of other tephras in the project area that have been chemically assigned to St. Helens Y (such as NOCA 7723 from 45WH303, located less than a mile to the

northwest). The position of the St.Helens Y tephra, which deeply underlies the cultural remains at the site, is stratigraphically consistent with the recent age of the arrow point.

Site Stratigraphy

The generalized stratigraphic sequence begins at the surface with a dark to pale brown, well-sorted, sandy silt reservoir deposit. It is underlain by a series of reddish-brown to yellowish-brown, moderately sorted, sandy silt to silty clay loam, fluvial deposits in which a B-horizon has developed.

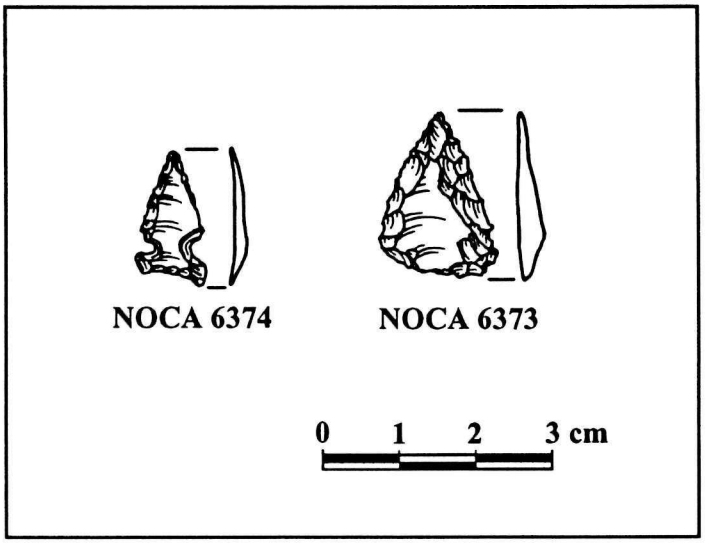


Figure 11.19 Artifact illustrations from Site 45WH302 (FS#122)

Table 11.42 Table Of Identified Tephra from 45WH302

TU	LEVEL	NOCA#	BULK	GLASS 1	GLASS 2	GLASS 3
TU5	L-5	10422	St. Helens Wn	St. Helens Y	Mazama O	ROLA 89 229-2
Number of shards analyzed			18	15	2	1

This unit is strongly color-mottled, partially from intensive heat oxidation of iron-bearing minerals in the soil, and partially from mixing of different soil horizons in the distant past. Substrata within this stratum are discontinuous and in some cases appear to have been truncated by prehistoric erosional events. The St. Helens Y tephra forms a discontinuous layer 40-70 cm below the ground surface within this stratum. A buried soil A-horizon was noted in test unit 7 stratigraphically above the St. Helens Y tephra. Beneath the tephra fluvial sands and overbank silt deposits, in some places interbedded with fluvial gravels. The basal unit consists of coarse, poorly-sorted, fluvial gravels.

This complex sequence of discontinuous depositional and weathered strata probably reflects the activity of Hozomeen Cr. over the last 5,000 or so years. Based on similar stratigraphic characteristics from other sites in the drawdown (45WH239 and 45WH303), valley-wide cycles in erosion, deposition, and stability, along with natural fire cycles, may be represented.

Conclusions and Assessment

Site 45WH302 appears to have been a short-term hunting camp occupied by a few individuals, on one or a few occasions. Artifacts are scarce, and the FMR and calcined bone clusters indicate that mammals were cooked for food or storage. Chipped stone tools at the site represent hunting, butchering, and processing animal carcasses. The site was probably used within the last 600 radiocarbon years.

Site 45WH302 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts, features, and cultural deposits lack integrity of location and association. The artifact-bearing deposits at the site have been completely disturbed by shoreline processes. No further treatment of the site is recommended.

11.2.19 45WH304 (FS#124) Hozomeen Creek #6

Site Setting

Site 45WH304 is located at the northern end of the project area on the flood plain of the Skagit River, approximately .5 km (.36 mi) west of Hozomeen Campground. This location is west of the eastern valley wall about one-third of the distance between the eastern and western margins of the valley. The site is adjacent to the main logging haul road that provided access to this part of the reservoir, and to site 45WH303, located a few hundred meters to the south. The landform has an eastern solar exposure and a 0-2% slope. The site is approximately 1,580 ft (482 m) elevation asl. The setting and views are as described for 45WH303.

Logging, haul road construction, and reservoir erosion have been the primary sources of historic disturbance to the site. During lowered reservoir levels, especially when the reservoir shoreline migrates across the site surface, erosion caused by heavy surf is severe. The pre-reservoir vegetation, evident from the remaining stumps, consisted of a mature closed-canopy, mixed conifer and deciduous old-growth forest.

General Site Description

Site 45WH304 is characterized as a low-density lithic scatter. The site and its immediate surroundings are covered by an obscuring layer of mud, but artifacts were made visible in small eroded areas. These areas were located where waves break against the base of sawn tree stumps, creating sufficient turbulence to wash away the mud cap. Dimensions of the surface scatter are 30 m north-south and 10 m east-west, covering an area 300 m^2. Artifacts extended to 30 cm below the surface. The estimated maximum volume of artifact-bearing deposits is 90 m^3. Artifact categories represented at the site include hammerstone, wedge (*pièce esquillée*), cobble tool, flake, shatter, mammal bone, and fire-modified rock. Five artifacts, a hammerstone and four flakes, were inventoried on the site surface when it was recorded. The lithic material types represented were

locally available Hozomeen chert, Hozomeen chalcedony, and metasediment. No time-sensitive or diagnostic artifacts and not intact features were recovered.

Testing Methods and Rationale

The site was recorded in 1988 and tested in 1990 through excavation of two 1x1 m test units. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of test units was intended to locate undisturbed artifact-bearing deposits or features.

Description of Testing Results

Most of the chipped stone assemblage consists of Hozomeen chert and chalcedony flakes (55%) and metasediment flakes (32%). The Hozomeen flakes represent manufacture or sharpening of expedient tools. The metasediment flakes are small and thin pressure flakes, from sharpening of a tool edge. The remainder of the assemblage consists of 1 (4%) each of Hozomeen chert shatter, basalt flake, wedge, and cobble tool. The wedge (NOCA 10078) was bifacially-flaked at the acute-angled edge and exhibits batter marks at the blunt edge; it was probably pounded on the blunt end and used to split some unknown material. The cobble tool (NOCA 10076) was made from rod-shaped, river rolled cobble. It was sharpened to an acute bifacial edge at one end, had one flake removed from the other end, and shows a concentration of pecked or scratched marks on one face. It appears to have been a multipurpose tool that could have been used for splitting (like a wedge), chopping, crushing, or pounding of some unknown materials.

One hundred and four fragmented faunal remains were recovered from test unit 1. Most were only identified as small or medium mammal, but 78 tooth fragments were identified as Artiodactyl (two-toed, hoofed animal) and were probably from Mountain goat or deer. The calcined and charred condition of the bones shows they had been subject to high temperatures, probably in a cooking hearth.

Artifacts in test unit 1 were within the reservoir deposits and an underlying color-mottled stratum. They extended to 30 cm below the surface. The mottled stratum contained a scatter of fire-modified rock (FMR), scattered and concentrated charcoal chunks, lithic debitage, and bone fragments. Pockets of sediment in this stratum had been oxidized by exposure to high temperatures, either in cultural or natural fires. The deposit could represent the disturbed remnant of a cooking hearth or an occupation surface. Test unit 2 was disturbed by logging activities as indicated by soil compaction, mixed sediments, the presence of buried logs, and axe-cut wood chips found 40 cm below the surface. No artifacts were recovered from test unit 2. Table 11.43 shows all cultural material collected from excavation units by level.

Site 45WH304 appears to have been a short-term, seasonal camp utilized by a small group of people. Small and medium mammals, including Artiodactyls (probably Mountain goat or deer), were cooked. Expedient tools were manufactured from local lithic materials, and some completed tools were sharpened by pressure flaking. Generalized tools were possibly used in cutting, chopping, and splitting some, as yet, unknown materials.

Table 11.43 Cultural Material From Excavation Units at 45WH304

		NOCA
test unit: 1 (1x1 m)		
L:S (surface)	0 Collections	
L:1 (10-20 cm BD)	1 Cobble Tool, Metasediment	10076
	16 Flake and shatter, Hozomeen Chert and Metasediment	10077
	3 Bone Fragments, Unidentifiable	10140
L:2 (20-30 cm BD)	1 wedge (*pièce esquillée*), Hozomeen Chert	10078
	1 Flake, Hozomeen Chert	10079
	21 Bone Fragments: 13 Unidentifiable; 8 Small to Medium Mammal	10119
	78 Tooth Fragments, Artiodactyl	10120
	1 Soil Sample	10121
L:3 (30-40 cm BD)	3 Flake, Hozomeen Chert and Metasediment	10080
	2 Bone fragments: 1 Unidentifiable; 1 Small to Medium Mammal	10122
	^{14}C, 330±70 BP Beta 40703	
L:4-8 (40-90 cm BD)	0 Collections	
L:9 (90-100 cm BD)	1 Bulk Sample, Soil	10190
L:10 (100-110 cm BD)	0 Collections	
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1-4 (10-50 cm BD)	0 Collections	

Site Chronology

One charcoal sample was submitted for radiocarbon dating. It yielded a date of 330±70 BP. (Table 11.44). The sample was collected from two pockets of charcoal associated with FMR, calcined bone, and debitage. The matrix from below and around the charcoal was reddened from thermal alteration and may be the remnant of a hearth. It could also, however, be the result of natural ground fires.

Table 11.44 Table Of ^{14}C Dates from 45WH304

TU	LEVEL	LAB#	UNCORRECTED DATE YBP
TP1	L-3	Beta 40703	330±70

Site Stratigraphy

The overall stratigraphic sequence is similar to recorded at nearby site 45WH303. The site stratigraphic sequence begins at the surface with a dark grayish-brown, well-sorted reservoir sand. It is underlain by a mottled, dark reddish-brown to grayish-brown, silty clay deposit that has been thermally altered by slash burning. The strata below are characterized as well-sorted silt and sand deposits. In some cases they are weakly stratified and exhibit sedimentary structures. In other cases, soil A- and B-horizons have developed in them. They contain charcoal and a possible tephra. These strata are from overbank deposition and resulted in vertical accretion of the flood plain. Cultural remains were confined to the reservoir deposit and the underlying stratum.

Conclusions and Assessment

Site 45WH304 appears to have been a short-term, seasonal camp utilized three to four hundred years ago by a small group of people. Small and medium mammals, including Artiodactyls (probably Mountain goat or deer), were cooked. Expedient tools were manufactured from local lithic materials, and some completed tools were sharpened by pressure flaking. Generalized tools were possibly used in cutting, chopping, and splitting some, as yet, unknown materials. The paucity of artifacts and their disturbed context hinders any more specific conclusions.

Site 45WH304 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts and cultural deposits lack integrity of location and association. Nearly all of the artifacts recovered from the test excavations were found within the disturbed reservoir deposits and from a thermally altered and mixed matrix in test unit 1. No further treatment of the site is recommended.

11.2.20 45WH468 (FS#181) Roland Campground #1

Site Setting

Site 45WH468 is located on the east side of the valley in the southern portion of the project area. It is on Roland Point at the east side of Roland Campground. The site is situated on a bedrock bench above the full pool elevation (588.5 m; 1,602.5 ft) of the reservoir and on an adjoining terrace that is bisected by the full pool line. The landform has an eastern solar exposure and a 0-45% slope. The site setting and views are as described for site 45WH237.

Logging, campground use, and reservoir erosion have been the primary sources of historic disturbance to the site. Although the landform is protected from large waves by it's location inside a cove, steeper portions of the site are eroded along the reservoir shoreline. Effects resulting from campground use include trampling of vegetation, soil compaction, and soil erosion. The pre-reservoir vegetation, evident from the remaining stumps in the below-pool portion of the site, consisted of an immature, open-canopy conifer forest. The above-pool portion of the site supports clumps of immature conifers and shrubs growing between exposures of bedrock and grassy expanses.

General Site Description

Site 45WH468 is a low-density lithic scatter. Its dimensions are 30 m north-south and 10 m east-west, covering an area 300 m^2. Artifacts extended to 30 cm below the surface. The estimated maximum volume of artifact-bearing deposits of 90 m^3. More than 51 artifacts were inventoried on the surface when the site was recorded. Artifact categories represented at the site include biface and flake. All flakes lacked cortex and consisted of Hozomeen chert (except for one of basalt).

Testing Methods and Rationale

The site was recorded in 1990 and tested in 1993 through excavation of two 1x1 m test units. Site sediments were excavated in 10 cm arbitrary levels and screened through 1/4 in wire mesh. The placement of test units was intended to locate undisturbed artifact-bearing deposits and features. No artifacts were collected from the surface.

Description of Testing Results

Three flakes were recovered from test unit 1. This unit was located immediately above the full pool shoreline, in an undisturbed context. The flakes were from the soil B-horizon matrix, one in each level. Test unit 2 was located adjacent to a moderate-density concentration of lithics in the drawdown zone. This concentration is the highest density portion of the site. No artifacts were found on the surface or within this test

unit. No features or faunal remains were encountered. Table 11.45 shows all cultural material collected from excavation units.

Site 45WH468 appears to represent a work station for reduction of Hozomeen chert and metasediment. Varieties of Hozomeen chert are abundant in the alluvial fan gravels of Roland Cr. fan, which is located a short distance from the site and may be the source of the chert. The absence of cortex and shatter suggest that primary reduction of nodules occurred elsewhere and that secondary reduction of the chert is represented at site 45WH486.

Site Chronology

Due to an absence of tephra, charcoal, and time-sensitive artifacts, age of the site cannot be estimated.

Site Stratigraphy

The general stratigraphic sequence for the site begins with a black, organic-rich horizon of decayed vegetation with little mineral soil incorporated into it. This organic accumulation reflects plant growth stimulated by a high water table adjacent to the

Table 11.45 Cultural Material From Excavation Units at 45WH468

test unit: 1 (1x1 m)		NOCA
L:S (surface)	0 Collections	
L:1 (0-10 cm BS)	1 Flake, Hozomeen Chert	10670
L:2 (10-20 cm BS)	1 Flake, Hozomeen Chert	10671
L:3 (20-30 cm BS)	1 Flake, Metasediment	10672
test unit: 2 (1x1 m)		
L:S (surface)	0 Collections	
L:1-2 (0-20 cm BS)	0 Collections	

reservoir during the growing season. It is underlain by a yellowish-brown, soil E-horizon developed in a silty sand; it may be mixed with volcanic ash. The underlying stratum is a dark brown, soil B-horizon developed in a gravelly silty sand. The next stratum below is similar in color and texture, but with larger boulders. In test unit 2, the organic horizon and upper soil B-horizon had been eroded and capped by a gravelly sand, reservoir deposit.

Conclusions and Assessment

Site 45WH486 appears to represent a work station for reduction of Hozomeen chert and metasediment. Flaking was by direct percussion and represents secondary reduction of locally available lithic materials. The age of the site is unknown.

Site 45WH486 is assessed ineligible for inclusion in the National Register of Historic Places. Artifacts and artifact-bearing deposits within the drawdown zone lack integrity of location and association. Intact artifact-bearing deposits above the drawdown zone exhibit a low density of flaking debris that does not contribute important information for understanding prehistory of the project area.

12. ANALYSIS AND DISCUSSION OF RESULTS

12.1 Introduction

This section provides discussion, and in some cases analysis, of data acquired during implementation of this project. The topics covered include site density, radiocarbon chronology, volcanic ash analysis, projectile point typology and chronology, projectile point function, the geological context of sites, petrographic analysis of lithic materials, chemical characterization of glassy lithic materials, microblade technology, land use and site types, and exchange systems. Treatment of these topics is necessarily provisional due to the limited scope of the investigation, which was driven by the need to acquire only sufficient information to evaluate the potential contribution of the archeological sites to yield new and important information about local or regional prehistory. The actual realization of this potential through the acquisition of a data base adequate to address a full range of research topics will occur in later phases of the project. The section ends with a general, nontechnical summary of the results.

12.2 Radiocarbon Chronology

A total of 22 radiocarbon dates was acquired during testing from archeological sites in the drawdown zone. All dates are on carbon extracted from charcoal samples collected from prehistoric features, from artifact-bearing soil matrices, or from geologic strata. None of the samples was assayed as "modern," and none was obviously contaminated. In a few samples, a date was unattainable due to insufficient size for the extraction of a datable amount of carbon. Two large bone samples were also submitted for dating of the collagen fraction, but so little collagen was present that even larger bulk samples would have been deficient (information provided by staff of Beta Analytic, Inc.). One of these samples was collected from an eroded surface scatter of FMR and calcined bone at 45WH303 (no radiocarbon lab number was assigned). The other sample (Beta 40694) was from the intact bone layer at 45WH241, which dated 1,430 and 1,890 BP based on two charcoal dates. A listing of all radiocarbon dates, their size, location, and artifactual and sedimentary associations is provided in Appendix B.

Figure 12.1 is a histogram of all 22 dates. The graph shows three clusters of dates. The cluster at about 2,500 BP represents the age of geologic strata from the flood plain at the northern end of the drawdown (beneath sites 45WH296 and 45WH303) and is not directly associated with cultural remains. The remaining dates are associated with cultural remains. Two clusters of radiocarbon ages are apparent in twenty dates. One mode averages about 1,500 BP and the other about 400 BP. However, because some of these dates are on charcoal derived from the soil matrix, a basis must be offered for supporting a claim that they accurately date cultural activity.

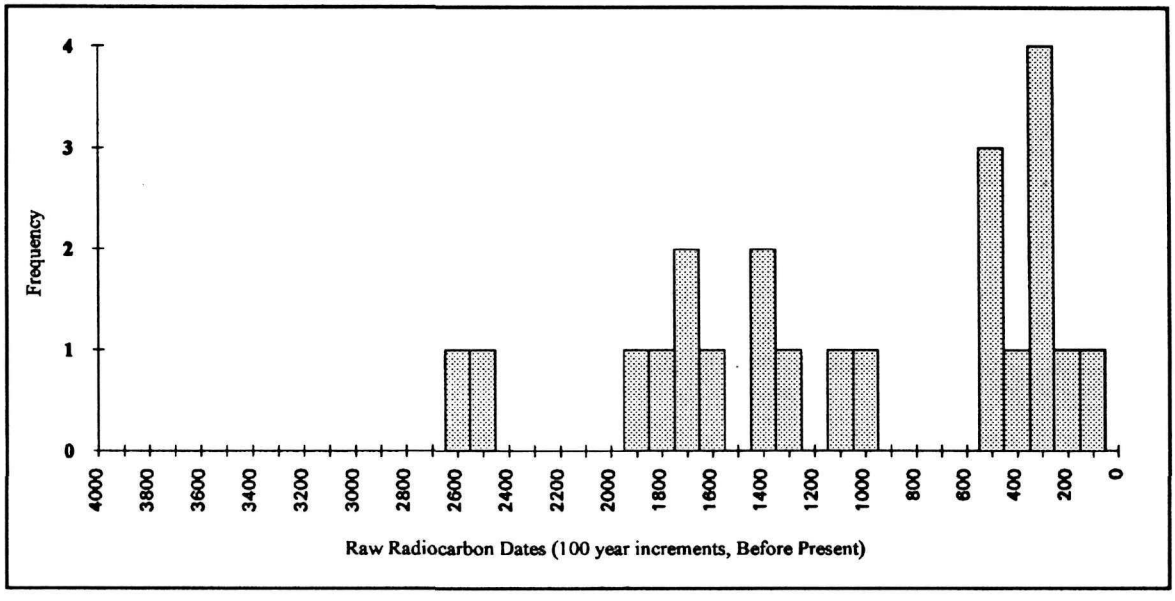


Figure 12.1 Histogram of uncorrected radiocarbon dates from tested sites in the drawdown zone of Ross Lake

Table 12.1 shows the 22 dates grouped by age and by whether they are associated with a cultural feature, artifacts within a soil matrix, or a geologic stratum devoid of artifacts. Eleven (50%) are from artifact-bearing soils, 9 (41%) are from cultural features, and 2 (9%) are from noncultural, geologic strata. These dates have been grouped according to sites <750 years BP and >750 years BP (only site 45WH262 is listed in both groups) in order to reflect the two modes shown in Figure 12.1. If these age estimates are statistically representative of all archeological sites in the drawdown zone, they suggest two separate periods of occupation of the upper Skagit River Valley. Considering that many factors are involved in the selection of assayed radiocarbon samples, there is no way at present of knowing just how representative the sample is of the total universe of sites in the project area. If occupation is assumed to have been constant over the last 2,000 or so years, then one would expect the radiocarbon dates to be more or less evenly distributed. Any clustering of dates would be accounted for as fortuitous, lacking in any cultural significance, and resulting from sampling error. If such error exists in the dates, then it most likely has been introduced by the soil charcoal dates, which may be non-cultural (we exclude from discussion the two geologic dates, which are not relevant to the question). For example, perhaps the two modes reflect peaks in natural forest fire cycles. Such non-cultural charcoal could have become dispersed by bioturbation processes into the artifact-bearing soil matrix. It is also possible that other natural processes selectively preserved charcoal and skewed the sample of dates.

A test for such skewing was made by comparing two subsets of the radiocarbon date assemblage, these being the dates of certain cultural origin that were removed from

features and the dates removed from soil matrix containing prehistoric artifacts. The average of three feature dates from sites <750 years old is 293 radiocarbon years BP, compared with an average of 420 years BP from seven soil dates. The average of six feature dates from sites >750 years old is 1682 radiocarbon years BP, compared with an average of 1,320 years BP from four soil dates. Although the sample size is small, these average values for the feature- and soil-derived dates are close. We conclude from this that we cannot disprove the possibility that the soil-derived charcoal dates provide an accurate age estimate of prehistoric occupations in the drawdown.

Table 12.1 Project Radiocarbon Dates by Site, Context, and Inferred Site Function

SITES <750 YEARS			
SITE	RADIOCARBON AGE	TYPE*	ACTIVITY/FUNCTION
45WH228 (FS#45)	310±70	S	Hunting camp; animal processing
45WH230 (FS#47)	580±120 BP	S	Hunting camp; animal processing
45WH237 (FS#57)	230±80 BP	S	Biface manufacture
45WH253 (FS#73)	580±80 BP	S	Biface manufacture
45WH255 (FS#75)	180±50 BP	F	Food preparation, cooking, consumption
	500±90 BP	S	" " "
45WH262 (FS#82)	310±70 BP	S	Cobble reduction
45WH264 (FS#84)	430±100 BP	S	Resource processing
45WH304 (FS#124)	330±70 BP	F	Artiodactyla hunting, processing; food preparation, cooking, consumption
45WH473 (FS#197)	370±80 BP	F	Deer hunting, processing, cooking, consumption
SITES >750 YEARS			
45WH239 (FS#59)	1,430±120 BP	F	Resource processing
45WH241 (FS#61)	1,430±90 BP	F	Ungulate hunting, processing, cooking, and consumption
	1,890±90 BP	F	" " "

45WH262 (FS#82)	1,120±80 BP	S	Biface manufacture
	1,020±80 BP	S	" " "
45WH268 (FS#88)	1,760±80 BP	S	Tool manufacture; animal processing
45WH283 (FS#103) antler	1,380±110 BP	S	Tool manufacture; working of bone and
45WH296 (FS#116)	2,670±70 BP	G	N/A
45WH300 (FS#120)	1,650±70 BP	F	Food preparation, cooking, consumption; tool manufacture
	1,940±90 BP	F	" " "
	1,750±60 BP	F	" " "
45WH303 (FS#123)	2,530±150 BP	G	N/A

* G Refers to charcoal from geologic context, not associated with cultural remains
S Refers to charcoal from soil matrix, usually associated with cultural remains
F Refers to feature-derived charcoal, resultant directly from cultural activity

Two late prehistoric periods of occupation are represented in the valley by radiocarbon dates: one was between about 1,900 and 1,100 radiocarbon years ago; the other between about 500 and 200 years ago. It is our belief, which we cannot fully substantiate at present, that the ca. 500 year interval between 1,000 and 500 years ago reflects a period of reduced use of the upper Skagit River Valley. This hypothesis is supported by independent data from a reach of the Skagit Valley about 16 km (10 mi) downstream of Ross Lake. Here, 10 radiocarbon dates were recovered from three test excavated archeological sites between Newhalem and Damnation Creeks (unpublished records, North Cascades National Park Service Complex). All of the 10 dates are from intact cultural strata containing abundant artifacts or from intact features. Eight of the dates (from 45SK171 and 45WH64) range between 170 and 660 radiocarbon years BP, with an average for the group of 439 years BP. From one of these sites (45WH477), two dates average 1,230 years BP. These two average dates (439 and 1,230 years BP) are similar to the averages of dates (293 and 1,682 years BP) derived from radiocarbon-dated features in the project area, and with the average dates (362 and 1,537 years BP) of the combined feature and soil matrices.

The radiocarbon chronology for the project area is enhanced by inclusion of the set of 13 dates acquired during excavation of the Desolation chert quarry (45WH224) (Mierendorf 1993a). Of these, two dates fall within the two modes; one date is 1,830 BP and the other is 290 BP. However, the remaining 11 dates reflect earlier uses of the quarry. Figure 12.1 is a histogram showing the combined project area sample of all 35 radiocarbon dates. Although five modes are apparent, only three are considered useful

for inferring occupational intensity. The three are ca. 4,000 BP, 1,500 BP, and 250 BP. An early date of 7,600 BP from the quarry and a 2,800 BP date from the same site are of uncertain significance. These combined data indicate the possibility of at least three periods of occupation of the upper Skagit River Valley.

The project area data were compared with two regional compilations of archeological radiocarbon dates. Salo (1985) plotted histograms of radiocarbon dates

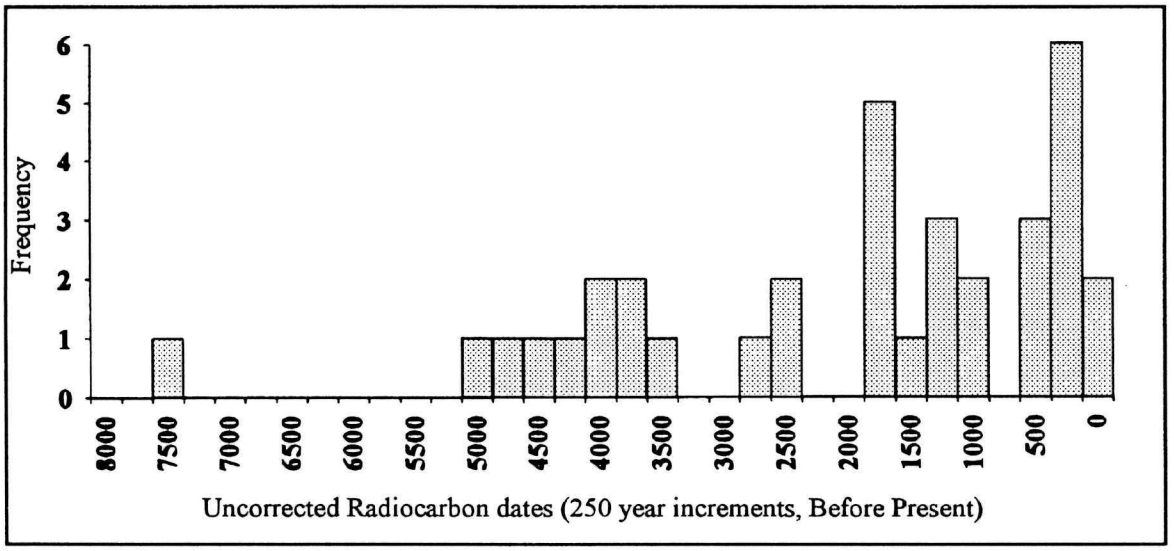


Figure 12.2 Histogram of radiocarbon dates from tested sites in the Upper Skagit River Valley

from segments of the Columbia River of eastern Washington. Peak frequencies in dates occur around 5,000 BP, 2,800 BP, a minor one around 1,000 BP, and 300 BP. These correspond roughly with periods of mountain glacier advances (Salo 1985:186), but the cause of the correspondence is unknown. Fladmark (1982:102) also plotted histograms of radiocarbon dates to show modes in date frequencies. He identified modes in the interior of British Columbia at ca. 400 BP and ca. 1,200 BP. For the southern and central coast, an earlier mode was identified between 4,500 and 3,500 BP. Fladmark thought that radiocarbon date frequencies may provide a rough measure of the relative population density (Fladmark 1982:115). These peaks, from two separate regions of the Pacific Northwest, are similar to the three modes identified from the project area radiocarbon chronology. This suggests that, whatever the cause, radiocarbon frequencies in the project area have been influenced by broad, region-wide factors.

12.3 Volcanic Ash Analysis

Research by volcanologists and tephrochronologists has shown that tephra erupted from Cascade Range volcanos show distinctive chemical signatures. Once tephra

deposits are dated and the chemistry of the glass fraction has been characterized, they can be used as stratigraphic time markers for estimating the age of Quaternary deposits (Sarna-Wojcicki et al. 1983). A total of 15 tephra samples from the drawdown was submitted for electron microprobe analysis of the glass shard chemistry. A complete listing of the samples, including their location and stratigraphic context, are provided in Appendix C. The significance of each sample for estimating site age is provided in the individual site descriptions. The source vent and date of eruption of the primary tephra layers identified at archeological sites in the drawdown is shown in Table 12.2.

Table 12.2 Primary Tephra Layers Identified in the Project Area

Vent	Tephra	Age (years BP)	Site
Mt. St. Helens	W	505	45WH228
Mt. St. Helens	Y	2,930-3,510	45WH239, -300, -303
Mt. Mazama	O	6,850	45WH227, -229, -234, -239

Generally the results indicate that landforms within the drawdown contain primary and secondary tephra layers dated to the middle and late Holocene. The three identified tephra have been found in a variety of localities in this region. Two other tephra from the project area do not have an identified source. The identified tephra are an important tool for dating archeological assemblages in the project area. At site 45WH234, for example, a tephra provides the only evidence that pre-Mazama (>6,800 years old) artifacts may exist in the drawdown (corroborating the earliest radiocarbon date, 7,600 BP from 45WH224). In other instances they reveal the rate at which flood plains build, thus providing a basis for estimating flood periodicity and assessing the stability of landforms occupied by early populations.

Although the usefulness of tephra layers for dating archeological assemblages is well accepted, not all project samples were unambiguously identifiable because they appeared to contain a mix of glass shards from temporally and geographically separated eruptions. In an attempt to understand this phenomenon, we compared the results of the tephra analysis with our excavation records. From this comparison, we were able to group our 15 tephra samples into three broad categories based on the sedimentary matrix in which each sample occurred. Although our total sample is small and our assessment of sedimentary properties is qualitative rather than quantitative, the categories appear to vary in their likelihood of yielding a good identification.

The first category consists of primary tephra layers that, in most cases, appeared in sedimentary context as continuous tabular beds having clear to abrupt upper and lower

boundaries, extending over lateral distances of a few meters or more, and displaying no evidence of mixing with the surrounding soil matrix. This group (7, or 47% of the total) provided chemical signatures that matched closely the glass chemistry from known, dated tephra (Table 12.2).

The second category consists of tephra that formed discontinuous, thin lenses a few centimeters long, with clear upper and lower boundaries. The two samples in this category (13%) closely matched Mazama O with the exception in each case of two anomalous shards of a dissimilar chemistry that most closely matched Glacier Pk. layer B (11,200 BP). The presence of the anomalous Glacier Pk. shards represents contamination of the Mazama tephra by some natural process or by sample collection procedures. Whatever the case, it is probably not coincidental that the younger tephra is contaminated by older tephra, rather than the other way around. No primary or secondary tephra deposit within the project area or the northern Cascade Range (north of approximately Darrington, Washington) has been assigned to layer B or any other eruption of Glacier Pk. It is possible that shards of this tephra were incorporated within Quaternary deposits of the project area via transportation in the prevailing southwesterly winds. The few glass shards of Glacier Pk. ash identified in this group could have been mixed into the matrix of primary tephra layers by adhering to penetrating plant rootlets or soil fauna, of which there are many in the forest soils, or by a sampling tool contaminated with soil B-horizon matrix containing Glacier Pk. shards. Possible sources of Glacier Pk. tephra are the flood plain deposits of the upper Stillaguamish River, the lower Sauk River, and perhaps the Skagit River below the mouth of the Sauk River. The Stillaguamish River valley in particular is deeply filled with volcanic alluvium and lahars from eruptions of Glacier Peak. One such lahar, dated 5,100 radiocarbon years old, extended 20 km (12 mi) west of Darrington, into the Stillaguamish River valley (Beget 1982:75).

The third category of tephra formed discontinuous lenses or pockets, exhibiting uneven or disrupted segments of the upper or lower boundary, and in some cases, was associated with a cultural (hearth) feature. In a few cases, however, tephra in this category exhibited field characteristics of a primary deposit, but these were included in this category due to a mixed composition representing different glass chemistries. The six samples (40% of the total) in this category revealed a mixture of between three and five distinctive glass chemistries. It is perplexing that a discrete and apparently clean tephra layer should, on analysis, contain glass shards assignable to Glacier Pk., Mt. Mazama, and Mt. St. Helens Y. If such lenses are to be explained simply as secondary deposits, this still begs the question, because we can offer no mechanism by which various chemically distinctive tephra were mixed together to form a coherent layer uncontaminated by crystalline (non-glass) particles or soil matrix. In those cases where tephra from this mixed category are associated with cultural activity, we have considered cultural processes, including the intentional collection of tephra for some purpose. However, our data do not permit us to explore this possibility because mottles and pockets of tephra are ubiquitous throughout and on top of the soil B-horizon matrix of

most sites in the project area, especially those located on older landforms such as glacial terraces, bedrock benches, and alluvial fans. It is likely that a larger data base in the future will lead to a resolution of this problem.

12.4 Projectile Point Typology and Chronology

One result of the combined survey and testing project was the collection of a moderate sample (n=117) of time-diagnostic projectile points. All were collected from the surface, and none from intact subsurface deposits. Age estimates for intact artifact-bearing deposits from excavated test units were based on radiocarbon and tephrochronology techniques. All three chronologic techniques (stylistic/morphological, radiocarbon, and tephrochronology) provide different age estimates and measures of the

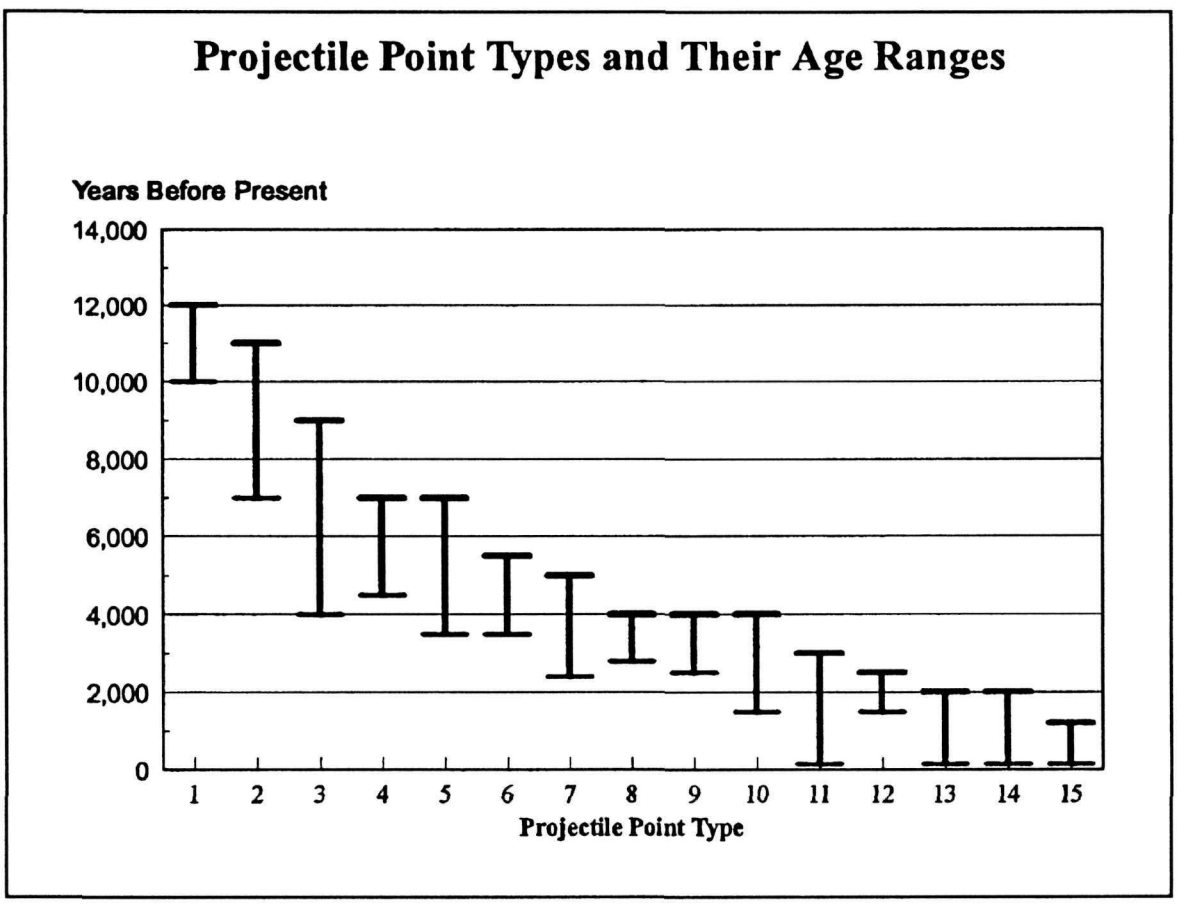


Figure 12.3 Projectile point types and their age ranges

major time periods of occupation of the drawdown zone. In Figure 12.3 the projectile point types and their age ranges are shown. Detailed morphological descriptions of the 15 time-sensitive types are provided in Appendix D.

Figure 9.9 in the survey results section shows the frequency distribution of project area points by broad prehistoric time periods. These are designated as Paleoindian, Early, Early-Middle, Late-Middle, and Late. The largest area of the histogram is covered by the Early-Middle and Late-Middle periods between 8,000 and 2,000 years ago, indicating a higher frequency of Middle period point types than Late period point types, and suggesting more intensive use in the Middle period. By comparison, radiocarbon dates from sites in the drawdown zone postdate 2,000 years ago, suggesting a pattern of intensive use beginning about this time. It is not possible at this time to account for the absence of radiocarbon dates in the drawdown zone older than 2,000 BP. If the projectile point chronology is approximately accurate, it means that we have not sampled charcoal from Early and Middle period occupations, possibly because it is not present. This seems unlikely considering that charcoal of cultural origin much older than 2,000 years was recovered from site 45WH224 located immediately above the drawdown. It is also unlikely that reservoir processes have removed charcoal, which is insoluble in water and tightly encased in the soil matrix. One possibility is that the techniques used to sample site deposits were biased and that the Middle period assemblages were missed (although some degree of bias is likely, the pre-3,000 year dates of St. Helens Y and Mt. Mazama O tephra demonstrate that at least some middle period-age deposits were sampled). Another possibility is that the projectile point chronology, which is based on radiocarbon sequences from outside of the project area, is not applicable to the upper Skagit River Valley, and the time periods assigned to the point types are in error (this also seems an unlikely explanation, as projectile point chronologies from western Washington appear to show consistent correlation with radiocarbon-dated styles from the Columbia Plateau [Lewarch and Benson 1989]).

The fact that no time-sensitive artifacts were recovered from the test excavations is probably an indication that projectile points are very sparsely distributed within the project area. A quantitative measure of just how sparse is provided by the 117 points that were distributed over 27.6 km^2 (6,817 acres) of land area, which equates to 4.2 projectile points/km^2 (0.017 points/acre or 1 point/58 acres). Such low densities suggest, in turn, that a large volume of soils had to have been eroded by reservoir operations for the 117 specimens to have been made visible, assuming that they were all buried to some depth. Whatever the cause, it means that, at present, the projectile point chronology for the project area is not based on an independent set of radiocarbon dates found in direct association with the points.

When the stylistic dates are compared with the full suite of radiocarbon dates from the project area, which includes those from 45WH224, there is somewhat better agreement than with the drawdown dates alone. Both stylistic and radiocarbon age estimates suggest a pattern of human use beginning in the Early-Middle period, at least by 8,000 years ago. However, the two methods of estimating site age support different conclusions about intensity of use in that stylistic ages suggest most intensive use during the Middle period while radiocarbon dates suggest most intensive use in the Late period.

Except at site 45WH234, artifacts in the drawdown are associated with primary tephra dating after about 3,000 years ago.

Caution should be exercised in the use of some point styles for dating site assemblages in the project area. As noted, the age range shown in Figure 12.3 for the point types is borrowed from other localities and is considered only an approximation for the project area. Type 3 (Cascade/Olcott), in particular, has been assigned a broad time range, spanning 5,000 years (9-4,000 BP). In the project area, it is possible that the younger age limit may extend to more recent times. Others have recognized that dating of Cascade/Olcott varieties is problematic. Connolly and Baxter (1986) note that Cascade-like points have a much broader time range in southwestern Oregon than in eastern Washington. Ames et al. (1981) found Cascade points in association with pit houses in northern Idaho and are cautious about their use as time markers. These regional differences in point type chronology may be relevant to understanding prehistory of the valley because it is possible that lanceolate (including Cascade varieties) points were used to tip spears that were part of a hunting tool kit during a late prehistoric time period. Several ethnohistoric references from the interior and coastal Northwest show that spears were used until relatively recently. For example, Haeberlin and Gunther (1930:26) record that beaver were speared by hunters from canoes. The Southern Okanogan also hunted beaver with spears (Teit 1930:242) and they used spears with "lozenge-shaped" flint points set in a socket (Cline and Post 1938:55). The Skagit people shot deer with arrows and spears tipped with stone (Blukis Onat 1980). Finally, using ethnographic data from Boas (1890) and Teit (1909), Wilson and Carlson (1980: Appendix A) note that the Shuswap flaked spear points out of basalt. It is perhaps relevant that two of these references mention the use of spears for taking beaver, one of the mammals identified in the drawdown archeological faunal assemblage. It may be that spears were adaptive to hunters in densely forested environments where game animals were caught in snares and traps, or for other reasons were dispatched from close range. Although this idea remains untested, it offers an explanation for the persistence of the style into later prehistoric periods.

A final pattern revealed in the classification of projectile point types is the wide variability in morphological types. The types are similar to, and in some cases are morphologically identical to points from widespread areas of both the inland and coastal Pacific Northwest and beyond. This variability seems to reflect visitation and use of the valley by people from the lower Skagit River Valley, Puget Sound, the lower Fraser River Valley, the Fraser Plateau, the Columbia Plateau, the northwestern Rocky Mountains, and the Cascade Range to the south. It may also reflect pan-regional trends in projectile technology. Whatever the sources of morphological variability in points, specific types cannot be tied to ethnohistorically identified Native American groups.

12.5 Projectile Point Function

The functional uses of projectile point types is of interest for understanding certain aspects of prehistoric subsistence in the project area. Traditionally, large lanceolate points are considered to have been used to tip spears that were thrown or used for jabbing. Large notched points are assumed to have been used to tip darts or spears thrown by an atlatl, and small points were used to tip arrow shafts propelled by a bow. In order to address functional differences in point types, we have compared the project area point assemblage to others that have been examined with the goal of separating dart (atlatl) points from arrow points. The procedure is based on the relationship between the shaft diameter and the distance between the notches or stem width of the point hafted to it. The general relationship is one wherein the larger the diameter of the shaft, the greater the neck or shoulder width of the point (Corliss 1972; Stryd 1973; Thomas 1978). Thomas (1978) analyzed a collection of ethnographic and archeological dart and arrow points and shafts to determine which characteristics discriminated between the two projectile types. His results indicated a mean neck width for arrow points of 10.0 mm and for dart points, 13.7 mm. Wilson and Carlson (1980:47) used 10 mm for the cutoff between arrow and dart points, but noted some overlap between the two groups, as three dart points had neck widths less than 10 mm. They present a mean neck width for arrow points of 7.5$\pm$1.6 mm and for dart points, 12.9$\pm$2.17 mm.

The neck widths of 74 projectile points from the project area were measured. Those not included were fragments lacking a measurable neck or stem and morphological Types 1-3, which are assumed to be spear tips (some could have served as knife blades). Metric attributes of neck or stem width by morphological point type (Types 4A to 15) are presented in Table 12.3. The methodology used to record projectile point neck width follows that used by Lohse (1985) for Columbia Plateau assemblages and corresponds with his measurement "H-2" (Lohse 1985:326-327).

Table 12.3 Projectile Point Neck Widths in Millimeters

TYPE	NUMBER	NECK WIDTH RANGE	MEAN	STANDARD DEVIATION
4A	1	14.2	14.2	0
4B	3	16.7 - 19.3	18.1	1.0
5	5	8.2 - 16.4	13.1	3.0
6	3	13.5 - 21.2	16.1	3.5
7	12	7.0 - 24.9	13.2	4.4
8	5	10.2 - 22.5	15.8	4.7
10A	3	9.5 - 10.8	10.1	0.5

10B	3	10.6 - 13.4	12.3	1.2
10C	9	10.9 - 14.6	12.7	1.3
11A	3	11.5 - 15.1	13.8	1.6
11B	8	11.9 - 17.7	13.6	1.9
12	2	11.8 - 17.2	14.5	2.7
13	2	9.4 - 10.4	9.9	0.5
14A	3	7.0 - 9.2	7.1	1.6
14B	4	8.8 - 14.2	11.4	2.4
15	8	5.0 - 10.5	7.3	2.0

Lohse (1985) conducted a detailed metric analysis of points from the Columbia River of eastern Washington and discriminated arrow points from dart points partially on the basis of how types plotted on a bivariate graph of neck width versus weight. None of the types in this sample had mean neck widths greater than 8.2 mm. Although the bivariate graph of type metrics is not strictly comparable to neck width alone, the cutoff between arrow and dart is approximately between 3.5 and 5.6 mm (Lohse 1985:357, Figure 11.13). Lohse applied Thomas' (1978) discriminant classification of dart points versus arrow points to his data, with the result that over 94% of all points were classified as dart points. This result is in error, he says, because 15% of all points are the small side-notched variety that date $<1,000$ BP and that are assumed to be arrow points. He suggests the discrepancy may result because Thomas' data is not valid for the Columbia Plateau due to the use of a geographically restricted sample, or because prehistoric people of the Plateau used somewhat larger arrow points than in other parts of North America (Lohse 1985:360).

The project area point assemblage shows a general trend towards decreasing mean neck width over time. If a 10 mm mean neck width is used to separate arrows from darts, then Types 13, 14A, and 15 fall into the arrow group; if a 7.5 mm mean neck width is used, only Types 14A and 15 fall into the arrow group. All three types date to the last 2,000 years and mark roughly the appearance of the use of the bow and arrow in the upper Skagit River Valley. Overlap between darts and arrows is most clearly expressed in our data by Type 14B, which is a dart point that has been radiocarbon dated within the last 2,000 years or less (see Appendix D). Overlap is also represented by Type 11, which represents dart points dating within the last 2,000 years. Such overlap can be viewed as resulting from the gradual transition of one technology into another. Lohse (1985), for example, looked at the decrease in blade size and neck width over the Holocene to infer broad changes in projectile technology; decreasing projectile point size and the continual development of shoulders and separable stems indicate refinements in the use of the atlatl, which eventually led to the appearance of the bow and arrow around

2,000 years ago. Although we agree with this view, we feel that in the project area, at least, it does not go far enough. It is possible that darts continued to be used, and were an important part of the hunting weapon assemblage well into the late prehistoric period, at least until approximately 1,200 years ago. Furthermore, it is possible that hunting spears were also used in late prehistoric time periods in selected environments and for specific hunting strategies, such as might have been used in densely forested environments where game animals were taken in snares and traps.

12.6 Archeological Assemblages and Soil Stratigraphy

It is clear from the individual site descriptions that most artifacts from intact site deposits were excavated from the soil B- and BC-horizon matrices. Due to this fact alone, any insights into the formation processes, age, geochemical behavior, effects on artifact deterioration, and other characteristics of these soil horizons will benefit understanding of the archeological assemblages within them. In this section, soil B-horizons are briefly characterized and their relevance to archeological investigations explained. Portions of this discussion were presented in Mierendorf 1993a and 1993b.

Most generally, B-horizons are zones of weathering that form below the organic-rich, upper soil layers. Of the full range of B-horizons that form, we are concerned with cases of a particular type that characteristically develop under montane forests and express most of the following pedogenic (field) properties. Soil B-horizons express a degree of redness that has been called "rubification". Typically they display Munsell colors of yellowish-brown, strong brown, yellowish-red, and red (with hues ranging from 2.5YR to 10YR and chromas of 4 to 6 or more). The color is imparted by the presence of iron and aluminum oxides derived from other soil horizons above (through a process of podzolization) or from in-place weathering of iron-bearing minerals. B-horizons are variable in thickness, depending on age and the rate of weathering. Where they form on landforms of different ages (such as a nested series of glacial outwash terraces), they form a chronosequence and exhibit a progression in strength of development according to increasing age of the landform. In the drawdown zone, B-horizons are well developed on older, stable surfaces of glacial moraines, glacial outwash and kame terraces, alluvial fans, bedrock benches, colluvial slopes, or the loess deposits that cap these landforms. They are absent or very weakly developed on the flood plain and steep slopes. Such horizons are generally acidic, so bone deteriorates rapidly, and they sometimes exhibit iron oxide segregations expressed as pellets or concretions. When classified according to the diagnostic horizons of soil taxonomy, these soils are entisols, inceptisols, and spodosols (Soil Conservation Service 1975).

The importance of the soil B-horizon to understanding site formation and artifact patterning goes far beyond the project area. It extends to a large region from the Cascades to the Rocky Mountains and beyond to broad areas of North America where soils have formed under the cool, humid canopy of dense coniferous forests. Archeologists working in the forests of western Washington and beyond have for some

time recognized a physical association between archeological assemblages and well-developed soil B-horizons, especially for Early period sites (see Borden 1975:54; Hedlund 1974:81; Kidd 1969:209, 214; and Swanson 1961). However, correlation and interpretation at a regional scale have encountered difficulties, due largely to only partial understanding by archeologists of the factors that control B-horizon development and archeological site formation.

Johnson et al. (1990) provide a useful theoretical perspective for understanding soil B-horizon development as we have seen it expressed in the project area. This perspective recognizes the polygenetic nature of these horizons. Any one B-horizon can reflect a complex history reflecting changeable rates of deposition, parent materials, periglacial phenomena, local and regional climatic cycles, and local physiographic factors, such as impeded drainage. To understand archeological assemblages in the drawdown zone, an important factor in the polygenetic model of soil development is the reversal of the progression in a soil's development towards a "mature" state. As progression towards maturity proceeds, it is common for a variety of homogenizing processes to reverse or impede the development of "mature" properties. Agents of homogenization include mixing of soil horizons by tree root mass tip-ups, soil fauna, penetration and dislodgment during plant root growth, movement of soil particles during freeze-thaw cycles, and burning of tree roots, which leaves voids that are eventually filled in. Thus, an old soil may have been affected by a range of genetic processes, but display "youthful" pedogenic characteristics.

One of the most persistent influences on artifact-to-soil horizon associations in the project area is the mixing together of soil horizons that occurs when trees tip over and displace large volumes of soil adhering to their root systems (Wood and Johnson 1978). Even in second growth forests of moderate-size trees, up to 48% of the ground area can be disturbed by trees, which individually can displace root mass volumes of up to 3 m^3 (Beatty and Stone 1986). In old growth forests of the Pacific Northwest, root mass volumes much larger than this are common. Awareness of the effects of such disturbance on archeological deposits is widespread, and perhaps has led some archeologists to mistakenly conclude that all prehistoric sites in heavily forested environments have been, for the most part, destroyed by mixing, resulting in loss of integrity of association and location of artifacts. This is simply not the case.

Soil B-horizons need to be understood in three dimensions, as volumes of soil matrix having different polygenetic histories. From the standpoint of artifact integrity, this means that some subset of this matrix, and the artifacts within it, has been homogenized through bioturbation and other mixing processes, resulting in destruction of integrity. It also means that another subset of this matrix remains intact, with artifacts that retain integrity. The boundary between these two subsets is difficult to map, even to recognize, within conventional archeological test units. Yet, intact features, artifacts, and culturally-generated charcoal may be found in their original depositional context. If the boundaries between these two subsets of soil volume could be mapped, they would

present a complex mosaic of irregular and intertwining lines reflecting the distribution of tree tip-ups where prevailing winds crest a ridgeline; or reflecting ancient and historic forest fires, particularly those that burned out roots, whose hollow casts eventually collapsed and filled in with soil matrix from above; or reflecting increased rodent activity during a cycle when the land sustained a shrub-grassland cover following a denuding forest burn; or reflecting a stable land surface occupied repeatedly by prehistoric groups of foragers, their habitual use of pits and hearths for cooking, and the attendant foot traffic associated with their daily camp activities.

Human activity must also be seen as a factor in the genesis of some soil B-horizons. The correspondence between feature charcoal dates and soil matrix charcoal dates (section 12.2 above) is likely explained by the integrity of the soil B-horizon encasing the charcoal and the associated artifacts. We do not yet have the means to estimate of the percent volume of a B-horizon matrix that is intact, but such a measuring device would be a useful tool for archeological research. The intent here is not to simplify the complex problems associated with making meaningful statements regarding the spatial (vertical and horizontal) distributions of artifacts within soil B-horizon matrices; rather, it is to identify processes and problems that ought to be addressed for a full recovery of information embodied in significant archeological sites that will be managed within the project area.

12.7 Results of Petrographic Analysis of Lithic Raw Materials

This section summarizes the results of petrographic analysis of selected rock samples. Eight lithic artifacts from project-area archaeological sites and three rock samples were submitted for petrographic analysis and identification to Ed Bakewell at the University of Washington, Department of Anthropology. The detailed results are provided in Appendix G-1. The main purpose of the analysis was to check the reliability of visual identification of "hand specimen" samples of lithic raw materials from the project area. Distinguishing some of the dark, opaque, fine-grained argillaceous material we term "metasediment" from other dark, opaque, fine-grained rocks of different origin, such as basalt (or "dacite") or some kinds of chert, was difficult and lacked replicability. The specimens selected for analysis represent a grab sample of items from this hard-to-identify group.

Table 12.4 lists the park catalog number (NOCA) for each sample, the site from which it was collected, the item's hand-specimen identification, and the identification derived from petrographic analysis. Of the eight archaeological specimens, two were correctly identified as metamorphic (metasediment or argillite), while another was correctly identified as igneous (basalt, trachydacite, or Cache Cr. "basalt"). The

Table 12.4 Results Summary from Petrographic Analysis

NOCA	Site No.	Object	Hand-specimen ID	Petrographic ID
6083	45WH79	flake	Metasediment	Argillite
6170	45WH79	flake	Metasediment	Argillite
6342	45WH230	flake	Metasediment	Andesite
7093	45WH417	flake	Basalt	Trachydacite
7133	45WH433	flake	Metasediment	Dacite
7236	45WH228	flake	Metasediment	Radiolarian Chert
10680	45WH274	biface	Metasediment	Trachydacite
10786	45WH300	flake	Metasediment	Trachydacite
Nonarchaeological samples				
Ref. No.	Provenience		Hand-specimen ID	Petrographic ID
21	Fraser Plateau, BC		Cache Cr. "Basalt"	Trachydacite
45	Mouth of Sauk R., WA		Metasediment	Cordierite Hornfels
67	Roland Cr. fan, WA		Actinolite	Serpentinite

remaining five specimens were incorrectly identified as metasediment. One of these turned out to be a sedimentary rock (radiolarian chert), while the rest were igneous (dacite, andesite, and trachydacite). Two of our archaeological specimens, NOCA 7093 and 10680, are very similar to a material commonly called "Cache Creek basalt", which is found in greatest abundance on the Fraser Plateau in British Columbia, north of the project area. However, the extent of local availability of this material in the glacial deposits of the upper Skagit River drainage is presently unknown.

Of the three nonarcheological source samples, one piece of Cache Creek "basalt" from British Columbia was identified as trachydacite. A sample of metasediment from gravels at the mouth of the Sauk River was identified as cordierite hornfels; although it resembled the metasediment found in archaeological assemblages, its composition was quite distinct. Finally, a piece of green metamorphic rock from Roland Cr. in the project area was identified as serpentinite. Although no artifacts were recovered from the Roland Creek area that were made of this material, two adz blades from sites in the Lightning Cr. vicinity are made of rocks in the jadeite-nephrite-serpentinite series, suggesting the possibility that a local source of serpentinite was used.

The misidentification of rock types revealed by the analysis was expected. The appearance of some of the "metasediment" is remarkably similar to that of a dark igneous rock that we identified as basalt. We deliberately selected specimens for analysis that presented difficulties in assigning to a rock type. Thus, while some portion of our

"metasediment" artifact assemblage is likely to be igneous, the actual number of such misidentifications is probably not as high as it might appear from this analysis. Other archeologists working in Washington State have encountered the same difficulty in distinguishing dark, opaque metamorphics from igneous rocks. Perry (1992), using microscopic examination (without thin-sectioning) of artifacts from Lake Roosevelt, checked the material type identifications of 204 lithic artifacts labeled "black argillite". She found 39% argillite, 36% basalt/extrusive igneous rock, and 25% other rock types, including quartzite, arkose, andesite, rhyolite, chert, and other materials. Another sample of 663 lithic items from sites around Curlew Lake, of which 98.8% had first been identified as "black argillite", was re-identified as 98.2% basalt. After failing to find a reliable field test to distinguish dark igneous from dark metamorphic stone artifacts, Perry concludes that she "...cannot tell basalt from black argillite without the help of a geologist armed with a microscope, and I suspect that I am not alone" (1992:206). Also concerned with identification of dark lithic materials, Bakewell (1993) performed petrographic and geochemical analyses on 44 samples of fine-grained, dark lithic materials from archeological sites throughout Puget Sound. Most of the sample (77%) consisted of vitrophyric dacite. Although lithic samples from some of the same sites represented in Bakewell's study had been identified as basalt, he found basalt to be absent from his sample.

This discussion indicates a clear need on the part of archeologists to develop, among other things, more reliable diagnostic procedures for identification of some lithic raw materials. There are a number of criteria that might be employed to distinguish metasediment from basalt in hand specimens. It appears that in the Ross Lake assemblages, metasediment is usually characterized by the presence of a light-gray, chalky weathering rind on flake scars of artifacts. The surface of metasediment artifacts seems to weather more rapidly than other raw materials, such as chert or basalt. However, the amount of weathering varies with the chemical environment of the soil/sediment matrix, mineralogy of the rock, and time elapsed since flaking. For these reasons, age estimates of site assemblages based on the apparent degree of weathering on the surface of projectile points, as employed for example by Grabert and Pint (1978) at 45WH79, should be treated with caution. Another characteristic of metasediments is the frequent presence of parallel laminae of different color and texture; these appear to be the remnants of depositional, sedimentary strata inherited from the parent sedimentary rock prior to metamorphism or of grain reorientation and secondary mineral formation during metamorphism. Perry (1992) also noted the presence of small, smooth-edged inclusions such as rounded quartz grains in argillite. By comparison, flake scars on basalt artifacts display no weathering rind; however, a light-gray weathered cortex can be observed on outcrop exterior surfaces and the exterior of geologic (unflaked) specimen surfaces. Unlike metasediment, basalt lacks bedding planes and stratification. Perry (1992) noted some success in identifying basalt by its being drawn to a magnet. These criteria are not 100% reliable, but their use is likely to increase the accuracy of hand-specimen identifications. Bakewell (1993:30) recommends use of the term

"pseudobasalt" for materials identified without the aid of petrographic and chemical analyses, which are necessary for accurate classification of igneous volcanics.

12.8 Results of X-Ray Fluorescence (XRF) of Glassy Volcanic Rock

Obsidian and other forms of glassy volcanic rock, such as vitrophyre and ignimbirite (hereafter called glassy volcanics), comprise a minor proportion of the lithic materials used for tool manufacture in the Ross Lake project area. However, their low frequency of occurrence belies their potential to address important issues in local prehistory, particularly regional exchange networks and patterns of local lithic resource procurement. In this section, local studies of obsidian sources will be reviewed briefly, the results of XRF analysis of glassy volcanics from the Ross Lake area will be discussed, and the results of the analysis will be placed in a local and regional context.

X-ray fluorescence analysis of obsidian to identify its geologic source has been employed in the Pacific Northwest for about 20 years. The technique has been improved in recent years due to characterization of more geologic sources and a greater understanding of the chemical variability within sources. Figure 12.4 shows the geographic distribution of the sources of glassy volcanics identified thus far in the Pacific Northwest. Most sources are in southern Idaho/northeastern Wyoming and south-central Oregon/northeastern California. There are few sources catalogued in British Columbia and Washington State.

Fourteen archeological specimens of glassy volcanics from the project area were submitted to the XRF Laboratory in the Department of Chemistry at Simon Fraser University in British Columbia to be chemically characterized and matched to a geologic source (Table 12.5; Appendix G-2). We chose the XRF Laboratory at Simon Fraser University because the proximity of the project area to British Columbia and the ethnographic accounts of Lower Thompson (Nlakápamux) people using the Ross Lake area made it likely that obsidian from British Columbia sources may exist. Seven specimens are of vitrophyre, a lustrous, gray material with a glassy groundmass, differing from classic obsidian in that some crystalization has occurred, resulting in the formation of visible crystals of feldspar. This is a tentative identification based on hand specimen examination. All vitrophyre specimens were small flakes. The other seven specimens submitted were of obsidian, two of which were formed tools, the others small pressure flakes. Additionally, one piece of vitrophyre from a geologic source within North Cascades National Park on Copper Ridge (Mierendorf 1987b) was submitted for XRF analysis for comparison with the Ross Lake samples. The Copper Ridge material is black, opaque glass with small white phenocrysts, possibly plagioclase. It did not match any of the Ross Lake materials.

Table 12.5 Summary of Results of XRF Analysis of Volcanic Glass from Ross Lake

SITE#	NOCA#	MATERIAL	OBJECT	PROVENIENCE	SOURCE
45WH79	6353	Vitrophyre	flake	surface	Unknown Source 1
45WH79	10450	Obsidian	flake	surface	Glass Butte D, OR
45WH79	10451	Obsidian	flake	surface	Glass Butte D, OR
45WH224	7387	Obsidian	flake	TU18/L2	Newberry 1, OR
45WH224	7565	Obsidian	flake	TU18/L2	Newberry 1, OR
45WH228	6365	Vitrophyre	flake	surface	Unknown Source 1
45WH232	6372	Obsidian	biface	surface	Sugar Mtn., CA
45WH234	7173	Vitrophyre	flake	TU1/L5	Unknown Source 1 (?)
45WH234	7174	Vitrophyre	flake	TU1/L2	Unknown Source 1
45WH239	6363	Vitrophyre	flake	surface	Unknown Source 3
45WH253	10003	Obsidian	flake	TU1/L2	Unknown, possibly Sugar Mtn., CA or Glass Butte, OR
45WH255	6368	Vitrophyre	flake	surface	Unknown Source 1
45WH262	7121	Obsidian	p-point	surface	Three Sisters, OR
45WH281	10777	Vitrophyre	flake	TU1/L2	Unknown Source 2
N/A	10168	Vitrophyre	source	outcrop	Copper Ridge, WA

None of the material identified as vitrophyre matched any known sources of obsidian or vitrophyre (Table 12.5); however, few such sources have been recorded and characterized. Three groups of vitrophyre are represented in Table 12.5. NOCA 6363 and 10777 stand apart from one another and from the rest of the vitrophyre specimens; their sources are referred to as Unknown Vitrophyre Sources 3 and 2, respectively. Four specimens, NOCA 6353, 6365, 6368, and 7174, can be placed into a single group called Unknown Vitrophyre Source 1. Assuming that there is a great deal of variability in the composition of the source, NOCA 7173 probably also belongs to this group. It comes from the same site and test unit as NOCA 7174 but was recovered from a different level. Thus, conservatively, there are at least three and perhaps four distinct, but unknown sources for the vitrophyre material in the Ross Lake lithic assemblage.

The inability to identify a geologic source for vitrophyre is not surprising. Based on McClure's (1989:66-67) work in the southern Washington Cascades, vitrophyre tends to have a limited distribution in archaeological sites and its use is confined to areas near the source. Explanations for this phenomenon have cited the generally poor quality of the material for tool production, the small quantity of material at these sources, and the relatively high cost of procuring the material unless offset by combining its procurement with other activities, such as hunting, that bring people within close proximity to the

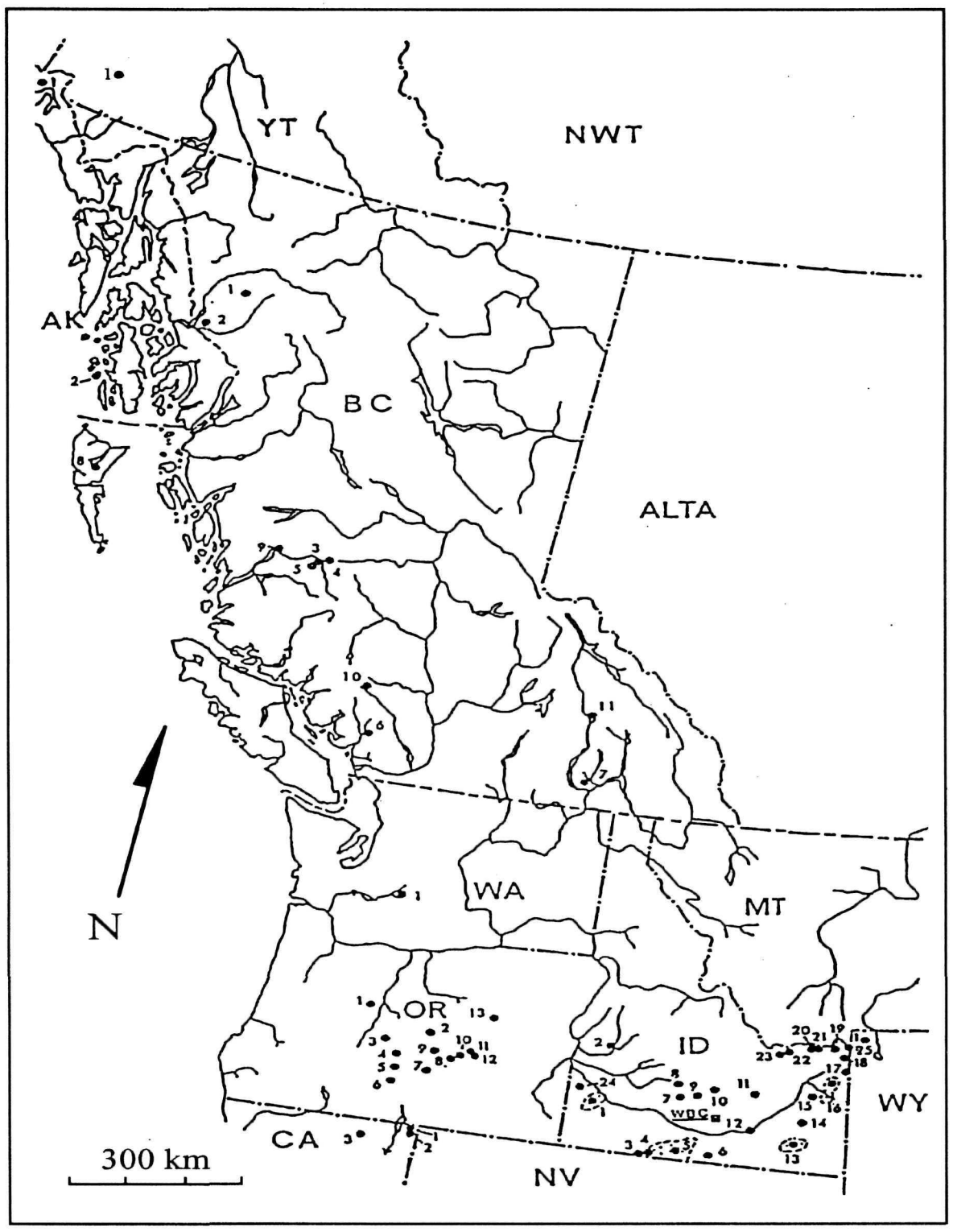


Figure 12.4 Map of identified obsidian sources in the Pacific Northwest (After James 1994)

source area. At the present time in the northern Cascade Range, the absence of obsidian-source surveys in volcanic terrains, more than any other single factor, could explain the inability to identify vitrophyre sources in archeological assemblages.

The sample of vitrophyre from an identified geologic source within the park, NOCA 10168 from Copper Ridge, did not match the chemical signatures of any of the archaeological specimens of glassy volcanics, nor did this sample resemble any of the vitrophyre from the project area in hand specimen. The Copper Ridge vitrophyre flow may be too variable in chemical composition to be accurately characterized by one sample, the first from this geologic source to be chemically characterized. The outcrop itself and three adjacent lithic reduction sites were described briefly by Mierendorf (1987b). The outcrop varied in color from black to light gray, and in some portions, exhibited color banding indicative of flow structure. This characterization has been

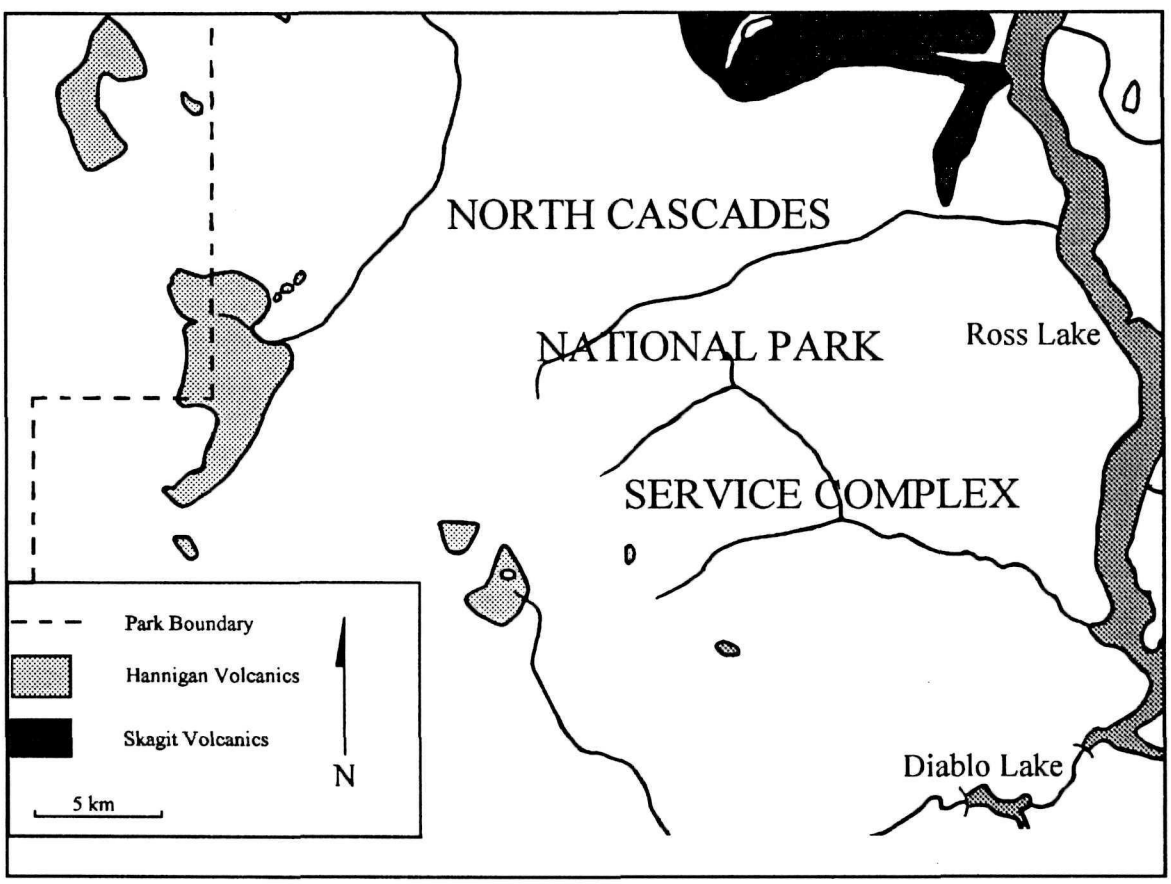


Figure 12.5 Map showing location of volcanic rock units in the vicinity of the North Cascades National Park Service Complex (after Staatz et al. 1972: Plate 1)

added to the source library at the XRF Laboratory at Simon Fraser University. Figure

12.5 shows locations of volcanic rock units in the vicinity of the park in which vitrophyre sources may be located.

Of the seven specimens of obsidian submitted for analysis, five were attributed to sources in central Oregon (Table 12.5): one (NOCA 7121) from Three Sisters, two (NOCA 10450 and 10451) from flow 4 at Glass Butte, and two (NOCA 7387 and 7565) from Game Hut flow at Newberry Caldera. One specimen, NOCA 6372, was matched to Sugar Mountain in northeastern California. The final specimen, NOCA 10003, was problematic, perhaps due to its thinness. The best match was with a flow of obsidian from Sugar Mountain that does not have a wide archeological distribution. In light of this, the most likely source is one of the secondary matches, particularly Glass Butte 5, Oregon.

The artifacts were correlated with chronometric dates from the project area. Of the 14 specimens in our sample, seven came from sites with radiocarbon dates (Table 12.6). Three of the seven specimens came from excavated contexts. Only one specimen, NOCA 1003, had a radiocarbon date from the same unit and level. Another site, 45WH224, produced a radiocarbon date that stratigraphically correlated with two obsidian flakes (NOCA 7387 and 7565). Four specimens were surface finds, so the nature of the association between them and the material dated is unknown; however, all radiocarbon dates are given in the table to show the range. Overall, radiocarbon dates associated with the specimens extend to 1,500 BP.

The only time-sensitive point in the sample (NOCA 7121) is classified as a Type 3A, Cascade/Olcott variety with an assigned age range of 9,000 to 4,000 BP. It is the only obsidian specimen from the Three Sisters, Oregon, source. Based on this, Middle period use in the project area of obsidian from sources in Oregon is suggested.

Results of the analysis were examined in terms of the distribution of specimens within the project area. Six of the 14 specimens came from sites in the Hozomeen Creek area at the north end of the project area. Three of the four vitrophyre specimens (NOCA 6353, 6365, 7174) were grouped together as Unknown Source 1. Each came from a different site. A fourth piece of vitrophyre from this area (NOCA 7173) probably can be attributed to the same source. It came from the same site and test unit as NOCA 7174, although from a different excavation level. Two flakes of obsidian from 45WH79 (NOCA 10450 and 10451) were attributed to the same source, Glass Butte, Oregon. In the Boundary Bay area, also near the northern end of the project area, only one piece of vitrophyre (NOCA 10777) was analyzed. It was chemically very distinct from all other vitrophyre characterized in the study and was assigned to Unknown Vitrophyre Source 2.

Table 12.6 Glassy Volcanics from Project Area with Radiometric Dates

NOCA	Site No.	Artifact Provenience	Sample Provenience	Radiocarbon Date
6363	45WH239	Surface	TU2/L2	1,430±120 (Beta 53852)
6365	45WH228	Surface	TU3/L3	310±70 (Beta 33508)
6368	45WH255	Surface	TU1/L1	180±50 (Beta 40698)
			TU1/L3	500±90 (Beta 40699)
7121	45WH262	Surface	TU1/L3	310±70 (Beta 65229)
			TU3/L3	1,120±80 (Beta 64821)
			TU3/L4	1,020±80 (Beta 64822)
7387	45WH224	TU18/L2	TU20/L2	290±80 (Beta 33522)*
7565	45WH224	TU18/L2	TU20/L2	290±80 (Beta 33522)*
10003	45WH253	TU1/L2	TU1/L2	580±80 (Beta 40697)

*This date was first published in Mierendorf (1991).

In the middle portion of the drawdown, sites in the Lightning Creek area produced fewer obsidian pieces than Hozomeen Creek area sites, and no vitrophyre was recovered. Two pieces of obsidian (NOCA 7387 and 7565) were from the Desolation chert quarry site (45WH224); both were attributed to the Game Hut flows of Newberry Caldera, Oregon. One obsidian tool, a biface (NOCA 6372) from site 45WH232, was sourced to Sugar Mountain, California. In the Dry Creek area, one piece of vitrophyre from site 45WH255 (NOCA 6368) was grouped chemically with the specimens found in the Hozomeen Creek area (Unknown Vitrophyre Source 1). Two pieces of obsidian were analyzed, one a projectile point (NOCA 7121) found at site 45WH262, attributed to Three Sisters, Oregon, the other a flake (NOCA 10003) from site 45WH253 whose source could not be determined with great certainty but may be Glass Butte, Oregon.

In the southern portion of the drawdown zone, site 45WH239 near Roland Point produced a single piece of vitrophyre (NOCA 6363). It was attributed to Unknown Vitrophyre Source 3 that is chemically very distinct from all other vitrophyre specimens studied. Most obsidian and vitrophyre was from the northern portion of the project area. It is likely that the obsidian materials were exchange items brought into the upper Skagit River Valley via both Fraser River and Puget Sound (via the lower Skagit River) trade routes.

In the Pacific Northwest, obsidian sourcing has followed the fate of other analyses conducted for archaeologists by nonarchaeologists. The results tend to be relegated to appendices in the back of technical reports and are little commented upon in the text. Table 12.7 summarizes the results of a few sourcing studies, including the present one.

With few exceptions, the sample sizes tend to be very small and represent a tiny proportion of the lithic assemblage. Some notable exceptions are from larger projects in eastern Washington, such as Kettle Falls (Chance and Chance 1985). Because of the lack of large samples of obsidian from a broad range of sites and time periods, it has been nearly impossible to synthesize these data into a regional or diachronic model of prehistoric obsidian trade in the Pacific Northwest (cf. Galm 1994; James et al. 1994).

Comparison of our results with those from other obsidian sourcing studies in the Cascade Range of Washington state shows some slight differences. These analyses were all conducted by the same laboratory and have been reported primarily for assemblages from sites in Gifford Pinchot National Forest in the southern Washington Cascades (Daugherty et al. 1987; Flenniken et al. 1992; Hughes 1992). North of Gifford Pinchot National Forest, XRF analysis of obsidian was conducted on artifacts from the Chester Morse Lake area (Hughes 1993). Of 44 specimens examined in these studies, 19 (43%) came from sources in Oregon, 14% from a Washington source (Elk Pass), and the remaining 19 (43%) represent unidentified sources.

Obsidian sourcing studies east of the Cascades are from the eastern Columbia Plateau near Idaho (Hughes 1991; James 1992; Sappington 1985), the western edge of the Columbia Plateau bordering the Cascade Range (Stevens and Galm 1991), and from within the eastern Cascades (Gough 1988). The last two of these studies are of single sites with few obsidian items (12), with slightly more than half (7) attributed to Oregon sources. Studies from the eastern Columbia Plateau include two large, multi-site samples which show a large proportion of obsidian from southern Idaho sources (Hughes 1991; Sappington 1985). However, in the Kettle Falls area, the majority of obsidian still comes from Oregon sources, although a large part of that may be from sources in Baker County, northeastern Oregon (Sappington 1985). In the Kettle Falls study, the majority of obsidian came from contexts dating to the last 600 years, during which period obsidian from the Anahim Peak source of British Columbia made up nearly one-quarter of the total sample (Sappington 1985:363).

Table 12.7 Summary of XRF Sourcing Studies of Glassy Volcanics in Washington State

REGION/PROJECT	TOTAL*	OR	ID	WA	BC	CA	WY	UNID	REFERENCE
Ross Lake[1]	14	5	-	-	-	1	-	8	This Volume
Cascades									
Chester Morse Lake[2]	12	2	-	-	-	-	-	10	Hughes 1993
Judd Peak 45LE422	5	2	-	3	-	-	-	-	Daugherty et al. 1987

Beech Creek[3] 45LE415	17	7	-	3	-	-	-	7	Hughes 1992
Johnson Butte 45LE417	10	8	-	-	-	-	-	2	Flenniken et al. 1992
Plateau									
Centennial Trail/ Middle Spokane R.[4]	50	4	29	-	-	-	-	17	Hughes 1991
Kettle Falls[5]	206	118	58	-	30	-	-	-	Sappington 1985
45PO149	2	-	1	-	-	-	-	1	James 1992
45CH563	2	1	-	-	-	-	-	1	Gough 1988
Rock Island Rapids 45CH309	10	7	-	-	-	-	-	3	Stevens & Galm 1991

*Numbers indicate artifact frequencies.
[1]Seven of 8 "unidentifieds" represent at least three separate sources of vitrophyre which may be located somewhere in the North Cascades; the other unidentified specimen is obsidian, possibly from Glass Butte, Oregon.
[2]Most of sample is from a single site; "unidentified" category represents five separate sources.
[3]"Unidentified" category represents five separate sources.
[4]"Unidentified" category represents six separate sources.
[5]Only specimens identified to source were reported.

This brief review of other obsidian sourcing studies in the region shows that sources in central and southern Oregon tend to dominate obsidian assemblages in the Washington Cascades and Columbia Plateau (James et al. 1994). It is also the case, however, that there is much local variability in the proportion of obsidian and other glassy volcanics from other sources, such as those in northeastern Oregon, southern Idaho, the Washington Cascades, and British Columbia. These patterns probably reflect the influence of subregional exchange networks, changes in exchange networks over time, and ease of access or proximity to various sources.

For the project area, two general conclusions can be drawn from this analysis. First, the identified sources for the obsidian portion of the volcanic glass were in south-central Oregon and northern California, which is consistent with source information from other sites in the Pacific Northwest. Oregon obsidian has the widest distribution and most frequent occurrence of any obsidian source on the Columbia Plateau (Sappington

1985), in the Washington Cascades (Daugherty et al. 1987:Appendix A; Flenniken et al. 1992:Appendix E; Hughes 1993; McClure 1989), and to a lesser extent on the Washington and southern British Columbia coast (Bangs and Lewarch 1994; Burley 1989:23; Carlson 1983:22). Despite ethnohistorical connections of the project area with the Nlakápamux people of the Canadian Plateau, there were no British Columbia sources identified in our sample. Second, while none of the vitrophyre from Ross Lake archeological assemblages chemically matched the Copper Ridge source, located about 30 km west of the project area, there are other possible but unidentified vitrophyre sources near the project area. Finally, because the lone vitrophyre sample from Copper Ridge may not be representative of the entire outcrop, this source cannot be excluded as the source of vitrophyre in the project area without more sampling and chemical characterization.

12.9 Microblade Technology

Microblades and microblade cores numerically constitute a small fraction of the total artifact assemblage from the project area, but study of their morphology, technology, and functions addresses an important problem in Northwest prehistory. Since the 1950s, microblades in the Pacific Northwest have been documented in archeological sites scattered throughout the region (Sanger 1968), although there is much uncertainty about their significance. Microblade technology is assumed to have been introduced into the Pacific Northwest from the Arctic or Subarctic by some of the earliest coastal and interior cultural traditions, approximately 9-11,000 years ago (Borden 1975; Matson and Coupeland 1995). (The technology is derived ultimately from Paleolithic Siberian cultures). The earliest recognized microblade assemblages near to the project area, from southern British Columbia, are dated to ca. 7,000 radiocarbon years BP (Browman and Munsell 1972).

As a subset of the more general class "flake", they display the morphological attributes of small size and elongation. There is debate as to the appropriate criteria for definition of "microblade" as a type, based on the recognition that "microblades", and "linear" and "parallel-sided" flakes can result from lithic technologies unrelated to intentional blade production. Sanger (1970:106) suggests the criteria for definition should be attributes that show evidence of intentional core preparation and the removal of successive blades. Typically, microblades are characterized as being parallel-sided, thin, more than twice as long as they are wide, and less than 10 mm wide, but not all artifacts with these attributes are the product of microblade technology (Campbell 1985).

In a review of Pacific Northwest core and blade technologies, Sanger (1968) distinguished between interior and coastal microblade traditions based on core morphology, and he suggested that morphological differences may reflect raw material type, specifically the use on the coast of quartz crystals. Campbell (1985) and Hicks (1997) have noted that Sanger and others have interpreted microblade assemblages from a culture-historical framework, and have thus sought to chronologically trace population

migrations or cultural diffusion. A limitation of this approach is that the presence/absence and frequency of microblades or microblade cores in archeological assemblages may have more to do with the site function than with cultural differences. Campbell suggested a functional approach in order to ascertain the association between microblade industries and site types, environmental settings, other artifact classes, and wear patterns (Campbell 1985). In a study of nineteen Northwest Coast microblade assemblages, Hicks found that microblade frequency varied with no apparent pattern across assemblages of varying size, tool type content, and other categories (Hicks 1997). His data support the hypothesis that microblades functioned as a generalized rather than a specialized technology. He also found that microblade frequencies varied within and between site types; that microblades exhibit no pattern of association with tool types; and that microblades form a greater proportion of the assemblage in field camps (synonymous with "base camp" in this report) than in residential bases (synonymous with "residential site" in this report).

Table 12.8 shows the frequency of microblades, microblade cores, and wedges (*pièce esquillées*) in the project area from tested sites. Due to small sample size, metric attributes are not given; instead, qualitative descriptions are provided. Morphology of cores is variable, ranging from blocky, to wedge-shaped, to conical. Cores vary from those that are well-formed and exhibit multiple adjacent blade scars, to those that are only slightly modified and exhibit a few blade scars. Some of the cores have more than one platform, indicating removal of blades from multiple directions. Striking platforms are on flaked surfaces rather than on weathered cortex surfaces. Based on the assemblage of 13 cores, lithic material percentages by number are Hozomeen chert 61.5%, metasediment (probably argillite) 23.1%, quartz crystal 7.7%, and chalcedony 7.7%. Based on the assemblage of 25 microblades, lithic material percentages by number are Hozomeen chert 80%, quartz crystal 8%, chalcedony 8%, and metasediment 4%. Based on two criteria, use of prepared platforms and use of quartz crystals, the core assemblage most closely resembles the coastal microblade tradition as it has been characterized by Sanger (1968:111).

Wedges are also itemized in Table 12.8. Morphologically, wedges are roughly triangular in shape, with one end tapering to an acute edge and the other end forming a flat blunted surface. There seems to be a positive correlation between core or blade frequency and wedge frequency; however, small sample size prohibits conclusive results. Wedges from the project area exhibit evidence of battering and crushing at opposite ends, but it is uncertain if this represents wear from use as tools or that they are debitage from bipolar reduction. Functionally, their presence in sites may be related to their use as splitting or slotting tools in bone, antler, and wood (Flenniken 1981). Technologically, their presence may simply reflect the use of bipolar techniques to initially prepare microblade cores.

Table 12.8 Microblade, Microblade Core, and Wedge (*pièce esquillée*) Frequencies and Associated Radiocarbon Dates by Site.

Site No.	^{14}C Age BP	Microblade Frequency	Microblade Core Freq.	Wedge Frequency
45WH241	1,430±90	0	1	0
45WH253	380±80	2	0	0
45WH275	no date	4	2	0
45WH283	1,380±110	7	4	2
45WH286	no date	11	6	3
45WH300	1,940±90 1,750±60 1,650±70	1	0	1
	Totals	25.00	13.00	6.00

Table 12.8 shows that all but two of the total of 38 microblades and microblade cores are from sites radiocarbon dated between ca. 2,000 and 1,400 years BP. The two microblades from 45WH253, which is dated to ca. 400 years BP, constitute too small a sample to provide a basis for concluding that microblade technology functioned near the end of the Late period. Instead, the data suggest an active microblade industry between ca. 2,000 and ca. 1,400 years ago.

The functions of microblades are uncertain. Whereas Sanger (1968) considers microblades to be specialized tools, others have suggested that they are generalized tools that served multiple resource processing tasks. Based on their association with temporary camps and task locations (they were absent from residential sites) in the Chief Joseph Dam reach of the Columbia River, Campbell (1985:310) suggested that they are more likely to be related to generalized foraging. Use wear studies may be a useful approach to address function; however, such analyses are not commonly performed on microblade assemblages. In one such attempt, inadequate sample size handicapped the results (Hicks 1997).

The presence of microblades in the project area, with some exhibiting use wear, is an indication of their importance in local mountain subsistence strategies. In fact, the areal distribution of microblades extends beyond the project area to land throughout North Cascades National Park Service Complex. Given the temporary nature of many of these sites and their association with resource processing, an argument for a generalized function seems to be supported. However, systematic study of microblade and microcore assemblages from the park complex must be conducted for an empirical test of this hypothesis. Any attempt at systematic study should begin with the recognition

that microblade technology may be better understood as one type of a more general microlith industry. Some "microblade cores" from the project area, for example, reveal that small flakes rather than blades were systematically removed from each core. These flakes do not meet the definition of "linear flake", "blade", "blade-like flake", "parallel-sided flake", or "microblade". This might suggest that "microblade technology" in the northern Cascade Range is part of a broader microlith industry, and there is some evidence for this from other locations in the Cascade Range and beyond. Flenniken (1981), for example, studied a non-microblade microlith technology on the Olympic Peninsula. Here, vein quartz marine beach pebbles were reduced through bipolar techniques to make cutting tools which may have been used to butcher fish. Elsewhere, from a high elevation site in the central Cascades of Washington, Kennedy and Oda (1988) described a microlith assemblage that included microblades and other small flake types; their function was unknown. The possibility exists that a range of microlith technologies may have been utilized in the upper Skagit River Valley.

12.10 Land Use and Site Types

In this section, the project data are used to examine broad-scale changes in prehistoric land use during a ca. 8,000 year span of occupation. This approach utilizes a model of change presented in the prehistoric cultural resources overview for North Cascades National Park Service Complex (Mierendorf 1986). The model recognizes a continuum between forager and collector organizational strategies as a means of understanding settlement and subsistence patterns (Binford 1980). For the purpose here, two main components of organizational strategies, mobility and intensity of resource use, are examined. The model proposes that in the early prehistoric time periods (prior to 5,000 to 4,000 years ago) forager land-use systems were characterized by small, highly mobile bands that exploited the resources surrounding each residential camp. Resources were not intensively utilized, and most economic pursuits were conducted at or near the residential camp, so that seldom were there extended (a few days or more) absences from it. However, within any residential camp's foraging radius there are likely to have been a series of locations where resources were acquired and prepared for consumption. After the resources utilized within the small foraging radius became depleted, the group relocated to a new residential camp surrounded by more abundant resources. Such a land-use system is described as having high "residential mobility" due to the frequent establishment of base camps throughout a large territory.

In later prehistoric time periods (after 5,000 to 4,000 years ago), populations used a collector organizational strategy characterized by lower residential mobility and more intensive use of the surrounding resource base. Such groups established one or a few large residential sites within a territory. At different times of the year as controlled by resource availability, occupants left the residential sites to establish temporary base camps to acquire and process needed resources, which were stored or brought back to the residential site. Working within a smaller territory than foragers, collectors made more intensive use of resources, particularly food staples that occurred in great

abundance, such as salmon, ungulates, or roots. As a result, in near proximity to residential sites and base camps there were numerous task-specific locations where resources were acquired and prepared for storage or consumption. These locations vary greatly in size, and while some were small, sizeable task locations were established where abundant resources could be processed in bulk, and thus made ready for use by the larger populace of the residential encampment or village. Unlike foragers, collectors relied heavily on food storage for winter survival and they transported food to residential sites, rather than move residential sites to the food source.

Based on differences between these two land-use systems, it is possible to state expectations for patterning in archeological site data from the project area. Although differences might be expected in site size, kinds of plant and animal remains, sizes and types of dwellings and features, frequencies in different site types, types and diversity of tools, and range of lithic materials, information acquired by the project cannot address all of these dimensions. In what follows, a rationale is presented for expected patterning in site type, tool type richness, and lithic material diversity of forager versus collector strategies. The expected patterns are stated as explicit assertions of *relative* rather than *absolute* conditions. Following description of the expectations, they are compared with project area data to assess evidence for changes in land use during the last 8,000 or so years.

Three expectations derived from the model consider the type and frequency of sites. (1) In the early periods, only base camps and task locations should be present. (2) Early period components should be dominated by base camps associated with fewer task locations. (3) Late periods should be characterized by few residential sites, many base camps, and many task locations. The expectations in (1) and (2) above derive from a small group size, nonintensive use of resources, and high residential mobility. The expectations in (3) above derive from low residential mobility, intensive use of local resources, and larger group size or a longer duration of use.

Two expectations are derived regarding the richness (diversity) of tool types. (1) Early period components are expected to exhibit moderate tool type richness at base camps and low tool type richness at task locations. Tool type richness in these sites should reflect use of simple, generalized tools and technologies in resource extraction and processing for immediate consumption, requiring overall fewer tool types. (2) Late period components are expected to exhibit high tool type richness at residential sites and base camps, but low richness at task locations. A wider range of tool types in collector site types should reflect intensive exploitation of some resources, the use of complex extraction and storage technologies requiring specialized tools. An overall low tool richness at task locations is expected to reflect a narrow range of activities associated with bulk processing of some abundant, staple resources.

Two expectations are derived regarding the diversity of lithic material types at early and late components. (1) In early periods, a moderate lithic diversity is expected

to reflect the utilization of stone types derived from sources within a geographically large territory. Tools made of lithic materials from such widespread sources are carried to the various settlement types, where they are used and discarded along with tools from local lithic sources. (2) In late periods, high material diversity in residential sites is expected to reflect a wide range of activities and a long occupation span. An overall low diversity in base camps is expected to reflect utilization of local lithic materials, but due to the use also of nonlocal materials from distant sources, the diversity in specific sites may vary substantially. Low material diversity in task locations is expected to reflect a narrow range and short duration of activities. Although not considered here in the derivation of expectations, a reliance on long distance exchange networks could increase the overall lithic material diversity in late period sites.

Site Types

In order to examine the expected changes in land-use strategies in the project area, fifty archeological sites were classified into feature site types. For this purpose, we utilized a modified version of the site classification developed for the Chief Joseph Dam Cultural Resources Project (CJDCRP) (Salo 1985). The site classification is based on characteristic associations of archeological features. Feature classes include house floor/house pit, living floor, midden, earth oven, hearth, pit, cache, and other. For any archeological component in the CJDCRP, the association of features as defined below formed the basis for inclusion within one of three "feature site types" (Salo 1985:194).

> Site Type 1 was "defined as a component with a house pit or house floor and at least one other kind of feature, excluding midden. We use this type as a surrogate for central bases, corresponding to the commonly used special case term 'winter village'".
>
> Site Type 2 was "defined as a component with a living floor and one other feature, or a midden and one other kind of feature. We use this type as a surrogate for field camps, or "open camps'". In components fitting this definition, they found that the other feature most often was a hearth.
>
> Site Type 3 was "defined as a component with one or no feature. The type is surrogate for locations/stations, or 'open camps', 'kill sites', 'lithic scatters' and the like--low density/low material diversity and relatively non-discrete sites."

Using slightly modified definitions, this site classification is used to examine land use in the project area. The modifications are as follows. Salo (1985:193) defined "midden" as the most inclusive feature class, "...subsuming bone, FMR, rock, shell or mixed debris concentrations or scatters; cultural stains; strata of dense cultural materials; housepit fill; and lithic concentrations. Occasionally occupational surfaces were included if they lacked discrete structure or other characteristics of nonenclosed domestic living

surface." We have employed a definition of midden that is more restrictive in that it does not subsume concentrations of single artifact types, such as flaked lithics, shell, or FMR. By our definition, the term midden is assigned to mixed concentrations or scatters of cultural debris. The modification is necessary in order to avoid misassignment of resource processing locations, such as lithic debris concentrations at stone procurement or reduction sites, or root baking locations, to site classes reflecting domestic functions. Given this modification, we define the following site types.

Site Type 1 is defined here as a component with a midden, or a living floor, and at least one other kind of feature (no house pit or house floors were identified in the project area). We use this type as a surrogate for permanent or semipermanent **residential sites** occupied for months during any season of the year. Although the special case term "winter village" meets this definition, we make no assumption as to the applicability of this ethnographic analog to the project area in regard to season of occupation or architectural characteristics. Also, given the absence of models of site formation processes in archeological sites in interior montane settings, and the concomitant lack of descriptive precedents for such sites, we feel the modified definition accommodates the different environmental factors encountered in the project area. Specifically, the arid CJDCRP area is characterized by basic soils with good bone preservation and relatively stable landforms. By comparison, the project area is characterized by acidic soils with poor bone preservation, massive displacement of soil volumes by large trees, and geologically active landforms.

Site Type 2 is defined as a component with a flaked lithic scatter and one other feature; or a flaked stone scatter with burned/calcined bone; or a flaked stone scatter with FMR; or a midden, or a living floor. This type is a surrogate for short term, seasonal **base camps** occupied during exploitation of local resources, and for travel or bivouac camps occupied by small groups traveling through the valley on trips across the range.

Site Type 3: is defined as a component with no features, or one feature, or, as a special case, many features if they are all of one type and are functionally related to bulk processing of a single resource, such as a lithic raw material or a plant. This type is a surrogate for a **task location**, which includes quarries and other lithic resource procurement sites, hunting locations, root and berry processing locations, kill and butcher sites, fishing stations, and others related to the extraction and processing of resources. Subsumed under this type are small, low-density and low-diversity lithic scatters and other nondiscrete sites. A unique example of site type 3, Desolation chert quarry (45WH224), is characterized as a large, high-density lithic scatter.

The modified site type definitions cover a wider range of empirical phenomena than were encountered within the project area. For example, no house floors, house pits, or living floors were encountered. In most cases, features consisted of discrete, circular hearths defined by a cluster of FMR with or without directly associated burned/calcined bone, charcoal, and flaked lithics; in a few cases, features consisted of amorphous

concentrations and scatters of such remains. One example of a thin, burned/calcined bone midden was recorded. Few ambiguous cases were encountered during classification; however, biases are inherent in the sample. The first is that features are probably underrepresented in the sample. Large volumes of artifact-bearing deposits at many sites had been severely eroded prior to being recorded and investigated. At such sites, the artifacts formed an erosional lag deposit on the surface, and it is probable that an unknown number of features and components probably had been destroyed by both reservoir-induced erosion and natural erosional processes. Also, some components and their associated features have been buried and obscured by reservoir deposits and natural burial processes. A second sampling bias was introduced by the nonuniform volume of deposits excavated from any one site compared to any other. Finally, the sample is likely to be biased against early site components, which, compared to later components, are more deeply buried and therefore are more difficult to find and are less well preserved. As a result, early components are likely to be underrepresented.

Table 12.9 shows components of the fifty project area drawdown sites arrayed by site type and time period. For tested sites, time period is based on the combined chronological data of radiocarbon dating, time-sensitive tool types, and tephrochronology. For untested sites, period assignment is based solely on time-sensitive tool types. If a particular site indicated use spanning more than one time period, then it was counted in each time period. For example, if a specific case of site type 3 spanned Late-Middle and Late time periods, a site type 3 component was listed for each period. If a site lacked any temporal measures, it was omitted from the sample. Using this method, a total of 85 components was assignable to a time period.

The site type components shown in Table 12.9 are compared against the three expectations for site type derived from the land-use model. In the early periods (combined Paleoindian, Early, and Early-Middle), 28 components are listed, consisting of 0 site type 1, 11 site type 2, and 17 site type 3. In the late periods (combined Late-Middle and Late), 57 components are listed, consisting of 2 site type 1, 25 site type 2, and 30 site type 3. (1) The first expectation is that only site types 2 and 3 should be present in the early periods; this is supported by the data. (2) The second is that in the early periods, forager base camps (site type 2) would constitute the dominant site type, and that they are associated with fewer task locations (site type 3). This expectation is not supported in that there are more task locations than base camps. It is possible that this expectation was not warranted, and that more resource extraction and processing at task locations was conducted than had been expected. An alternate possibility is that forager base camps and task locations are not discriminated by the definitions, especially if groups were smaller and more mobile than anticipated. (3) The third is that in the late periods, a collector type of adaptation should be manifested by a relatively small number of residential sites (site type 1), a larger number of base camps (site type 2), and the largest number of task locations (site type 3). This expectation is supported by the data. In spite of the sample biases already noted, the overall trend shown in the data supports

the assertion of a change in land use from a forager type of system in the early prehistoric periods to a collector type of system in the later prehistoric periods.

Table 12.9 Feature Site Types by Prehistoric Time Period

	Forager			Collector		
Site Type	Paleo-indian	Early	Early-Middle	Late-Middle	Late	Total
1	0	0	0	1	1	2
2	0	2	9	11	14	36
3	1	1	15	18	12	47
Total	1	3	24	30	27	85

Richness of Tool Types

The richness of tool types shown in Table 12.10 is compared against the two expectations derived from the land-use model. (1) In the first, Early period components exhibit a higher tool-type richness at base camps than was expected, but low tool-type richness at task locations, as expected. (2) In the second, late period components exhibit a high tool-type richness at residential sites as expected; however, because the sample size is one, richness has little comparative significance. Base camps in late period components show the same relative differences compared to task locations as they do in early components. Furthermore, it is questionable if a tool-type difference of 1 (between Early and Late period base camps) is even significant. The data are equivocal with regard to the expectations, but they do suggest a trend, that from early to late time periods, tool type richness is higher in base camps than in task locations.

The absence of any significant differences in tool-type richness between base camps and task locations from early and late time periods may be important to understanding prehistoric adaptations to the project area. Specifically, it raises the possibility that regardless of time period and the organizational strategy practiced in other environments, a forager strategy is most adaptive for coping in extreme, mountainous settings. Such a strategy would be practiced by small, highly mobile groups carrying a simple, generalized tool kit. Although an abundance of one or a few key resources may be the focus of bands practicing a collector type of organization, factors such as the need to relocate quickly, to travel lightly, and to opportunistically exploit food and utilitarian resources on an encounter basis may favor a forager strategy.

Table 12.10 Richness of Component Tool Types by Time Period

Site Type	Early Periods (Forager)	Late Periods (Collector)
1	N/A	5
2	4.6	3.6
3	2.7	2.5
Average	3.4	3.0

Lithic Material Diversity

The diversity of lithic materials shown in Table 12.11 is compared against the two expectations derived from the land-use model. (1) In the first, a high rather than moderate lithic diversity is observed. The expected low diversity of task locations is observed. (2) In the second, the expected high lithic diversity is observed in one residential site, but due to small sample bias, this case has little comparative value. A moderate rather than the expected-low diversity is observed in base camps; and the expected low material diversity in task locations is observed.

The main difference between expectations and observations is a higher lithic diversity in both forager and collector base camps. In forager base camps, the higher-than-expected diversity probably reflects a large territory, greater residential mobility, or both. In collector base camps, lithic diversity seems to reflect the intensive use of the abundance of lithic materials locally available in the project area and immediately surrounding mountains. Whatever the relative contribution of the factors that control lithic diversity, the overall expected pattern of greater diversity of early base camps as compared with late base camps is supported by these data.

Table 12.11 Diversity of Component Lithic Material Types by Time Period

Site Type	Early Periods (Forager)	Late Periods (Collector)
1	N/A	5
2	5.9	4.4
3	3.2	3.3
Average	4.1	3.8

In conclusion to this section, trends towards broad-scale changes in land use during the Holocene seem to be supported by the data. Comparison of early prehistoric forager components with late prehistoric collector components shows slight differences

in site types and lithic material diversity. A general trend that was predicted and observed is for greater lithic diversity in forager base camps compared with collector base camps. However, another observed trend, not predicted, was the similarity in tool-type richness between forager and collector camps. This may reflect a tendency on the part of prehistoric bands, when inhabiting the mountainous interior, to resort to a foraging strategy as an accommodation to the extremes of mountainous environments.

The use here of project data to address questions of land-use change is necessarily exploratory, due mainly to the probable mixing of different age assemblages on the eroded site surfaces, which made it impossible to unambiguously assign artifact assemblages to chronological periods. In the future, more sensitive measures will be applied to a larger data base from intact deposits of known age. Finally, we recognize that the present body of quantitative data from the project area reflects the well-known problem related to the relationship between sample size and absolute diversity. Simply stated, the diversity of an archeological assemblage is a direct linear function of sample size (Thomas 1989; and others cited therein). Although cognizant of this problem, we accept the overall trends shown in the data because they rely on the relative rather than the absolute degree of diversity (Thomas 1989:86).

12.11 Regional Exchange Networks

As discussed in earlier sections of this report, several lithic raw material types found in the archeological sites, particularly obsidian, were derived from nonlocal sources located a great distance from the northern Cascade Range. The importance to Native people of regional exchange systems that provided them with access to commodities from distant sources is well-known. Although any item or material could have exchange value, and a wide variety of materials were exchanged, only materials such as stone and bone are typically preserved in archeological contexts, and it is only recently that archeologists have been able to chemically distinguish obsidian from separate source localities. For these reasons, archeologists in the Pacific Northwest have utilized obsidian as a tool to examine prehistoric exchange patterns (Carlson 1994; Galm 1994). However, such studies are in their infancy and it will be some time before region-wide models of exchange can be constructed. Nevertheless, archeological sites in the project area have the potential to contribute importantly in such studies as a consequence of their location in a broad mountain valley strategically positioned between the coast and the interior, which constitute two of the geographic supply centers for exchange products. Indeed, trans-Cascades trade routes are inferred by both Carlson (1994) to the north of the North Cascades, and by Galm (1994) to the south.

The occurrence of obsidian in project area sites that was derived from sources in today's Oregon indicates the great geographic extent of exchange and that the small bands of mountain people who used the project area prehistorically were participants in the larger trade network. Beyond this much, however, little more can be said about the role of exchange in the valley or its influence on the economies of local Native

populations until more study is completed. Possible avenues of investigation in future studies include the sourcing of other raw materials, including chert and chalcedony lithic types. Another approach could involve tracing the occurrence of raw materials from the project area, such as Hozomeen chert, to locations outside of the upper Skagit River Valley as a means of defining trade and travel routes. Yet another avenue might be to explore the use of the project area as a route for the movement of nonlithic resources, such as mountain goat wool or tobacco (for the latter, see the discussion of the significance of site 45WH303 in section 10).

12.12 General Summary and Conclusions

Overall, a major contribution of the project to the area's prehistory is the identification of an abundance of archeological sites that exceeded expectations based on the archeological and anthropological information available during the project's implementation. Prior to the survey, no comparable scale of archeological investigations had been conducted in such a remote, interior valley of the northern Cascades. Lacking any empirical data for the abundance of archeological sites in the mountainous interior, Mierendorf (1986) developed a baseline estimate of abundance by using empirical site densities from published reports of archeological surveys in different environments. This resulted in a conservative estimate of 3-5 archeological sites/km^2 for environments comparable to the project area. Subsequently, the survey's measured range of 1.3 to 32 sites/km^2, along with the striking preference of some landform types over others as measured by site density, constitute the first empirical demonstration for intensive prehistoric exploitation of the rugged interior. Also, the observed site densities in the Ross Lake drawdown zone (average of ca. 10/km^2) are an order of magnitude greater than in the immediately adjacent forested zone (ca. 1/km^2). These data provide a dramatic quantitative demonstration of the obscuring effects of dense vegetation and an explanation for the limited success experienced by conventional surveys in heavily forested environments. These quantitative differences and their absolute values will be useful in designing future archeological surveys in the region's forested and mountainous terrain. Just as important, these density values are generally applicable to an extensive area of the Cascade Range and beyond, and they could be used to develop estimates of prehistoric site abundance that suggest that many thousands of archeological sites remain to be identified in the forested terrain of Pacific Northwest mountains.

The project results also indicate the nearly complete domination of archeological assemblages by utilitarian artifacts reflecting economic activities associated with food and resource procurement, processing, and food consumption. With the exception of two soapstone (steatite) pipe bowl fragments, none of the artifacts relate to leisure or ceremonial activities. The frequent occurrence of expediently made tool forms and the absence of decorative elements further suggests a primary concern with function on the part of the tool users. Based on the senior author's observations of over 300 prehistoric sites in the northern Cascades, including project area sites, the impression is created that

a majority of the tool assemblages reflect two general subsistence needs: the processing of foods and other resources and the manufacture and maintenance of gear. It is suggested that a prime requirement of human use of the mountainous interior for almost any length of time is the ability to maintain both food-securing gear and personal-protection gear in good working order. A failure in any of these survival technologies could result in mortality through exposure or starvation. For prehistoric foragers the ability to maintain individual and group mobility across steep mountainous terrain was highly dependent on protective footwear; water-shedding and abrasion-resistant outer garments; and a repair assemblage that probably consisted of cutting, piercing, and sewing tools. In this environment, the need would have been ever-present to maintain and repair, for example, stitched seams of leather garments, particularly footwear; in winter, the fastenings and lashings of snow-shoes; the water-proofing of bows, bow strings, and sinew and adhesives that fastened stone tools to shafts and handles. As is readily apparent, it is probable that most of the necessary survival technologies involved the use of tools and other items made of organic materials, which are not preserved in project area sites. This fact reaffirms the future importance of lithic assemblage studies to understanding prehistoric human use of the mountainous interior.

When this archeological project was implemented, there existed no radiocarbon chronology for an archeological site or valley from the interior of the northern Cascades Range. Currently, the dates acquired from this project constitute the first prehistoric chronology of human use of this remote area. The radiocarbon dates confirm at least 8,000 radiocarbon years (8,400 calibrated years) of Native use of the upper Skagit River Valley. Over this span of time, however, there appear to have been three distinct periods of more or less intensive or frequent use. Based on the project area sample of 35 dates, the three modes of use are 4,000 BP, 1,500 BP, and 400 BP. The cultural significance of these modes is presently uncertain, but they are likely to reflect, at least in part, broad cultural trends that occurred across widespread areas of the Pacific Northwest at these same approximate times. Although the date of 7,600 BP from Desolation chert quarry (Mierendorf 1993a) is currently the oldest radiocarbon age from an archeological site in the northern Cascade Range, time-sensitive point styles suggest the likelihood that humans have been using the North Cascades for at least 10,000 years.

It is a well-known fact that numerous tephra layers blanket the Pacific Northwest landscape. Considering their ubiquity, few of these have been systematically collected or identified, which limits their usefulness as time-stratigraphic markers. Even so, the analysis of project area volcanic ashes demonstrates the widespread occurrence of at least three identifiable tephra units that serve as time-markers: Mt. Mazama O (ca. 6,800 BP), Mt. St. Helens Y (3,350-3,510 BP), and Mt. St. Helens W (505 BP). Other tephra units were also observed, but these cannot presently be identified to a source, although Mt. Baker and Glacier Peak are likely candidates. Identifiable tephra in the project area are useful for bracketing the age of archeological assemblages, for independent confirmation of radiocarbon dates, and for stratigraphically defining ancient, buried landform surfaces. However, difficulty was encountered in the analysis of uneven and discontinuous volcanic

ash layers from some soil horizons and from prehistoric cooking hearths, suggesting that identification of tephra from these contexts is less reliable than from better preserved, more discrete layers.

Before project implementation, no projectile chronology had been applied to, or developed for the northern Cascade Range, largely due to inadequate sample size. The comparison of the project sample of points to chronologies developed in the adjacent lowlands constitutes a preliminary attempt to assess the range of morphological types and the time periods they represent. This comparison has demonstrated general, overall agreement with the radiocarbon chronology. One main difference, however, is that several early projectile point series, dated in other regions to ca. 10,000 BP, are older than any radiocarbon dates from the project area. In the future, after a large enough sample of time-sensitive points has been recovered in direct association with radiocarbon-dated materials, it will be possible to establish a local chronology based on independent radiocarbon dates, rather than one based on stylistic and morphological comparisons. Another, perhaps more significant difference between the projectile point and radiocarbon chronologies, is the absence from archeological sites within the drawdown zone of any radiocarbon dates older than ca. 2,000 BP; the reason for this difference is presently uncertain, but may be due to the poor preservation of charcoal from early site components or to sampling error. Finally, the range of projectile point morphologies is greater than might have been expected, which may reflect travel through and concurrent use of the upper Skagit River Valley by Native groups from widespread areas surrounding the northern Cascade Range.

The project results have demonstrated a spatial correlation between the occurrence of archeological sites and specific soil characteristics. This is the same pattern that has been observed across a broad area of mid- to northern-latitude, closed-canopy, coniferous forests (Mierendorf 1993b). As expressed in the project area, a majority of the archeological sites have been found in the upper soil matrix, particularly in the soil B-horizon. Unfortunately within the drawdown zone, most of the artifact-bearing soil B-horizons are eroded, their upper portions having been truncated by reservoir-related shoreline erosion. For these reasons, a clear understanding of the genesis of B-horizons and the processes by which archeological remains are incorporated into them would be useful for interpreting the valley's prehistory. In an effort towards this goal, a general model has been offered that recognizes the polygenetic nature of soil B-horizons formed under the influence of closed-canopy, coniferous forests. The main contribution of this model is the recognition that on any given landform, the total soil volume contained within the B-horizon is likely to consist of a complex mixture of intact, mature soil material along with less intact, homogenized or disturbed soil material. It is furthermore proposed that the integrity of archeological remains is retained in intact B-horizons and it is lost within disturbed or homogenized portions of B-horizon. Presently, our ability to distinguish between these two subsets of the B-horizon are limited and there is a need to develop field criteria or analytic techniques for this purpose. If this can be done, it

will become possible to focus excavation efforts on the intact soil matrices and to avoid expending resources on disturbed matrices.

Prior to the mid-1980s, little if anything was known about the sources and means of acquiring stone raw materials used to make the tools found in archeological sites of the upper Skagit River Valley. Compared with other major northern Cascade Mountain valleys, it has now been shown that a great variety of lithic materials occur naturally in the upper Skagit Valley and that many of these were quarried and collected by the prehistoric inhabitants. This knowledge constitutes a significant advance in western Washington prehistory for it has contributed for the first time to the recognition of a unique and rich lithic province in a region of the state that traditionally has been characterized as impoverished in lithic raw materials. As a consequence, there is great potential for acquisition of new knowledge and discoveries through the investigation of research domains that are empirically dependent on lithic assemblages. Due to difficulties in classifying and distinguishing between some lithic materials in the project area, a petrographic analysis was performed on a small sample of artifacts and rock samples. The sample was chosen to assist in distinguishing between what were suspected to be different lithic raw material types that exhibited the same physical appearance. Results of the analysis indicates the difficulty of using macroscopic characteristics for distinguishing lithic specimens that are black, opaque, and fine-grained, particularly in the case of small, debitage-size items. For the project area, this means that distinguishing between basalts, metasediments (including argillite, siltstone, siliceous mudstone), and dacites can be troublesome unless quantitative analytic techniques are used. The ability to accurately identify lithic material types is necessary to correlate artifacts with the material source locations. Such correlations provide a partial basis for inferring the geographic extent of prehistoric territories and exchange routes, and other cultural phenomena.

Although obsidian was highly valued as a tool-making material by prehistoric peoples, its occurrence is relatively restricted in the Pacific Northwest. Since the early Holocene, obsidian has been traded and transported long distances from source locations to serve the needs of prehistoric populations. Through use of the x-ray fluorescence technique, the chemical signature of obsidian artifacts can be compared with the signature of obsidian outcrops, thus linking artifacts to a source location. X-ray fluorescence analysis of project area obsidians indicates that inhabitants of the valley had access to high quality obsidians from southern Oregon and northern California. This finding agrees with other such analyses from the Pacific Northwest. Consequently, data from the project area is now recognized as useful for addressing questions and problems related to region-wide prehistoric exchange systems. However, the presence of imported obsidians and other lithic raw materials from nonlocal sources constitutes only a part of the available data base useful for addressing exchange. It is likely that other lithic and nonlithic resources were also exchange commodities. Resources that were locally abundant were likely exported while many with sources in distant regions were imported. Some examples of resources from the project area having potential exchange value

include Hozomeen chert and its many varieties; mountain goat wool, meat, and horn; hides, dried meat, and antler; and parts of plants used for medicine, food, and fiber materials. Although it was suspected that obsidian sources in British Columbia would be represented in the project area artifact assemblages, this could not be demonstrated. Neither has obsidian (vitrophyre) been found in the project area that was derived from the single verified and characterized local source that has been reported in the North Cascades (Mierendorf and Skinner 1997). It is likely, however, that as yet unknown local sources exist that will someday be linked to the obsidian varieties (vitrophyre) recovered in project area sites that currently have no known source.

One of the distinctive stone-working technologies of the region involves the production and use of microblades, a distinctive technological category defined by thin, sharp, elongated, and parallel-sided flakes of stone. This technology was important in the early Holocene in the northern Northwest Coast and parts of Alaska, but its use and occurrence south of today's British Columbia is much more restricted. After initial discovery of a microblade core in the project area at 45WH79, this unique technology became recognized at archeological sites widespread across North Cascades National Park Service Complex. However, the functions of microblades is uncertain and their role in the subsistence strategies of the region's inhabitants is a matter of debate. Within the drawdown zone, microblades and microblade cores seem to be most closely correlated with sites radiocarbon dated between 1,400 and 1,900 BP, and the preferred material for their manufacture is Hozomeen chert.

A most important contribution of anthropological archeology is its ability to acquire facts and information about the long-term development or evolution of cultures. Within the project area, cultural developments spanned approximately the last 10,000 years, but except for the last 200, any new knowledge about this time span will be derived from archeology and supporting scientific studies. The potential contribution to knowledge is immense. Archeological research in the upper Skagit River Valley presents an opportunity to test and revise traditional models of Northwest Coast and Plateau cultural development. These models were proposed without the benefit of data from the mountains, and as a result, they reflect archeologists' perspectives developed while working in the lowlands on either side of the Cascades. But there is reason to believe that some aspects of the traditional models are deficient. Recent studies of foraging human groups have identified a wide range of organizational and adaptive options that resulted in a greater complexity of forager lifestyles than had been considered previously. Thus, for example, the ethnographic reference to Nlakápamux hunting parties wintering in the project area is in disagreement with the winter residential pattern as it is characterized for all of Washington west of the Cascade crest. However, the Nlakápamux are classified linguistically as Interior Salish and the project area shares environmental characteristics of both the coast and the interior. Here is where the culture area concept breaks down, for it draws a sharp boundary between interior and coast along the Cascade crest, and in this case, the boundary fails to explain an interior adaptation far to the west of the crest. Environmentally, the culture area concept also

fails to recognize the unique qualities of mountain climate and climate change, resource seasonality, and topographic constraints on human mobility and settlement that set the mountains apart from lowland landscapes on either side. As a result, the mountains are seen as a single, unified ecological entity, which they are not. Rather, the mountains are characterized by great ecological diversity, and any successful attempt to model human forager use of this landscape will require a knowledge of the resource structure. Currently, however, the spatial and temporal resource structure of the northern Cascades as a whole remains poorly known to the disciplines of anthropology and archeology, and likewise also the Holocene climatic history of the mountainous interior. This is likely to be true for most other portions of the Cascades, as well. The project area data base provides an unparalleled opportunity to investigate such issues. Using the limited test excavation data from project area sites, an attempt was made to measure archeological assemblage changes by using a model of forager evolution that proposes the existence of highly mobile groups in the first half of the Holocene (forager type) and less mobile, more logistically-organized foragers (collector type) in the last half of the Holocene. Although biases in the data and the small sample size limited the conclusiveness of the results, the overall trend supports the assertion of a change from a forager to a collector strategy during the Holocene. Equipped with a larger data base and a fully-developed research design, on-going studies in the project area will be able to rigorously test and refine research questions that attempt to follow the evolutionary paths of forager cultures across the span of the Holocene.

13. NATIONAL REGISTER SIGNIFICANCE OF ARCHEOLOGICAL SITES

13.1 Introduction

A total of 150 archeological sites is inventoried within the Ross Lake Archeological Project boundaries. Of these, 128 are directly affected by operation of the reservoir, and it is this subset of the total that was evaluated according to National Register significance criteria. Five sites recommended for evaluation were not tested because they remained submerged beneath the reservoir pool after they were recorded in 1988 and 1989. These sites will be evaluated for significance during implementation of an archeological site management plan covering the project area. The purpose of this section is to set forth the criteria for assessing significance of the 16 sites to be nominated to the National Register of Historic Places.

The database employed for this purpose has been presented in earlier sections of the report. Results of the archeological survey are presented in section 9, results of the test excavations of the 16 sites recommended as eligible to the National Register are documented in section 10, and excavation results of the 20 sites recommended as ineligible are documented in reported in section 11. For ease of reference, other sections of the report offering supporting documentation for this section are identified where appropriate.

13.2 National Register Significance of Sites

13.2.1 The National Register Criteria

One of the main objectives of the Ross Lake Archeological Project is to assess the significance and scientific value of archeological sites in the project area. In the North Cascades National Park Service Complex, as on other federal lands, this is done by assessing cultural resource properties against the National Register criteria. The National Park Service is responsible for protecting cultural resource sites on federal lands which are eligible for listing in the National Register of Historic Places under the provisions of the National Historic Preservation Act, as amended. With specific reference to Sections 106 and 110 of the Act, the National Park Service, and Seattle City Light under the Settlement Agreement, are required to take into account the effect of proposed actions on resources eligible for the National Register and to mitigate adverse impacts (National Historic Preservation Act of 1966 [Public Law 89-665] as amended by The National Historic Preservation Act Amendments of 1980 [Public Law 96-515] and The National Historic Preservation Act Amendments of 1992, Title XL [102-575]).

Implementing its legislative mandate, the U.S. Department of Interior has published guidelines for determining the eligibility of cultural resources (U.S. Department of the Interior 1990). The archeological properties discussed in this section

have been recommended for eligibility based on Criterion D of the National Register. None of these properties appear to qualify under Criteria A, B, or C. Under criterion D, each property must meet two requirements to qualify as eligible. First, it must contribute to or have the potential to contribute to our understanding of human prehistory. Second, the information contributed must be "considered 'important' when it is shown to have a significant bearing on a research design that addresses....current data gaps or alternative theories that challenge existing ones..." (U.S. Department of Interior 1990:21). These guidelines further ask that archeological information be evaluated within an appropriate historic context to determine its importance. It is the job of historic contexts to explicitly show the linkages between research issues on the one hand, and the important information embodied in specific cultural properties, on the other.

The purpose of a research design is to identify relevant theoretical models, to relate theoretical research questions to the data categories contained within cultural properties, and to identify the methodologies appropriate for retrieving the data. The research design guiding the Ross Lake Archeological Project has been stated in a series of agency documents. The two archeological MOAs established between SCL and NPS (cited in the introduction to this report) guided the research by providing a set of project-specific research goals and strategies. Many of the research problems and methodologies addressed in the MOAs were derived from an earlier document (Mierendorf 1986) which provided a regional research design and overview for all lands within the park complex. In addition, sections 7, 8, and 12 of this report summarize background information related to the project's overall research approach. In the following section, this research framework is linked with the archeological properties through the development of historic contexts.

13.2.2 The Upper Skagit River Valley Archeological District

For the purpose of assessing the significance of the archeological resources within the project area, they are considered here to comprise a National Register district. A "district" historic property category is appropriate where there is a related grouping of archeological properties within a definable geographic area distinguishable from surrounding properties (U.S. Department of Interior 1990:4-6). The components of the Upper Skagit River Valley Archeological District are functionally and historically related through prehistoric patterns and themes that are defined in this report by eight separate historic contexts. This is in keeping with the National Register guidelines, which note that specific properties can be significant within more than one historic context and the guidelines encourage the identification of these contexts. This has been done below. The approximate boundaries of this archeological district extend from just north of Ross Dam on the south, to the U.S.A.-Canada border on the north. The eastern and western boundaries of this district follow the 1,620 (493.9 m) contour line.

13.3 Components of the Upper Skagit River Valley Archeological District

A district consists of a variety of cultural resource types that together define a unified entity. In the Ross Lake vicinity, archeological resources are unified by functional, cultural, and geographic associations. The National Register guidelines (U.S. Department of Interior 1990:5-6) employ several different words synonymously to refer to the archeological resources, including "component", "property", "feature", and "resource". For clarification, the use of these terms in the remainder of this report will be consistent with the guidelines, with one exception. The word "feature" is not used synonymously with the others; rather, it is used here in its archeological sense, to refer to a type of archeological remain that consists of a physical association or clustering of related materials. The most common archeological feature type in the project area, for example, is "hearth", which typically consists of charcoal, fire-modified rocks arranged in a regular pattern, with associated chipped stone artifacts and burned animal (food) bones. A "feature" in this sense can be observed, described, and excavated, but unlike artifacts, it usually cannot be collected or removed intact.

The components (resources or properties) that comprise the Upper Skagit River Valley Archeological District consist of sites, features, structures, and objects. Because these components are within defined site boundaries, they are not listed separately in the table below. Rather, Table 13.1 lists the components as the 16 archeological sites that are recommended as contributing to the National Register eligibility of the district according to criterion D. Many other components within the district do not contribute to its significance and these are not addressed here.

Table 13.1 Archeological Sites Contributing to District Eligibility

Field #	Trinomial #	Site Name
48	45WH224	Desolation Chert Quarry
54	45WH234	East Landing #1
57	45WH237	Casino Bay #1
59	45WH239	Casino Bay #3
61	45WH241	Casino Bay #4
73	45WH253	North Tenmile Island #2
75	45WH255	North Tenmile Island #3
82	45WH262	Devil's Junction Cr. #2
88	45WH268	North Lightning Cr. #4
95	45WH275	North Lightning Cr. #7
103	45WH283	Boundary Bay #4
106	45WH286	North Lightning Cr. #10
120	45WH300	Perry Point #2
123	45WH303	Hozomeen Cr. #5
197	45WH473	Cat Island #10
214	45WH496	Boundary Bay #18
	Total	16

13.4 Historic Contexts, Site Types, and Data Categories

The subsections that follow constitute a listing and explanation of the historic contexts that have been identified for the project area. These eight historic contexts are defined and discussed in sections 13.5.1. through 13.5.8. Table 13.2 is organized as a matrix that connects historic contexts with the archeological components and the data categories within them. The archeological component types are used here as functional categories that help to link patterns in prehistoric land use (historic contexts) with research issues. Data categories are specific, empirical characteristics of, or associated with, archeological components. Data categories are usually retrieved through scientific archeological techniques and methodologies as the raw data and as such, they are often quantifiable. A description of each historic context follows Table 13.1 below.

Table 13.2 Matrix of Site Significance by Historic Contexts and Property Types

HISTORIC CONTEXTS AND PROPERTY TYPES	ARCHEOLOGICAL SITES															
	224	234	237	239	241	253	255	262	268	275	283	286	300	303	473	496
Subsistence																
1. Collection																
2. Processing		●			●		●		●				●	●	●	
3. Storage																
4. Midden					●											
Lithic Procurement																
5. Quarry	●															
6. Procurement	●				●											
Settlement																
7. Residential Site													●			
8. Base Camp		●			●							●		●	●	
9. Task Location	●		●	●		●	●	●	●	●	●					●
Stone Tool Technologies																
10. Biface	●		●			●		●								●
11. Flake			●					●			●					
12. Microblade					●	●				●	●	●				
13. Quartz Crystal											●					
14. Cobble								●			●					
15. Tool					●											
16. Groundstone	●						●				●	●		●		
Exchange																
17. Exotic	●					●		●					●	●		
18. Exchange Route																
Chronology																
19. Chronometric Date	●		●	●	●	●	●	●	●		●		●	●	●	
20. Tephra Date		●		●						●			●	●		●
21. Stratigraphic Date	●	●		●						●			●	●		
22. Typological Date						●		●			●	●	●	●		●
23. Relative Date		●		●												
Past Climates																
24. Plant Remains	●		●	●	●	●	●	●	●		●		●	●	●	
25. Animal Remains		●			●						●		●	●	●	
26. Geologic Remains	●			●				●	●	●	●			●		
Funerary Patterns																
27. Human Bones																
28. Associated Remains																
29. Funerary Objects																

13.4.1 Prehistoric Subsistence in the Upper Skagit River Valley

This historic context addresses the archeological components associated with the acquisition, preparation, and use of plant and animal materials for food, medicine, and the manufacture of utilitarian items. Archeological components related to this historic context reflect subsistence functions that include food and resource procurement; food and resource processing, consumption, and use; food and resource storage; and disposal of food and resource remains.

Subsistence-related components include sites that were used to acquire plant and animal resources. Examples of sites include hunting or fishing stations; examples of features include hunting blinds or bark-stripped trees. Examples of associated artifacts include projectile points or a distinctive assemblage of objects devoted to hunting, fishing, or plant gathering activities. Residue analysis (protein or DNA) or phytolith analysis (plant opal residues) of tools can provide data categories with varying taxonomic specificity about the plants and animals procured. It is possible that residue analysis of soapstone pipe bowls from the project area, for example, can be used to determine the kinds of plants used for tobacco. Blood residue analysis of projectile points can identify the family, genus, or species of game animals hunted. Any archeological property that is associated with gathering, collection, or other acquisition techniques for animal or plant resources or contains data categories that clearly reflect a specified resource's procurement is functionally categorized as a "collection" component.

Activities related to processing, consumption, and use address a second subsistence category of archeological components. Of high research value in the upper Skagit River Valley are discrete and intact hearth features that provide a wealth of data regarding subsistence activities. These data include charcoal for radiocarbon dates and macrofloral analysis for identification of plant taxa living in the area and used for food. Burned and calcined bone remains from such features permit identification of local animal taxa that were used for food, and they provide data for the reconstruction of food processing techniques, such as marrow and bone grease extraction. The color variations and conditions of bones from hearths appear to be related to the cooking temperature and methods of cooking (McCutcheon 1992). The fracture patterns of rocks used in cooking features are indicative of food preparation techniques, such as stone boiling in a container or pit baking in the ground. The research potential of processing and consumption-related features is extremely high due to recent advances in the ability of archeologists to detect and identify plant and animal protein, DNA, blood, and other organic residues that can be recovered from artifact surfaces (cf. Newman and Julig 1989). Archeological components related to processing retain data categories indicating butchering, cooking, boiling, and consumption of animal or plant resources, or the shaping of wood, plant fibers, bone, or antler, or other data indicating a specified resource's processing. These components are assignable to "processing" as a functional category.

Animal and plant resource storage is an important subsistence activity that currently lacks clearly assignable archeological components in the Ross Lake area, but not in the North Cascades. This activity may be manifested by rock cairn and rock pit features hollowed out of scree and talus, but these have not yet been tested to confirm their artifact content or the presence of other data categories. Many other storage facilities are likely to have been used, also. Data categories potentially embodied in storage facilities relate directly to how native peoples transported themselves and subsistence resources to encampments and to how storage practices evolved, beginning with their apparent absence in the early prehistoric periods and leading up to the heavy reliance placed on them in the later middle and late prehistoric periods (Schalk and Cleveland 1983). The functional category "storage" is assigned to these components.

Food discard ("garbage disposal" in contemporary nomenclature) is a subsistence activity related to the disposal of resources, including food and other remains, resulting in their accumulation as recognizable deposits or features. In the Ross Lake area, this property type is clearly manifested in at least one archeological component. This consists of a thin, midden-like layer of burned and calcined bone fragments mixed with charcoal at site 45WH241. This feature represents the discarded bone refuse which remains after splitting bone for marrow extraction, and possibly the extraction of grease by boiling the bone fragments, which appears to have taken place on-site. Hearth features from the project area may also reflect this same pattern, but this is not yet clearly demonstrated. Typically, data categories embodied within midden components address a variety of subsistence questions regarding not only the use, processing, discard, and accumulation of plant and animal remains, but also many other aspects of culture. Such components are assigned to the functional category "midden".

Archeological components related to animal and plant use for subsistence in the upper Skagit River Valley have much information to contribute to an understanding of local and regional prehistory. The kinds of information such properties are likely to yield and the research problems and questions they are likely to address are listed below.

1. What is the role of animal and plant procurement in the organization of settlement and subsistence in hunting-gathering-fishing cultures of the upper Skagit River Valley? We can break this question into two parts:

    a. How do hunting-gathering-fishing bands organize to make such resources available to those who use them?

    b. How do we conceptualize the organization of technology and labor for the acquisition, processing, consumption or use, and discard of animal and plant resources?

2. To what extent did the prehistoric populations using the project area rely on subsistence resources that they brought with them from areas outside of the upper Skagit River Valley?

3. What does our understanding of prehistoric adaptations to the mountains tell us about the evolution of Northwest Coast and Plateau land-use patterns and cultural evolution? More detailed aspects of this question include:

   a. Were populations that lived in the sparsely populated mountains affected by cultural processes and changes occurring in the more densely populated lowlands? Are adaptations to "marginal" environments sensitive indicators of cultural changes occurring in the lowlands?

   b. Is there a demand placed on animal and plant resources in mountainous areas, such as the upper Skagit River Valley, in proportion to the size of lowland populations? In proportion to competition between lowland populations? Or is it due to the dispersion of populations away from overpopulated areas?

   c. With the onset of intensified land use in the middle and late Holocene (the geologic time period following the disappearance of the Cordilleran and Laurentide ice sheets is called the Holocene and encompasses the last ca. 10,000 years), how did animal and plant resource procurement and use patterns change? What was the role and importance of storage practices in this change?

   d. Were there specialized strategies or logistic adaptations that were developed in order to cope with the greater constraints placed on the transportation of resources in rugged montane landscapes?

4. What can the geographic distribution of archeological sites with animal and plant materials tell us about exchange systems in the Northwest Coast and Plateau culture areas?

   a. Can we trace the source of exchange commodities or the groups participating in exchange?

   b. Can we trace trade routes or corridors between trading partners?

   c. What animal or plant materials from the project area were valued for trade purposes? Was mountain goat wool one of these? Were other alpine and subalpine resources valued for exchange purposes?

5. How do changing patterns in animal and plant resource procurement relate to broad regional cultural sequences?

   a. What is the cultural significance of temporal differences in the presence and frequency of procurement sites?

   b. Do changes in procurement patterns over time relate to changes in the organization of subsistence that were triggered by shifts in climate?

   c. Do time periods reflecting more intensive exploitation of the valley, perhaps beginning 5,000 years ago and 2,000 years ago, relate to the initial phase of a new (Salishan) tradition, as has been proposed by Stryd and Rousseau (1996) and others?

6. What is the role of specific artifact classes in the subsistence activities of the project area's inhabitants? Does a functional analysis of artifacts reveal any changes in subsistence activities from assemblages of different time periods?

7. Do the inferred or reconstructed subsistence patterns of the prehistoric inhabitants of the upper Skagit River Valley reflect aspects of complexity in forager adaptations not reflected in forager groups from non-mountainous environments of the Pacific Northwest?

13.4.2 Lithic Resource Procurement in the Upper Skagit River Valley

This historic context is also an aspect of subsistence, but it is defined separately in order to more specifically designate the set of activities, embodied in archeological sites and features, that center around the acquisition of stone materials used for the manufacture of tools. Due to the abundance of lithic resources in the project area, this is an important historic context for assessing archeological components. Stone materials having qualities that make them suitable for use as tools are not evenly distributed across the Pacific Northwest landscape. Some areas of eastern Washington and Oregon are known for their abundant tool-quality stone, but western Washington is considered impoverished by comparison. Prior to 1987, there was no strong empirical evidence that stone procurement and tool manufacture was an important prehistoric activity in the North Cascades. Following the discovery of a major chert quarry along Ross Lake (currently the largest one reported for western Washington and the Cascades), it was demonstrated that some lithic raw materials from the North Cascades were intensively utilized by native populations for at least the last eight thousand years (Mierendorf 1993a). Today, the Ross Lake vicinity comprises one of the best known lithic landscapes exploited by Native peoples in the interior of the northern Cascades.

Two basic techniques were used to acquire stone raw materials from their source. The first was to quarry it directly from bedrock formations or large boulders. Archeological site 45WH224, the Desolation chert quarry, is an example of such a quarry. A wide range of other raw materials was available in the North Cascades for quarrying, including soapstone, chalcedony, jasper, metasediment, and vitrophyre. If an archeological component (a site, feature, structure, or object) can be related to stone quarrying from evidence of removal directly from bedrock, often indicated by the presence of hammer marks, bashed bedrock corners, and flake scars on bedrock surfaces, then the functional term "quarry" can be used to describe the component.

The other technique was to collect naturally-occurring fragments of stone as they were found in the environment. Collection localities usually occur where natural processes make lithic raw materials available at the ground surface, including on river gravel bars, talus slopes, alluvial fans, or glacial gravels. Data categories indicative of the source of raw materials can be found on artifacts in the form of river-rolled cortex, angularity of shape, weathering in the form of iron oxide coats, lichen-covered surfaces, or adhesions of weathered soil. In some stone procurement sites, excavations consisting of pits, trenches, or adits visible on the ground surface or in subsurface stratigraphy, indicate that collection strategies were labor-intensive. If an archeological component can be related to collection of stone by evidence for removal from alluvial fans, stream gravels, talus, glacial deposits, or by evidence for extraction from pits, adits, or trenches, and if it reflects a clear pattern of procurement, then it can be assigned to the functional category "procurement".

In describing quarry and procurement functional types, it is important that the raw material type be empirically and accurately characterized. A complete characterization includes description of physical properties, petrological analysis, and chemical analysis. This degree of characterization may not be required in all instances, such as in the case of stone material that is sufficiently distinctive in appearance and geographic occurrence that there is no doubt as to its source and recognition. However, characterization should be detailed enough to avoid the potential confusion inherent in attempting to identify and source the great variety of stone materials that is typically encountered in archeological assemblages.

Methods of procurement may be reflected in artifacts that served as tools for quarrying or procuring stone material. For example, of the many hammerstones scattered across 45WH224 and buried in the quarry deposits, the "large" size category was most often used as percussion tools to remove fragments from bedrock and large nodules. At many large procurement sites, there are likely to be important relationships between the means of procuring stone and the variety of types and the number of extraction-related tools. Detailed analysis of hammerstone wear patterns and other physical attributes are data categories that can potentially contribute as much to understanding reduction technologies as can analysis of the worked stone itself.

Archeological components related to lithic resource procurement in the upper Skagit River Valley contribute new information to our understanding of local and regional prehistory. The kinds of information such properties are likely to yield, and the problems and questions they are likely to address, are listed below.

1. What is the role of stone procurement in the organization of settlement and subsistence in hunting-gathering-fishing cultures of the northern Cascade Range? We can break this issue down into two parts:

    a. How do hunting-gathering-fishing bands organize to make lithic raw materials available to those who use them?

    b. How do we conceptualize the organization of technology and labor for the production of lithic tools?

    c. What are the conditions under which stone procurement is embedded in other subsistence pursuits? Or is it conducted as a distinct pursuit in its own right?

2. How can artifact-to-source correlations of lithic raw materials be used to define the home range or habitually-used territory of hunting-gathering-fishing populations?

3. What does our understanding of prehistoric adaptations to the upper Skagit River Valley tell us about the evolution of Northwest Coast and Plateau land-use patterns and cultural evolution? More detailed aspects of this question include:

    a. Are adaptations to "marginal" environments sensitive monitors of cultural processes and changes occurring in the more densely populated lowlands?

    b. Is there a demand placed on lithic resources in mountainous areas, such as the project area, in proportion to the size of lowland populations? In proportion to competition between lowland populations? Or is it due to the dispersion of populations away from overpopulated areas?

    c. With the onset of intensification of land use in the middle and late Holocene, how did lithic resource procurement and use patterns change?

4. What can the geographic distribution of archeological sites with lithic materials from known sources tell us about exchange systems in the Northwest Coast and Plateau culture areas?

a. Can we trace trade routes or corridors between trading partners?

b. Which lithic raw material types in the Pacific Northwest region can serve as "indicator materials?" Is Hozomeen chert one of these and are there others from the upper Skagit River Valley?

5. What are the boundaries and what is the range of stone materials available within the various lithic landscapes of Washington State and the Northwest region, beginning with the upper Skagit River Valley?

   a. At what spatial or geographic scales should lithic landscapes be defined and described in order to be relevant to understanding prehistoric Pacific Northwest land-use systems?

   b. Can distance-decay curves be constructed for stone materials of known source, and what do these tell us about cultural dispersion and use of materials?

6. What are the acceptable standards for lithic raw material characterization?

   a. What techniques and data categories are available for characterization of lithic raw materials?

   b. What techniques of lithic raw material characterization are needed to do artifact-to-source correlations in the Northwest lithic landscapes?

7. How do changing patterns in chert procurement and use relate to broad, regional cultural sequences?

   a. What is the cultural significance of temporal differences in the use of quarry and procurement sites?

   b. Do temporal differences relate to cultural changes in the organization of subsistence, such as could be triggered by shifts in climate?

   c. Does the apparent intensive exploitation of 45WH224 5,000 to 3,500 years ago relate to the initial phase of a new (Salishan) tradition, as proposed by Stryd and Rousseau (1996) and others?

13.4.3 Prehistoric Settlement Patterns in the Upper Skagit River Valley

This historic context relates to the archeological components that manifest the nature and distribution of prehistoric settlements and habitations occupied during seasonal subsistence migrations. Patterning in the distribution of different functional site types is a result of how cultures are organized socially and economically. The interrelationships between the different kinds of functional settlement types and their locations are tied to the environment, subsistence needs of the culture or group, and intergroup relationships. The large inventory of archeological sites in the Ross Lake area and the extensive data base recovered from them constitute an unprecedented opportunity to examine the settlement patterns in an interior valley of the North Cascades. In no other valley of the North Cascades is there an equivalent body of data related to the settlement practices of interior, mountain-dwelling groups that spans most of the Holocene. The three functional settlement types defined for the project area are residential camp, base camp, and task location. When combined with the subsistence and lithic resource procurement types (sections 13.5.1 and 13.5.2), a wide range of functional site categories can be recognized.

A few archeological sites in the project area appear to have been occupied on a recurrent basis, and although it is difficult to specify with any precision, the duration of each occupation probably spanned one or more months. The observation that locally available lithic raw material types numerically dominate exotic materials in assemblages may indicate more than just transitory or ephemeral use of the valley. The artifact assemblages from longer-occupation sites exhibit a wide range of morphological and functional tool types, lithic raw material types, stone tool technologies, and food processing features. This diversity of archeological remains is a consequence of the range of subsistence activities conducted at residential sites. These activities include food processing, consumption, discard, and storage, and the manufacture and repair of stone, wood, bone, antler, and fiber tools and gear. Such sites are more likely to contain midden deposits. Residential sites were also the locus of a wide range of daily and seasonal social and ceremonial activities that tend to be under-represented in archeological assemblages. It is likely that some form of house structure or shelter was erected at such residential sites, but any archeological evidence of these has not been recognized to date. These sites served as the "headquarters" or the seasonal base of operations for those bands and groups of people inhabiting the upper Skagit River Valley for extended periods of time. Archeological sites displaying most of the characteristics described above can be assigned to the "residential site" functional type.

Other archeological components reflect temporary, short-term use of a given area. Data categories within the artifact assemblages from these exhibit relatively few tool types, lithic raw material types, and stone tool technologies. Exotic lithic raw materials may be more diverse and may occur in higher proportions relative to residential sites. Food processing features, such as cooking hearths, are generally few and not well-preserved, or nonexistent. Fire-modified rocks occur in low concentrations and are

loosely scattered. This pattern of archeological remains is consistent with the narrow range of subsistence activities that was conducted at base camps occupied for a short duration. Such sites were occupied for periods of time spanning a few days to a few weeks by groups traveling through the valley on their way to or from residential sites, or by smaller groups who used a locality for hunting or other resource procurement or travel-related purposes. The archeological assemblages reflect limited food processing or consumption, and the repair of stone, wood, bone, antler, and fiber tools and gear. In addition, the assemblages may contain relatively high frequencies of certain tools and morphological types reflecting the more specialized activities or functions that the site served. Absent at such sites is any manifestation of a wide range of daily and seasonal social and ceremonial activities. Only temporary shelters were likely to have been erected at base camps, and archeological evidence of their presence is difficult to recognize. Archeological sites and features displaying this association of characteristics are assignable to the "base camp" functional category.

Archeological resources in the project area reflect a wide range of specialized activities associated with the subsistence tasks of groups that occupied or traveled through the valley. Archeological components mark the locations of specific subsistence tasks, such as the hunting and butchering of mountain goats, deer, or elk; fishing and drying of trout and salmon; or the procurement of flakeable stone. Because such sites reflect specific tasks or functions, the artifact assemblages are restricted to very few tool, raw material, and technological types. It is common for one or a few tool or morphological types to dominate the artifact assemblage as a reflection of a specific use or activity. A corollary is that task-specific sites exhibit a high degree of dissimilarity when compared to other individual members of the group (Binford 1980). For example, a temporary storage facility or cache may be manifested by a rock cairn or rock filled pit with no other associated artifacts, while a hunting blind may be manifested by a lithic scatter consisting of broken arrow points in association with pressure flakes created during the sharpening and repairing of points. Features representing food consumption at such sites are usually absent and fire-modified rocks are rare. Occupation duration is on the order of a day or less, and a large number of these property types in a restricted area may reflect the close proximity of a residential site or base camp. Archeological components exhibiting this pattern of characteristics are assignable to the "task location" functional type.

Archeological components manifesting settlement patterns in the upper Skagit River Valley have new information to contribute to our understanding of local and regional prehistory. The kinds of information such properties are likely to yield and the problems and questions they are likely to address are listed below.

1. What settlement patterns can be recognized from the distribution of archeological components in the upper Skagit River Valley?

a. How were the hunting-gathering-fishing bands who utilized the valley organized for the movement and use of people and resources?

b. What is the spatial relationship of the functionally differentiated, but interrelated, archeological components in the valley?

c. Do functionally differentiated components exhibit different spatial patterning according to time period?

2. What does our understanding of prehistoric settlement patterns for the interior of the mountains tell us about the evolution of Northwest Coast and Plateau land use and cultural evolution? How do the settlement patterns identified in the upper Skagit River Valley compare with the various models of culture change and process proposed for the Northwest?

a. Are adaptations to "marginal" environments sensitive monitors of cultural processes and changes occurring in the more densely populated lowlands?

b. Do settlement models proposed for lowland or riverine environments have any utility for understanding montane settlement patterns? Do conceptions of "upland," most often undefined and based on perceptions from a lowland perspective, have utility for studying mountain adaptations?

c. Was there an influence on settlement patterns in the mountains, in this case the upper Skagit River Valley, in proportion to the size of lowland populations? In proportion to competition between lowland populations? Or is it due to the dispersion of populations away from overpopulated areas?

d. With the onset of intensified land use in the middle and late Holocene, was there a detectable change in settlement patterns compared to earlier time periods?

e. If there was a shift in the mid-Holocene from a mobile, foraging pattern towards a less mobile, collecting pattern, as some have hypothesized for other subregions of the Northwest, is the shift reflected in a greater frequency of task locations and fewer residential sites, as might be expected?

f. Was there a change in settlement pattern related to a hypothesized movement of populations throughout the West during the "Altithermal," from droughty intermontane valleys and basins to more hospitable upland

locations in major cordillera, including the Cascades (Benedict and Olson 1978)?

g. Is there, as some have suggested (Nelson 1969; Stryd and Rousseau 1996), a shift in settlement pattern in the North Cascades relatable to an expansion of people having a genetic relationship with Salishan-speaking groups of the ethnohistoric period?

h. Is there a winter residential pattern that can be identified in the archeological data base acquired from the project area? What are the appropriate analytic methodologies and data categories necessary for recognizing winter occupations? How do winter camps and residential sites differ from those occupied during summer?

3. What can the spatial distribution of archeological components in the upper Skagit River Valley tell us about exchange systems in the Northwest Coast and Plateau culture areas?

a. Can we trace trade routes or corridors between trading partners?

b. Did the extremes of mountain physiography constrain such activity in ways that allow us to predict the locations of trade and travel routes?

c. Was the upper Skagit River Valley one of the trade and travel routes through the North Cascades? What geographic exchange areas did it connect?

4. How do changing settlement patterns relate to broad, regional cultural sequences?

a. What is the cultural significance of temporal differences in settlement patterns?

b. Do settlement pattern changes correspond to archeological cultural types that have been recognized in regions adjacent to the North Cascades?

5. Is there any validity to the notion that severity of physiography or other environmental characteristics creates a "marginal" environment for human habitation?

a. What constraints does the mountainous landscape of the Ross Lake area place on settlement strategies adopted by bands and groups?

b. Were there settlements, however small, that functioned as outposts or supply centers by virtue of their location in the interior or along travel routes, that served the needs of transient groups traveling across the mountains?

c. Can today's concept of wilderness be meaningfully applied to prehistoric use of the upper Skagit River Valley and North Cascades?

6. Do the inferred or reconstructed settlement patterns of the prehistoric inhabitants of the upper Skagit River Valley reflect aspects of complexity in forager adaptations not reflected in forager groups from non-mountainous environments of the Pacific Northwest?

7. To what extent did diseases introduced in the historic period from the Old World contribute to the depopulation of the northern Cascade Range? Is there any evidence that such diseases began affecting Pacific Northwest native populations earlier than about A.D. 1780?

13.4.4 Prehistoric Stone Tool Technologies in the Upper Skagit River Valley

This historic context relates to the techniques used to manufacture, utilize, and maintain stone tools. Although many of these techniques were used prehistorically over widespread areas, they were all used at one time or another in the project area. A technology is identified by the manner in which the raw material is shaped or by the finished product itself, quartz crystal technology being the exceptional case (based on material type) due to the distinctive qualities of this material. Individual archeological components often reflect more than one technology. This does not automatically or necessarily impart significance; however, if the assemblage constitutes an *outstanding example or pattern* of the intensive reliance on a technology, or if it offers a significant data base for the study and explication of a particular technology, then this knowledge may contribute to the property's National Register significance. For example, nearly all lithic assemblages from the project area are characterized by the presence of discarded stone-working debris that resulted from more than one technology, and these might not contribute new and important information to prehistory. By comparison, the lithic assemblage from 45WH262 constitutes the best example in the project area of the reduction of Hozomeen chert into intermediate stage bifaces and it, therefore, contributes new and important information about prehistoric biface manufacturing. The list of reduction technologies so far recognized for the project area is defined by biface production, flake production, bi-polar reduction, microblade technology, quartz crystal technology, cobble reduction, tool production and maintenance, and finally, grinding, pecking, and carving technologies.

Making bifaces was an important prehistoric subsistence activity conducted in the upper Skagit River Valley. The abundance of flakeable raw materials resulted in the use

of technologies to convert raw materials into bifacial tools. Comparison of the early biface stages represented at a large quarry (45WH224) with the intermediate biface stages represented at a manufacturing workshop (45WH262) suggests that different segments of the production sequence were conducted in different locations in the valley. Site 45WH262, which exhibits the valley's largest assemblage of Hozomeen chert biface reduction flakes and bifaces, constitutes a biface manufacturing site that contributes important and new information about this technology in the upper Skagit Rive Valley. A majority of lithic scatters in the project area reveal some evidence of biface use, repair, or manufacture, but that does not in and of itself necessitate inclusion of the component in this technological category. However, if an archeological component contains data categories reflecting biface manufacturing techniques, or the mass production of bifaces, or patterns in the uses of bifaces, then it is categorized as a biface technology component.

Evidence for flake production using bi-polar and other techniques are common in lithic assemblages and were important to the prehistoric inhabitants of the valley. Nearly every archeological component containing chipped stone shows evidence of flake production. In spite of this, little is known about flake production technologies and their role in subsistence. There are likely to be important archeological components in the project area pertaining to the use of these technologies. An archeological component that clearly relates to patterns in flake production, including bipolar techniques, or to the mass production of flakes, or to flake tool production, or the functions and uses of flakes and bipolar products can be classified as a flake technology component.

Microblade technology, the preparation of microblade cores for the production of microblades and microblade tools, and their functions and uses has been an important research topic of archeologists in the Pacific Northwest for the last few decades. The use of this technology and its meaning as a cultural pattern are poorly understood. Following the recognition that microblade technology was represented in archeological components in the upper Skagit River Valley (Mierendorf and Thomson 1986), a number of sites with microblade remains have been found within the project area. Most microblade cores and blades are manufactured of Hozomeen chert and other locally available lithic materials. Within the project area, sites 45WH283 and 45WH286 embody this technology to a greater extent than any others. Both contain microblades and microcores in undisturbed deposits and have a high likelihood of contributing new information about this technology. An archeological resource that is clearly related to microblade manufacturing techniques, to microblade tools and their uses, or to the artifact types in the assemblages associated with them can be classified as microblade component.

A poorly known, but distinctive, technology relates to the use of quartz crystal as a raw material. It is manifested by data categories including flakes, tools, cores, blades, and pieces (fragmentary and complete) of quartz crystals. Unlike other flakeable lithic materials, quartz crystal is anisotropic (it has different physical properties along the

different crystal axes), resulting in a different fracture pattern when flaking. Although little is known about its use, this distinctive lithic material was used in the upper Skagit River Valley and beyond to make microblade cores, microblades, flakes, and *pièces esquillées* (wedge-shaped flaked tools). Although never abundant in archeological sites in the project area, a few components appear to contain a preponderance of the known quartz crystal artifacts. The source of the quartz crystals is unknown, but a few sources have been reported in the North Cascades outside of the project area and it is possible that others may be located in the upper Skagit River Valley. Quartz crystal artifacts have been reported from widespread areas of the Pacific Northwest, consequently, archeological sites containing data categories related to this technology could potentially contribute important new information. An archeological resource that can be clearly related to quartz crystal source areas and its quarrying or procurement, to reduction techniques, or to the uses and functions of quartz crystal can be classified as a quartz crystal technology component.

Reduction of river cobbles by flaking into tools is a common activity represented at archeological resources throughout the Skagit Valley. This technology was once considered indicative of early period sites only, but is now known to have been used in all time periods. The technology seems to have served a variety of purposes, including producing flakes that were fashioned into carefully formed tools such as knives and points, or into simple, expedient flake tools that were discarded immediately after use. The cobble core from which the flakes were removed was also used as a tool, although there are divergent ideas as to how these tools functioned and what resources were processed with them. It is partially on the basis of a large assemblage of flaked cobbles that Grabert and Pint (1978) assigned site 45WH79 to an early time period and considered it to possess regional importance for the study of early cultures of the Pacific Northwest. Site 45WH283 contains a high density of flaking debris representing cobble reduction techniques, tools, and associated non-cobble tools from intact deposits in a radiocarbon dated context. Recognition and study of the flaked cobble assemblages is necessary for understanding prehistoric subsistence in the upper Skagit River Valley during all time periods. An archeological resource that is clearly related to patterns in the procurement, reduction techniques, uses, and functions of cobble flakes and tools can be classified as a cobble technology component.

Finished stone tool manufacture, repair, and maintenance were required to support a variety of subsistence activities for groups living in or traveling through the mountains. These technologies centered around the final shaping of stone tools, including the straightening, sharpening, and refurbishing of cutting, scraping, or piercing edges, on new or used tools; the manufacture of notches for hafting; the tightening of haft bindings; the straightening of bent shafts and the replacement of broken ones with new ones. Many of the tools needed for these purposes were made of organic materials; many were also made of stone. These latter are represented in archeological assemblages by morphological categories of flaking debris, including pressure flakes, notching flakes, and broken or discarded tools. The recognition that this technology is manifested in a

great variety of data categories embodied within finished tools indicates a high probability to contribute new information to understanding the adaptive strategies of the early inhabitants of the project area. An archeological resource that can be clearly related to patterns of manufacture, maintenance, and repair of tools and utilitarian items can be classified as a tool technology component.

Grinding, pecking, abrading, and carving techniques are distinct from the variety of chipped stone technologies discussed to this point. They constitute the techniques that were used prehistorically to shape lithic materials into tools that cannot be shaped by flaking. These techniques were not any less important than flaking technologies. Rather, they were the techniques used to manufacture other important tools, such as adze blades for chopping and carving wood; slate knives for cutting meat and other soft materials; soapstone pipes and effigies; stone bowls; and grinding stones and pestles for processing seeds and other plant foods, and abrading tools for evening wood shafts or making sewing needles and awls. Although use of such tools constituted an important aspect of prehistoric peoples' subsistence activities in the project area, there are relatively few components that embody information about these techniques. In the case of sites 45WH241 and 45WH303, the presence of carved and polished soapstone pipe fragments, in addition to other artifact categories, contributes to their National Register significance through their likelihood to contribute new information about local and regional prehistory. An archeological resource that can be clearly related to the procurement, shaping techniques, and uses and functions of ground, pecked, abraded, and carved stone objects and tools can be classified as a groundstone technology component.

Archeological components related to stone tool technologies in the upper Skagit River Valley have new information to contribute to our understanding of local and regional prehistory. The kinds of information such properties are likely to yield and the problems and questions they are likely to address are listed below.

1. What is the role of lithic technologies in the organization of settlement and subsistence in hunting-gathering-fishing cultures of the upper Skagit River Valley?

    a. How do we conceptualize the organization of lithic technologies relative to the acquisition, processing, and consumption or use of subsistence resources?

    b. Are there lithic technologies characteristic of prehistoric occupants of the project area that are not evidenced in distant lowland environments of the Northwest?

    c. Are specific lithic technologies tied to the processing of selected resources? Were cobble tools used as expedient woodworking tools, for some other specific use, or for a wide range of general and specific tool needs?

2. To what extent did the prehistoric populations using the project area rely on artifacts, reflective of distinct technologies, that they brought with them from areas outside of the project area, and to what degree did they rely on artifacts manufactured locally?

3. What does our understanding of prehistoric adaptations to the mountains tell us about the evolution of Northwest Coast and Plateau land-use patterns and cultural evolution? More detailed aspects of this question include:

    a. Are adaptations to "marginal" environments sensitive monitors of cultural processes and changes occurring in the more densely populated lowlands?

    b. Were there specialized strategies that selected for specific lithic technologies in order to cope with the greater constraints placed on the human use of interior montane landscapes, such as the project area?

4. What can the spatial distribution, within archeological components, of different lithic technologies tell us about site structure and function?

    a. Were lithic reduction workshops and activities spatially segregated from other subsistence activities?

    b. Can stratigraphically separated lithic technologies aid in the recognition of separate site components?

    d. Do specific lithic technologies correlate with certain functional site types, such as residential site, campsite, bivouac site, hunting station, etc.?

5. Are the different lithic technologies employed by prehistoric populations confined to specific time periods? Are there regional differences in the reliance on certain lithic technologies?

    a. What is the cultural significance of temporal differences in the reliance on lithic technologies? Are there differences in the reliance on lithic technologies related to changes in cultural sequences, such as the proposed Sqlelten Tradition (ancestral Salishan) proposed by Stryd and Rousseau (1996)?

    b. What is the significance of the mounting evidence in the North Cascades interior for the use of microblade technology by prehistoric populations?

6. Did mountain-dwelling populations exploit a wider range of lithic technologies as part of their adaptation to the environment? What needs did the various lithic technologies serve?

   a. Which lithic technologies were used for the manufacture of expedient tools, or to respond to the need for a rapid, on-the-spot solution to an unanticipated problem?

   b. Which lithic technologies were used for the manufacture of curated tools in order to serve needs that were anticipated?

13.4.5 Prehistoric Exchange Networks in the Upper Skagit River Valley

This historic context relates to the archeological components manifesting the existence of trade and exchange networks among bands, villages, and other groupings of prehistoric populations. Items traded and exchanged include processed and unprocessed foods; raw materials from plants, animals, and minerals; and artifacts, including tools, art and ceremonial objects, other related items. The presence of established trade partnerships between groups in the historic period suggests the existence of informal and formal exchange systems, with the attendant development of trade routes and communities or settlements that served as exchange centers. The definition of component types relating to this historic context is based on the categories of exchanged items (materials and artifacts) and the settlement locations that functioned as part of the exchange system.

In the upper Skagit River Valley, nonlocal (exotic) obsidian derived from sources located in central Oregon and California is inferred to have been imported into the valley (sites 45WH224 and 45WH262) via exchange networks. This is consistent with a pattern observed throughout most of Washington and southwestern British Columbia (Carlson 1994; Galm 1994; James et al. 1994). In the Skagit Valley a short distance south of the project area, *Dentalium*, a marine shell, has been recovered from a prehistoric Skagit River site (North Cascades National Park Service Complex, unpublished field records). In the North Cascades northeast of the project area, Hudson (1994) notes an important source of red ocher that was traded to coastal Indian groups by Upper Similkameen people. It is likely that some archeological sites may have an abundance of exotic materials or these materials may simply occur in measurably greater proportions than in other sites. It is also possible in archeological components for distinctive artifact categories to occur that exhibit recognizable styles or morphologies that are associated with distant localities or regions, suggesting that they were objects of exchange. An archeological resource that contains data categories that can be clearly related to patterns of exchange with other regions or localities on the basis of exotic materials or on stylistic and morphological attributes can be categorized as an exotic component.

Exotic archeological components may, on occasion, be located in settings or environments that are anomalous, out of the ordinary, or distant from any other similar sites; or, their locations, when plotted on a map, may define a nonrandom pattern. Such assemblages may help to trace ancient trade or travel routes, particularly if they are associated with a recognizable trail, pass, or corridor through the mountains. An exotic archeological resource that is associated with a unique setting, position in the landscape, or other cultural resources suggesting the presence of a route or passage used for trade can be categorized as an exchange route component.

Archeological components related to exchange systems in the upper Skagit River Valley have new information to contribute to our understanding of local and regional prehistory. The kinds of information such properties are likely to yield, and the problems and questions they are likely to address, are listed below.

1. What role did exchange systems have in the several land-use strategies of hunting-gathering-fishing practiced by cultures of the upper Skagit River Valley?

    a. How did hunting-gathering-fishing bands and groups organize the exchange of resources to make them available to members?

    b. How did mountain physiography constrain or structure some aspects of the organization of exchange? Are there definable travel corridors or natural passages through the mountains that permit the modeling of exchange routes?

    c. Were there settlements in the upper Skagit River Valley that served as exchange centers as a consequence of their location between trade partners or along trade routes?

    d. Were exchange activities embedded in other subsistence pursuits, or were they primary subsistence activities that dictated their own schedule of resource procurement, processing, and distribution?

2. To what extent did the prehistoric populations using the upper Skagit River Valley rely on subsistence resources that they brought with them from distant areas versus the degree to which they relied on locally available resources?

    a. Were locally available resources procured in excess of immediate needs, thus offering a commodity having exchange value?

    b. Were there locally available resources in the valley that were unavailable in lowland environments, such as mountain goat wool or medicinal plants, that were in demand by lowland populations? Did these resources have

exchange value and to what degree did value-based trade in resources contribute to subsistence economies?

3. What does our understanding of prehistoric exchange systems in the project area tell us about the evolution of Northwest Coast and Plateau land-use patterns and cultural evolution?

   a. Is there an exchange value placed on resources in mountainous areas in proportion to the size of lowland populations? In proportion to competition between lowland populations? Due to the dispersion of populations away from overpopulated areas?

   b. How important was exchange to the more mobile foraging groups that seem to characterize the early and early-middle prehistoric time periods, prior to about 5,000 BP?

   c. With the onset of intensification of land use in the middle and late Holocene, did exchange patterns change? Did intensification make communities more or less dependent on exchange systems?

   d. Were there specialized strategies or logistic adaptations that were developed in order to cope with the greater constraints placed on the transportation of resources in rugged montane landscapes?

4. What can the geographic distribution, within archeological components, of trade items tell us about exchange systems east-west, across the mountains?

   a. Can we trace trade routes or corridors between exchange partners across the mountains?

   b. Did some mountainous areas act as barriers to exchange between east and west?

5. How do exchange patterns relate to broad, regional cultural sequences?

   a. Are there different patterns of exchange that characterize the different chronological periods that have been recognized?

   b. To what degree is exchange a cause and a consequence of culture change?

   c. What is the relationship or role of exchange in the proposed Salishan expansion hypothesis?

13.4.6 Development of an Archeological Chronology for the Upper Skagit River Valley

This historic context relates to a wide range of data categories embodied in artifacts, organic materials, sedimentary deposits, volcanic ashes, and noncultural or cultural materials that provide the basis for dating archeological resources in the project area. The ability to accurately date artifact assemblages and chronologically order cultural events and processes is the basis upon which many research questions and conclusions are founded. The specificity and accuracy of age estimates is dependent on the dating technique employed and the nature of the physical association of the dated material with artifact assemblages. Component types for the project area are defined on the basis of four dating techniques.

Chronometric dating is based on the principle that certain natural processes occur at known, measurable rates. A wide variety of chronometric measures are available that provide an absolute age estimate. One of the most frequently used is the radiocarbon technique, which is the only method that has been used so far to derive absolute dates for archeological assemblages in the upper Skagit River Valley. However, other methods are also potentially useful, including obsidian hydration, thermoluminescence, tree-ring dating (dendrochronology), and archeomagnetism. All of the significant components in the project area are potentially datable by radiocarbon assay of charred or otherwise preserved organic remains, and a number of these resources have contributed dates that have helped build the first archeological chronology for the valley. An archeological component that contains, or has the potential to contain datable material that has a known physical association relative to intact cultural remains can be categorized as contributing chronometric data categories.

Tephrochronology is the method of dating a layer of volcanic ash (tephra) by identifying the eruptive event of the source volcano. Due to the presence in the Pacific Northwest of several active volcanos, this technique is useful for dating archeological components that have a known stratigraphic relationship to a primary ash layer of known age and source. Many of the significant archeological resources in the project area have both identifiable and unidentifiable tephra layers. The means of identifying the various tephra sources is based on measurement of the chemistry of the glass particles that comprise the tephra. The unidentifiable tephra are also important because, at some future time, the chemical signature that they produce will be linked to a dateable eruptive event. Many of the archeological sites in the upper Skagit River Valley contain tephra layers that have been dated by radiocarbon at their source or at widespread locations throughout the Pacific Northwest; consequently, their presence within an archeological component serves as a time-marker. An archeological component that contains a *primary* tephra layer (i.e., in the position and place where it was deposited following eruption of the volcano) bedded within *in situ* sediments and with a defined stratigraphic relationship to the component can be considered as contributing tephra data categories.

Stratigraphic dating is a means of estimating age by relating a geologic unit of known age to another deposit or an archeological layer of unknown age. The known age may be derived from radiocarbon, tephrochronology, or some other technique. The usefulness of stratigraphic dating is dependent on the reliability of the dated deposits and the ability to correlate (define the physical, spatial, and genetic relationship) these with the archeological resources. Many archeological components in the upper Skagit River Valley are dated through stratigraphic correlation or have the potential to be dated in this manner. An archeological component that is physically associated with *in situ* deposits that can potentially be stratigraphically dated is considered as contributing stratigraphic age data categories.

Typological dating is a means of estimating age by relating a morphologically or stylistically distinctive artifact type to other similar types that already have been dated. The age of a morphological type or style may be derived from its association with a sample dated by radiocarbon, tephrochronology, or some other technique. The usefulness of the typological date is dependent on the reliability of the dates associated with the artifacts, on the reliability of the correlation of the type with the date, on the degree of similarity between artifact types, and finally, on the cultural and scientific validity of artifact typologies generally. This dating technique provides age estimates of widely varying accuracy and it can present numerous problems to archeological inference. Nevertheless, it is often the only technique available and many sites in the project area are dateable by this method only. An archeological component that is datable by use of an established typology, or a new typology correlated with an independent set of age estimates for the types is considered as contributing typological data categories.

Relative dating is a technique used to array cultural remains from youngest to oldest without the benefit of absolute dates or anything but the most general or speculative age estimates. Usefulness of the technique is dependent on the strength of the stratigraphic or associational evidence (this is usually based on the stratigraphic principle of superposition) that permits discrimination of older from younger. Even in the absence of any absolute age estimates, this is an important technique for ascertaining the relative age of cultural remains and cultural events of the prehistoric past in the upper Skagit River Valley. An archeological component that occurs *in situ* and that has a defined stratigraphic relationship to other cultural remains that are also in their original geological context is considered as contributing relative age data categories.

Archeological components related to development of a prehistoric chronology in the upper Skagit River Valley have new information to contribute to our understanding of local and regional prehistory. The kinds of information such properties are likely to yield and the problems and questions they are likely to address are listed below.

1. What time period represents the initial settlement and the earliest occupation(s) of the upper Skagit River Valley by human populations, and what artifact assemblage(s) characterizes this period?

2. Was the project area continuously occupied following initial use by humans, or was subsequent occupation intermittent? If intermittent, what are the identifiable time periods of prehistoric occupation?

3. What does the chronology of prehistoric use of the valley tell us about the evolution of Northwest Coast and Plateau land-use patterns and cultural evolution? More detailed aspects of this question include:

    a. Are the major time periods of occupation in "marginal" mountainous environments sensitive to cultural processes and changes occurring in the more densely populated lowlands?

    b. Was there demographic pressure placed on mountainous areas, such as the upper Skagit River Valley, in proportion to the size of lowland populations? In proportion to competition between lowland populations for space or resources? Due to the dispersion of populations away from densely populated areas?

    c. Did mountainous regions experience the onset of more intensive land-use practices (referred to as "intensification" in some studies) beginning in the middle Holocene, as has been reported for some regions of the Pacific Northwest?

4. Does the chronological pattern of morphological and stylistic types from the upper Skagit River Valley correspond with the patterns in adjacent regions? What is the cultural significance of these patterns?

5. Are there differences in exchange networks and patterns of trade during the different chronological time periods represented in the project area?

    a. Do trade routes or corridors change over time?

    b. Do exchanged items and resources change over time?

6. Do periods of occupation of the mountains correspond with or respond to climatic, geologic, or ecological time periods? Do cultural changes in the organization of subsistence or settlement correspond to shifts in climate?

7. How do changing patterns in animal and plant resource procurement relate to broad, regional cultural sequences?

a. What is the cultural significance of temporal differences in the presence and frequency of procurement sites?

b. Does the apparent intensive exploitation of the valley ca 5,000 years ago relate to the initial phase of a new (Salishan) tradition, as proposed by Stryd and Rousseau (1996) and others?

13.4.7 Reconstruction of Past Climates in the Upper Skagit River Valley

This historic context relates to a variety of biological and geological materials in or correlated with archeological components that provide data about earlier environments and climates. These data are the basis for inferring or "reconstructing" what the landscape and climate was like in the upper Skagit River Valley during prehistoric time periods. The accumulated evidence from throughout North America shows dramatic changes in the distribution of forests and grasslands and the kinds of animals (many of which became extinct) that inhabited them. Studies of climate and geology demonstrate that the first people to inhabit areas following glacier retreat, ca 12,000 years ago, faced environmental conditions and challenges far different from those that typify these same areas today. Lacking knowledge about past environmental and climatic conditions, our understanding of past cultures, the resources they depended on, and their evolutionary development is incomplete or severely limited. Archeological components manifesting this historic context are defined on the basis of three general categories of environmental data: plant remains, animal remains, and geologic remains.

Plants remains can be important indicators of past environments. Because they are preserved under a variety of circumstances, numerous specialized techniques have been developed for the identification of plant parts, some of which permit recognition to the species level. One of the most useful is the analysis of pollen, which can be preserved in lake or pond sediments, on artifacts, and in archeological features such as hearths. Other techniques are used to collect and identify larger plant remains (macrofloral analysis), such as conifer needles, cone scales, leaves, and seeds, to name a few. Identifiable plant remains oftentimes are preserved as charcoal in ancient cooking hearths. Within the last decade, archeologists working in mountainous areas of Washington have investigated whole sites that consist of numerous plant processing features, for baking camas bulbs (Thoms 1989) and for drying huckleberries (Mack 1992). An archeological component or a soil or sedimentary deposit that the potential to contain preserved plant parts can be considered as contributing floral data categories.

Animal remains also are important for reconstructing past environments, and like plants, there are many specialized techniques for their identification. Data categories from fauna include a wide variety of zoological remains, including vertebrates and invertebrates. Examples include insects, snails, marine and freshwater mollusks, fish, ungulates, birds, predatory mammals, etc. Also, like plants, zoological remains in the project area are most often preserved unintentionally from charring that occurs during

the use of prehistoric cooking hearths. Preservation in the protected environment under rockshelters also occurs. An archeological component or a soil or sedimentary deposit that has the potential to contain preserved animal remains can be considered as contributing faunal data categories.

Geologic evidence indicates much about past landscapes and environments in the upper Skagit River Valley. The entire range of evidence is derived from the specialized subfields of the earth sciences, including sedimentology, geochemistry, geomorphology, hydrology, glaciology, pedology (soil formation), and others. Several of these subfields contribute important data to understanding Holocene environments and climates in the project area. For example, buried, relic soils of different ages and degrees of weathering are found throughout the project area, and in some cases, archeological remains are associated with these ancient, now-buried land surfaces, such as at sites 45WH224 and 45WH262. These weathered soil horizons are related to periods of landform stability, or to periods of more rapid soil formation, or to both. At site 45WH303, a series of buried soils containing charcoal from natural fires provides the evidence for computing the rate of deposition and build-up of the Skagit River flood plain over the last 3,500 years or more. An archeological component, soil, or sedimentary deposit that has the potential to contain geologic data about past environmental or climatic conditions can be considered as contributing geologic data categories.

Archeological components related to reconstruction of past climates in the upper Skagit River Valley have new information to contribute to our understanding of local and regional prehistory. The kinds of information such properties are likely to yield and the problems and questions they are likely to address are listed below.

1. What major climatic/environmental time periods are represented in the upper Skagit River Valley? Were these accompanied by changes in the distribution, boundaries, and character of biotic zones?

    a. When did pioneer vegetation become established in the project area following the disappearance of the Cordilleran ice sheet? What species and genera colonized the newly deglaciated landscape?

    b. What pollen spectra characterize the Holocene vegetation sequence in the upper Skagit River Valley?

    c. What are the climatically-sensitive plant taxa represented in pollen spectra, and what climatic implications can be derived from their presence?

2. Was the upper Skagit River Valley affected by the major climatic shifts and intervals that have been recognized for other regions of North America?

a. Was there, for example, a mid-Holocene warm period (variously labeled the "Altithermal" and "Hypsithermal") or other periods of relative drought?

b. As is known to have occurred in a number of locations around the world, did the upper Skagit River Valley experience a "little optimum", a warm and mild interval between 1,200 and 700 BP, just preceding the Little Ice Age (Goudie 1983:129)?

c. Was the upper Skagit River Valley affected by the Little Ice Age and other advances of alpine glaciers during the Neoglacial period?

3. What does the changing prehistoric environment and climate of the project area tell us about the evolution of Northwest Coast and Plateau land-use patterns and cultural evolution?

a. Do the major time periods of occupation in the mountains correspond to climatic or environmental periods?

b. Do cultural changes in the organization of subsistence or settlement correspond to shifts in climate? Did mountain-dwelling populations in the valley practice more intensive land-use patterns (referred to as "intensification" in some studies) in response to climatic or environmental shifts?

c. Did Native settlement and subsistence patterns shift in response to changes in the kinds or abundance of key resources, as related to or controlled by climatic and environmental factors?

4. Were there animal taxa present in the project area prehistorically that today are extinct? Were any of these exploited by native populations for subsistence purposes? Were salmonids ever present in the project area during any prehistoric time periods?

5. Are there major periods of erosion, deposition, or stability represented in the geological record for the project area?

a. Are there identifiable periods of floodplain aggradation or downcutting?

b. Are certain landform types more sensitive indicators of climatic or environmental changes than others?

c. Did prehistoric inhabitants select certain landform types for placement of settlements? What were the selection criteria?

6. Can geologic or soil strata be used to correlate in time between archeological sites that are spatially separated?

   a. What is the significance of the fact that most of the early and middle period archeological assemblages are found in soil B-horizons?

   b. Can the rate of soil B-horizon formation be estimated and can this rate be used to date archeological components relatively or absolutely?

13.4.8 Funerary Behavior in the Upper Skagit River Valley

A potentially important historic context for the project area relates to the archeological components associated with funerary patterns. Resources relating to this historic context have never been found in the upper Skagit River Valley, but it is mentioned here in the event that unanticipated discoveries are made during future investigations. The range of cultural phenomena recognized by this historic context includes all funerary ceremonies, the artifacts associated with such ceremonies, the associated treatment of the human remains, all the artifacts and objects associated with interment, and the set of cultural beliefs centering around death and a life beyond.

Three types of archeological resources are most frequently recognized for this theme, these being human osteological remains, any structures or features associated with human remains, and any associated funerary objects. The first type is defined by the presence of human skeletal remains. The second type is best recognized when in the presence of human remains, and in their absence, recognition may depend on an established pattern of association with human remains. The last type is variable, is sometimes uncertain, and is best defined in consultation with tribal elders and governments that are likely to be culturally affiliated with the funerary remains.

The component types are likely to yield important information to history and prehistory for the region and locality. The information potential relates to both scientific research values and to the cultural values of tribal groups and governments, some members of which may be able to demonstrate an ancestral relationship to the funerary remains.

Prehistoric funerary remains within the project area have not been encountered, probably due to the natural acidity of project area soils. Such soils destroy bone in a few hundred years or less, so that the upper Skagit River Valley constitutes a poor environment for the preservation of osteological remains. Neither have funerary artifacts or objects have been recovered from the project area. The single reported historic burial within the project area consists of the marked grave site of John McMillan, an early homesteader who lived in the lower Big Beaver River Valley. This grave dates to the early part of this century.

In the event that any archeological components relating to this historic context are encountered in the project area, the first action will be to consult with the appropriate tribal governments. These include the Upper Skagit Indian Tribe, the Swinomish Tribal Community, the Sauk-Suiattle Tribe, and the Nlakápamux (Lower Thompson) Nation. The consulting parties will determine cultural affiliation and develop a treatment plan for the funerary remains in compliance with the applicable legislative and regulatory mandates. These include the National Historic Preservation Act of 1966 (as amended by Public Law 96-515 and 102-575), Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601), and the National Park Service's Native American Relationships Management Policy (Federal Register 52(183):35674-35678).

14. REFERENCES CITED

Agee, James K., M. Finney, and R. de Gouvenain
1986 *The Fire History of Desolation Peak.* National Park Service Cooperative Park Studies Unit, College of Forest Resources, University of Washington, Seattle.

Ahler, Stanley A.
1986 *The Knife River Flint Quarries: Excavations at Site 32DU508.* State Historical Society of North Dakota, Bismarck.

Ames, Kenneth. M., James. P. Green, and Margaret Pfoertner
1981 *Hatawai (10NP143): Interim Report.* Archaeological Reports No. 9. Boise State University, Boise, ID.

Ames, Kenneth M. and Alan G. Marshall
1981 Villages, Demography and Subsistence Intensification on the Southern Columbia Plateau. *North American Archaeologist* 2(1):25-52.

Armstrong, J. E.
1977 *Quaternary Stratigraphy of the Fraser Lowland.* Geological Association of Canada, Mineralogical Association of Canada, Society of Economic Geologists, Canadian Geophysical Union, Joint Annual Meetings (Vancouver), Fieldtrip Guidebook, Trip 10.

Armstrong, J. E., D. R. Crandell, D. J. Easterbrook, and J. B. Noble
1965 *Late Pleistocene Stratigraphy and Chronology in Southern British Columbia and Northwestern Washington.* Geological Society of America Bulletin 68.

Avey, Michael G.
1992 *Fluted Point Occurrences in Washington State.* Paper presented at the 45th annual Northwest Anthropological Conference, Burnaby, British Columbia.

Bakewell, Edward F.
1993 Shades of Gray: Lithic Variation in Pseudobasaltic Debitage. *Archaeology in Washington* 5:23-38.

Bangs, Eric W. and Dennis E. Lewarch
1994 *Spatial and Temporal Organization of Lithic Manufacturing and Tool Use at West Point.* Poster presented at the 59th annual meeting, Society for American Archaeology, Anaheim, CA.

Barrett, Stephen W. and Stephen F. Arno
1982 Indian Fires As an Ecological Influence in the Northern Rockies. *Journal of Forestry* 80(10):647-651.

Beatty, Susan W. and Earl L. Stone
1986 The Variety of Soil Microsites Created by Tree Falls. *Canadian Journal of Forest Resources* 16:539-548.

Beckey, Fred
1977 *Cascade Alpine Guide, Climbing and High Routes: Stevens Pass to Rainy Pass*. Mountaineers, Seattle.

Beget, James E.
1982 *Postglacial Volcanic Deposits at Glacier Peak, Washington, and Potential Hazards From Future Eruptions*. Open-File Report 82-830. U.S. Geological Survey.

Benedict, James B. and Byron L. Olson
1978 *The Mount Albion Complex*. Research Report No. 1. Center For Mountain Archeology, Ward, CO.

Bennyhoff, James A.
1956 *An Appraisal of the Archaeological Resources of Yosemite National Park.* Archaeological Survey No. 34. University of California, Berkeley.

Bergland, Eric O.
1984 *Olympic National Park Archeological Base Map Study: Summary Report to Superintendent Chandler*. Report on file, Cultural Resources Division, Pacific Northwest Region, National Park Service, Seattle.

Binford, Lewis R.
1980 Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement. *American Antiquity* 45:4-20.

Blukis Onat, Astrida R.
1980 *Skwikwikwab: A Methodological Study of a Prehistoric Puget Sound Settlement*. Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

Boaz, Franz
1890 The Shuswap. Second General Report on the Indians of British Columbia. *Report of the British Association for the Advancement of Science* 60:632-647.

Borden, Charles E.
1960 DjRi-3, an Early Site in the Fraser Canyon, British Columbia. *National Museum of Canada Bulletin* No. 162:101-118.

1975 Origins and Development of Early Northwest Coast Culture to About 3000 B.C. *National Museum of Man Mercury Series, Archaeological Survey of Canada Paper* No. 45.

1979 Peopling and Early Cultures of the Pacific Northwest, a View From British Columbia, Canada. *Science* 203:963-971.

Boyd, Robert T.
1990 Demographic History, 1774-1874. In *Northwest Coast*, edited by Wayne Suttles, pp. 135-148. Handbook of North American Indians, vol. 7, William C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.

Browman, David L. and David A. Munsell
1972 Columbia Plateau Prehistory: Some Observations. *American Antiquity* 37(4):546-548.

Brubaker, Linda B.
1992 Climate Change and the Origin of Old-Growth Douglas-Fir Forests in the Puget Sound Lowland. In *Implications of Climate Change for Pacific Northwest Forest Management*, edited by Geoffrey Wall, pp. 5-18. Department of Geography Publication Series, Occasional Paper No. 15, University of Waterloo.

Bryan, Alan L.
1980 The Stemmed Point Tradition: An Early Technological Tradition in Western North America. In *Anthropological Papers in Memory of Earl H. Swanson, Jr.*, edited by Lucille B. Harten, et al., pp. 77-107. Special Publication of the Idaho Museum of Natural History, Pocatello, ID.

Burley, David V.
1989 *Senewelets: Culture History of the Nanaimo Coast Salish and the False Narrows Midden.* Memoir No. 2. Royal British Columbia Museum, Victoria, BC.

Butler, B. Robert
1961 *The Old Cordilleran Culture in the Pacific Northwest.* Occasional Paper No. 5. Idaho State College Museum, Pocatello.

1962 *Contributions to the Prehistory of the Columbia Plateau: A Report on Excavations in the Palouse and Craig Mountain Sections*. Occasional Paper No. 9. Idaho State College Museum, Pocatello.

Cairnes, C. E.
1944 *Hope, Yale and New Westminster Districts, British Columbia*. Canada Geological Survey Map 737A.

Callahan, Errett
1979 The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts. *Archaeology of Eastern North America* 7:1-180.

Campbell, Sarah K.
1985 Selected Aspects of the Artifact Assemblage. In *Summary of Results, Chief Joseph Dam Cultural Resources Project*, edited by S. K. Campbell, pp. 289-316. Office of Public Archaeology, Institute for Environmental Studies, University of Washington, Seattle.

Carlson, Roy L.
1983 Prehistory of the Northwest Coast. In *Indian Art Traditions of the Northwest Coast*, edited by R. L. Carlson, pp. 13-32. Archaeology Press, Simon Fraser University, Burnaby, BC, Canada.

1987 Prehistoric Trade: Obsidian. In *Historical Atlas of Canada*, edited by R. C. Harris, plate 14. University of Toronto Press, Toronto.

1990 History of Research in Archeology. In *Northwest Coast*, edited by Wayne Suttles, pp. 107-115. Handbook of North American Indians, vol. 7, William C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.

1994 Trade and Exchange in Prehistoric British Columbia. In *Prehistoric Exchange Systems in North America*, edited by T. G. Baugh and J. E. Ericson, pp. 307-361, Plenum Press, New York.

Chance, David H. and Jennifer V. Chance
1982 *Kettle Falls: 1971/1974*. Anthropological Research Manuscripts Series No. 69. Alfred W. Bowers Laboratory of Anthropology, University of Idaho, Moscow.

1985 *Kettle Falls: 1978*. Anthropological Research Manuscripts Series No. 84. Alfred W. Bowers Laboratory of Anthropology, University of Idaho, Moscow.

Chatters, James C.
1981 *Archaeology of the Sbabadid Site, 45KI151, King County, Washington.* Office of Public Archaeology, University of Washington, Seattle.

1984 *Dimensions of Site Structure: The Archaeological Record From Two Sites in Okanogan County, Washington.* Central Washington Archaeological Survey, Central Washington University. Submitted to US Army Corps of Engineers, Seattle District, Contract No. DACW67-82-C-0062.

1986 *The Wells Reservoir Archaeological Project Volume 1: Summary of Findings.* Archaeological Report 86-6. Central Washington Archaeological Survey, Central Washington University, Ellensburg.

1989 Resource Intensification and Sedentism on the Southern Plateau. *Archaeology in Washington* Vol. I:3-19.

Clague, John. J.
1980 *Late Quaternary Geology and Geochronology of British Columbia, Part I: Radiocarbon Dates.* Geological Survey of Canada Paper 80-13.

Collins, June M.
1974 *Valley of the Spirits.* University of Washington Press, Seattle.

Connolly, Thomas J., and Paul W. Baxter
1986 New Evidence on a "Traditional" Topic in Pacific Northwest Prehistory. In *Contributions to the Archaeology of Oregon 1983-1986*, edited by Kenneth M. Ames, pp. 129-146. Occasional Paper No. 3. Association of Oregon Archaeologists, Salem, OR.

Corliss, Don W.
1972 *Neck Width of Projectile Points: An Index of Culture Continuity and Change.* Occasional Paper No. 29. Idaho State Museum, Pocatello, ID.

Crabtree, Robert H.
1957 *Two Burial Sites in Central Washington.* Unpublished MA thesis, Department of Anthropology, University of Washington, Seattle.

Crandell, D. R.
1963 *Surficial Geology and Geomorphology of the Lake Tapps Quadrangle, Washington.* U.S. Geological Survey Professional Paper 388-A.

Cressman, L.S.
1960 Cultural Sequences at the Dalles, Oregon. *Transactions of the American Philosophical Society* New Series 50, Part 10.

Custer, Henry
1866 *Report of Henry Custer, Assistant of Reconnaissances Made in 1859 Over the Routes in the Cascade Mountains in the Vicinity of the 49th Parallel.* Typed manuscript, Pacific Northwest Regional Office, National Park Service, Seattle.

Dancey, William S.
1968 *Archaeology of Mossyrock Reservoir.* Unpublished MA thesis, Department of Anthropology, University of Washington, Seattle.

Daugherty, Richard D.
1956 Archaeology of the Lind Coulee Site, Washington. *Proceedings of the American Philosophical Society* 100(3):223-278.

1962 The Intermontane Western Tradition. *American Antiquity* 28(2):144-150.

1965 *An Archaeological Survey of Mount Rainier National Park.* Report on file, U.S. National Park Service, Pacific Northwest Region, Seattle.

Daugherty, Richard D., J. Jeffrey Flenniken and Jeanne M. Welch
1987 *A Data Recovery Study of Judd Peak Rockshelter (45LE222) in Lewis County, Washington.* Studies in Cultural Resource Management No. 8, USDA Forest Service, Pacific Northwest Region, Portland, OR.

Davis, Wilbur A.
1964 *Archaeological Surveys of Crater Lake National Park and Oregon Caves National Monument, Oregon.* Report on file, National Park Service, Pacific Northwest Region, Seattle, WA.

Dawson, George M.
1891 Notes on the Shuswap People of British Columbia. *Transactions of the Royal Society of Canada* Section II, Part 1:3-44.

Dobyns, Henry F.
1983 *Their Number Become Thinned.* The University of Tennessee Press, Knoxville.

Ebasco Environmental
n.d. Appendix 4C, Archaeological Methodology. In *Newhalem Creek Environmental Report.* Submitted to Seattle City Light, Bellevue, WA.

Elmendorf, William W.
1963 Linguistic and Geographic Relations in the Northern Plateau Area. *Southwestern Journal of Anthropology* 21:63-78.

Envirosphere Company
1988 *Study of Skagit Dams Original Impacts on Wildlife and Fish Habitat and Populations*. Submitted to Seattle City Light, Bellevue, WA.

Federal Energy Regulatory Commission
1995 *Final Environmental Assessment for New Hydropower License*. Skagit River Hydroelectric Project, FERC Project No. 553, Washington (Issued May 16, 1995), prepared by Federal Energy Regulatory Commission, Office of Hydropower Licensing, Division of Project Review, Washington, D.C.

Fladmark, Knut R.
1982 An Introduction to the Prehistory of British Columbia. *Canadian Journal of Archaeology* 6:95-156.

1986 *British Columbia Prehistory*. Canadian Museum of Civilization, Ottawa.

Fladmark, K. R., J. C. Driver, and D. Alexander
1988 The Palaeoindian Component at Charlie Lake Cave (HbRf-39), British Columbia. *American Antiquity* 53:371-384.

Flenniken, J. Jeffrey
1981 Replicative systems Analysis: A Model Applied to the Vein quartz Artifacts From the Hoko River site. *Laboratory of Anthropology Reports of Investigations* 59, Washington State University, Pullman.

Flenniken, J. Jeffrey, Terry L. Ozbun, and Jeffrey A. Markos
1992 *Archaeological Testing and Evaluation of the Johnson Butte Site, 45LE417*. Report on file, USDA Forest Service, Gifford Pinchot National Forest, Vancouver, WA.

Franklin, Jerry F., and C. T. Dyrness
1988 *Natural Vegetation of Oregon and Washington*. Oregon State University Press, Corvallis.

Fulkerson, Ann C.
1988 *Predictive Locational Modeling of Aboriginal Sites in the Methow River Area: Deductive and Inductive Approaches*. Unpublished MA thesis, Department of Anthropology, Washington State University, Pullman.

Galm, Jerry R.
1994 Prehistoric Trade and Exchange in the Interior Plateau of Northwestern North America. In *Prehistoric Exchange Systems in North America*,

edited by T. G. Baugh and J. E. Ericson, pp. 275-305, Plenum Press, New York.

Galm, Jerry R. and Ruth A. Masten (editors)
1985 *Avey's Orchard: Archaeological Investigation of a Late Prehistoric Columbia River Community*. Reports in Archaeology and History 100-42. Archaeological and Historical Services, Eastern Washington University, Cheney, WA.

Gibbs, George
1877 Tribes of Western Washington and Northwestern Oregon. US Geographical and Geological Survey of the Rocky Mountain Region. *Contributions to North American Ethnology* 1:157-241.

Goudie, Andrew
1983 *Environmental Change* (second edition). Clarendon Press, Oxford.

Gough, Stan
1988 *Results of Data Recover Investigations at 450K563, Okanogan County, Washington.* Reports in Archaeology and History 100-65. Archaeological and Historical Services, Eastern Washington University, Cheney, WA.

Gough, Stan and Jerry R. Galm (editors)
1988 *Results of Archaeological Investigations at 45KI291, King County, Washington.* Reports in Archaeology and History 100-67. Archaeological and Historical Services, Eastern Washington University, Cheney, WA.

Grabert, Garland F.
1968 *North-central Washington Prehistory: A Final Report on Salvage Archaeology in the Wells Reservoir-Part 1.* Reports in Archaeology 1. Department of Anthropology, Western Washington University, Bellingham, WA.

1975 *An Archaeological Reconnaissance of the Newhalem Vicinity, Washington.* Report on file, National Park Service, North Cascades National Park, Marblemount, WA.

1983 *Ferndale in Prehistory: Archaeological Investigations in the Lower and Middle Nooksack Valley.* Occasional Paper 19. Center for Pacific Northwest Studies, Western Washington University, Bellingham, WA.

Grabert, Garland F. and E. Richard Chesmore, Jr.
1979 *Archaeological Investigations at 45WH81, Newhalem, Washington.* Reports in Archaeology No. 10. Department of Anthropology, Western Washington University, Bellingham, WA.

Grabert, Garland F. and Donald J. Pint
1978 *An Archaeological Reconnaissance and Cultural Resource Inventory of the North Cascades National Recreation Area.* Reports in Archaeology No. 5. Department of Anthropology, Western Washington University, Bellingham, WA.

Gramly, Richard M.
1993 *The Richey Clovis Cache: Earliest Americans Along the Columbia River.* Monograph in Archaeology, Persimmon Press, Buffalo, New York.

Greiser, Sally T.
1984 Projectile Point Chronologies of Southwestern Montana. *Archaeology in Montana* 25(1):35-52.

Gustafson, C. E., D. Gilbow, and R. D. Daugherty
1979 The Manis Mastodon Site: Early Man on the Olympic Peninsula. *Canadian Journal of Archaeology* 3:157-164.

Haeberlin, Herman, and Erna Gunther
1930 The Indians of Puget Sound. *University of Washington Publications in Anthropology* 4(1):1-84.

Haynes, C. Vance, Jr.
1982 Were Clovis Progenitors in Beringia? In *Paleoecology of Beringia*, edited by David M. Hopkins et al., pp. 383-398. Academic Press, New York.

Hedlund, Gerald C.
1974 Mudflow Disaster. *Northwest Anthropological Research Notes* 10(1):77-89.

Heusser, Calvin J.
1983 Vegetational History of the Northwestern United States including Alaska. In *Late Quaternary Environments of the United States, vol. 1: The Late Pleistocene*, edited by S. C. Porter, pp. 239-258. University of Minnesota Press, Minneapolis.

Hicks, Brent A.
1997 Microblades and Function: A Study and Comment. In *Archaeology in Washington*, 6:35-52.

Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey, and J. W. Thompson.
1959 *Vascular Plants of the Pacific Northwest*, Part 4: Ericaceae through Campanulaceae. University of Washington Press, Seattle.

Hollenbeck, Jan L. and Susan L. Carter
1986 *A Cultural Resources Overview: Prehistory and Ethnography, Wenatchee National Forest.* Report on file, USDA Forest Service, Pacific Northwest Region, Portland, OR.

Hudson, Douglas
1994 *Upper Similkameen Ethnographic and Ethnohistorical Overview.* B.C. Studies Conference, Okanagan University College, Kelowna, B.C.

Hughes, Richard
1991 Appendix L: Results of X-Ray Fluorescence Analysis of Obsidian Artifacts from the Centennial Trail Archaeological Project. In *Archaeology of the Middle Spokane Centennial Trail*, edited by J. A. Draper and W. Andrefsky, Jr., pp. L.1-L.7. Project Report No. 17. Center for Northwest Anthropology, Department of Anthropology, Washington State University, Pullman, WA.

1993 Appendix C: Obsidian Source Analysis. In *The Archaeology of Chester Morse Lake: Long-Term Human Utilization of the Foothills in the Washington Cascade Range*, edited by S. R. Samuels, pp. C.1-C.7. Project Report No. 21. Center for Northwest Anthropology, Department of Anthropology, Washington State University, Pullman, WA.

Husted, Wilfred H.
1974 Prehistoric Occupation of the Alpine Zone in the Rocky Mountains. In *Arctic and Alpine Environments*, edited by J. D. Ives and R. G. Barry, pp. 857-872. Muethen and Co., Ltd., London.

International Joint Commission, Canada and United States
1971 *Environmental and Ecological Consequences in Canada of Raising Ross Lake in the Skagit Valley to Elevation 1725.* Appendix F. Report on file, National Park Service, North Cascades National Park, Sedro Woolley, WA.

Irwin, Ann M., and Ula Moody
1978 *The Lind Coulee Site (45GR97).* Project Report No. 56. Washington Archaeological Research Center, Washington State University, Pullman, WA.

Ives, R. L.
1941 A Cultural Hiatus in the Rocky Mountains Region. *Southwestern Lore* 7(3):42-46.

1942 Early Occupation of the Colorado Headwaters Region. *Geographic Review* 32(3):448-462.

James, Malcolm A.
1992 Appendix D: Site 45PO149 Obsidian Source Analysis. In *Archaeological Investigations along the Pend Oreille River: Site 45PO149*, edited by Paul H. Sanders, pp. D.1-D.9. Project Report No. 18. Center for Northwest Anthropology, Department of Anthropology, Washington State University, Pullman, WA.

James, Malcolm, Jeff Bailey, and John D'Auria
1994 *Site Specific and Regional Patternings of the Archaeological Distribution of Volcanic Glass Artifacts: X-Ray Fluorescence Analysis Studies in Northwestern North America.* Paper presented at the 47th annual Northwest Anthropological Conference, Spokane, WA.

Jenkins, Will D.
1984 *Last Frontier in the North Cascades, Tales of the Wild Upper Skagit.* Skagit County Historical Series No. 8. Skagit County Historical Society, Mount Vernon, WA.

Jermann, Jerry V. and Roger D. Mason
1976 *A Cultural Resource Overview of the Gifford Pinchot National Forest, South-Central Washington.* Submitted to the USDA Forest Service, Gifford Pinchot National Forest Service, Vancouver, WA.

Johnson, D. L., E. A. Keller, and T. K. Rockwell
1990 Dynamic Pedogenesis: New Views on Some Key Soil Concepts, and a Model for Interpreting Quaternary Soils. *Quaternary Research* 33:306-319.

Kennedy, Hal and Astrida R. Blukis Onat
1988 *Data Recovery for Headwaters-Extension FS#06-17-30 Site 45CH208.* Report submitted to USDA Forest Service, Wenatchee National Forest, Wenatchee, WA.

Kennedy, Hal and Harry Oda
1988 Lithic Analysis. In *Naches Lithic Scatter CR05-07-31 Data Recovery Report*, Astrida R. Blukis Onat, with Hal Kennedy, Harry Oda, and

Nancy A. Stenholm, pp. 54-93. Submitted to White River Ranger District, Mt. Baker-Snoqualmie National Forest, by BOAS, Inc., Seattle.

Kidd, Robert S.
1964 *A Synthesis of Western Washington Prehistory from the Perspective of Three Occupation Sites.* Unpublished MA thesis, Department of Anthropology, University of Washington, Seattle, WA.

1968 Archaeological Survey in the Lower Fraser River Valley, British Columbia, 1963. *National Museum of Canada, Bulletin 224, Contributions to Anthropology VI, Paper* No. 5:208-247.

Kintigh, Keith W.
1989 Sample Size, Significance, and Measures of Diversity. In *Quantifying Diversity in Archaeology*, edited by R. D. Leonard and G. T. Jones, pp. 25-36. Cambridge University Press, Cambridge.

Kroeber, A. L.
1939 Cultural and Natural Areas of Native North America. *University of California Publications in American Archaeology and Ethnology* 38:1-242.

Kuijt, Ian
1989 Subsistence Resource Variability and Culture Change during the Middle-Late Prehistoric Cultural Transition on the Canadian Plateau. *Canadian Journal of Archaeology* 13:97-117.

Lane, Robert B. and Barbara Lane
1977 *Indians and Indian Fisheries of the Skagit River System, Skagit Salmon Study, Vol. 1: Archeological Background.* Ms. on file, Upper Skagit Indian Tribe, Sedro Woolley, WA.

Larson, Lynn L. and Dennis E. Lewarch
1989 *Report on Testing of 45SK200, Near Bacon Creek, Skagit County, Washington.* Prepared for Parametrix, Inc. and City of Seattle Lighting Department, by Larson Anthropological/Archaeological Services, Seattle.

LeClair, Ronald
1976 Investigations at the Maurer Site Near Agassiz. In *Current Research Reports*, edited by R. L. Carlson, pp. 33-42. Publication No. 3. Department of Archaeology, Simon Fraser University, Burnaby, BC.

Lenihan, D. J., T. L. Carrell, S. Fosberg, L. Murphy, S. L. Rayl, and J. A. Ware
1981 *The Final Report of the National Reservoir Inundation Study*, Vols. I and II. Report on file, National Park Service, Southwest Cultural Resources Center, Santa Fe, NM.

Leonhardy, Frank C. and David G. Rice
1970 A Proposed Culture Typology for the Lower Snake River Region, Southeastern Washington. *Northwest Anthropological Research Notes* 4(1):1-29.

Lewarch, Dennis E. and James R. Benson
1989 *Archaeological Data Recovery at the Vine Site (45-SA-85).* Submitted to USDA Forest Service, Contract No. 53-05K3-8-05930r, Gifford Pinchot National Forest, Vancouver, WA.

Lewarch, Dennis E. and Lynn L. Larson
1990 *Diablo and Gorge Dam Reservoirs, Whatcom County Cultural Resource Reconnaissance.* LAAS Technical Report No. 90-5. Larson Anthropological/Archaeological Services, Seattle, WA.

Lohse, Ernest S.
1985 Rufus Woods Lake Projectile Point Chronology. In *Summary of Results, Chief Joseph Dam Cultural Resources Project, Washington*, pp. 317-364. Office of Public Archaeology, Institute for Environmental Studies, University of Washington, Seattle. Submitted to U.S. Army Corps of Engineers, Contract No. DACW67-78-C-0106.

Lowden, J. A. and W. Blake, Jr.
1968 Geological Survey of Canada Radiocarbon Dates VII. *Radiocarbon* 10(2):207-245.

Luxenberg, Gretchen A.
1984 *Historic Structures Inventory, North Cascades National Park Service Complex.* Report on file, Cultural Resources Division, Pacific Northwest Region, National Park Service, Seattle.

1986 *Historic Resource Study, North Cascades National Park Service Complex, Washington.* Report on file, Cultural Resources Division, Pacific Northwest Region, National Park Service, Seattle.

Mack, Cheryl A.
1989 In Pursuit of the Wild Vaccinium-Huckleberry Processing Sites in the Southern Washington Cascades. *Archaeology in Washington* 4:3-16.

Matson, R. G.
1976 *The Glenrose Cannery Site.* Archaeological Survey of Canada No. 52. National Museum of Man, Mercury Series, Ottawa.

1983 Intensification and the Development of Cultural Complexity: The Northwest Versus the Northeast Coast. In *The Evolution of Maritime Cultures on the Northeast and the Northwest Coasts of America*, edited by R. J. Nash, pp. 125-148. Publication No. 11. Department of Archaeology, Simon Fraser University, Burnaby, BC.

Matson, R. G. and Gary Coupland
1995 *The Prehistory of the Northwest Coast.* Academic Press, New York.

McClure, Richard H., Jr.
1989 Alpine Obsidian Procurement in the Southern Washington Cascades: Preliminary Research. *Archaeology in Washington* 1:59-69.

McCutcheon, Patrick T.
1992 Burned Archeological Bone. In *Deciphering a Shell Midden*, Julie K. Stein (editor), Academic Press, Inc.

Mehringer, Peter J., Jr.
1988 Weapons of Ancient Americans. *National Geographic* 174(4):500-503.

Mehringer, Peter J., Jr. and Franklin J. Foit
1990 *National Geographic Research* 6(4):495-503.

Meltzer, David J. and Robert C. Dunnell
1987 *Fluted Points from the Pacific Northwest.* Current Research in the Pleistocene 4, Center for the Study of Early Man, University of Maine, Orono.

Mierendorf, Robert R.
1986 *People of the North Cascades.* Report on file, National Park Service, Cultural Resources Division, Pacific Northwest Region, Seattle, WA.

1987a *A Progress Report on Archaeology of the Upper Skagit River Valley, North Cascades Range, Washington.* Report on file, National Park Service, North Cascades National Park, Sedro Woolley, WA.

1987b *Archaeological Reconnaissance in the Near Timberline of the North Cascades National Park.* Paper presented at the 40th annual Northwest Anthropological Conference, Gleneden Beach, OR.

1991 *Final Report of Intensive and Reconnaissance-Level Archaeological Surveys in the Upper Skagit River Basin, Washington.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to Seattle City Light, Bellevue, WA.

1992 *Status Report of Archeological Testing and Evaluation in the Drawdown Zone of Ross Lake, 1991-1992, Skagit River Hydroelectric Project, FERC NO. 553.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to City of Seattle, City Light Department, Bellevue, WA.

1993a *Chert Procurement in the Upper Skagit River Valley of the Northern Cascade Range, Ross Lake National Recreation Area, Washington.* Cultural Resources Technical Report No. 93-001. National Park Service, North Cascades National Park Service Complex, Sedro Woolley, WA.

1993b *Consideration of the Stratigraphic and Geomorphic Occurrence of Forager Archaeological Assemblages of the Northern Cascade and Rocky Mountain Ranges of the USA.* Program and Abstracts, First Rocky Mountain Anthropology Conference, Jackson, WY.

Mierendorf, Robert R. and Sheila J. Bobalik

1983 Lithic Analysis. In *Cultural Resources of the Rocky Reach of the Columbia River*, vol. II, edited by Randall F. Schalk and Robert R. Mierendorf, pp. 603-618. Project Report No. 1. Center for Northwest Anthropology, Washington State University, Pullman, WA.

Mierendorf, Robert R., Greg C. Burtchard, and Alston V. Thoms

1987 The Regional Stratigraphic Record and Stratigraphy at 24LN1054. In *Prehistoric Land Use in the Northern Rocky Mountains: A Perspective From the Middle Kootenai River Valley*, edited by Alston V. Thoms and Greg C. Burtchard, pp. 303-336. Project Report No. 4. Center For Northwest Anthropology, Washington State University, Pullman.

Mierendorf, Robert R. and David J. Harry

1992 *A Progress Statement On Archeological Survey and Testing of Lands Along Lake Chelan, Lake Chelan National Recreation Area.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to Chelan Co. Public Utility District in compliance with Memorandum of Agreement No. 1443-MA-9000-92-001.

1993 Results of a Subsurface Archaeological Survey on a Pleistocene Terrace in North Cascades National Park Service Complex. *Archaeology in Washington* 5:39-51.

Mierendorf, Robert R. and Gretchen A. Luxenberg
1987 *Reconnaissance Survey for Cultural Resources in Diablo Lake, Whatcom County, Washington.* Report on file, National Park Service, North Cascades National Park, Sedro Woolley, WA.

Mierendorf, Robert R., Jon L. Riedel and Gretchen A. Luxenberg
1988 *Technical Summary Results of an Intensive Cultural Resources Survey in the Upper Skagit River Basin.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to City Light Department, City of Seattle, Bellevue, WA.

1989 *Technical Summary Results of an Intensive Cultural Resources Survey in the Upper Skagit River Basin.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to City Light Department, City of Seattle, Bellevue, WA.

Mierendorf, Robert R. and Craig E. Skinner
1997 *Correlation of Artifact and Source Obsidian, North Cascades National Park Service Complex, Washington.* Paper presented at the 50th Annual Northwest Anthropological Conference, Program with Abstracts, pp. 49-50, Central Washington University, Ellensburg.

Mierendorf, Robert R. and Linda Switzer
1989 *A Progress Report on Testing of Archaeological Sites in the Upper Skagit River Basin, Washington, Skagit River Hydroelectric Project FERC No. 553.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to the City Light Department, City of Seattle, Bellevue, WA.

Mierendorf, Robert R. and Jim Thomson
1986 *An Assessment of the Effects of Endowment Commission Projects to Archaeological Remains in the Ross Lake National Recreation Area.* Report on file, National Park Service, North Cascades National Park, Sedro Woolley, WA.

Misch, Peter
1966 Tectonic Evolution of the North Cascades of Washington State. In Symposium on Tectonic History and Mineral Deposits of the Western Cordillera in British Columbia and Neighboring Parts of the United States, *Canadian Institute of Mining and Metallurgy* Special Volume No. 8:101-128.

1977 *Geological Excursions in the Pacific Northwest.* Western Washington University Press, Bellingham.

National Oceanic and Atmospheric Administration
1979a *Local Climatological Data: Annual Summaries*. U.S. Government Printing Office, Washington, D.C.

1979b *Climates of the States*, Vol. 2. Water Information Center, Port Washington, NY.

Nelson, Charles G.
1969 *The Sunset Creek Site (45KT28)*. Report of Investigations No. 47. Laboratory of Anthropology, Washington State University, Pullman, WA.

1973 Prehistoric Culture Change in the Intermontane Plateau of Western North America. In *The Explanation of Culture Change: Models in Prehistory*, edited by C. Renfrew, pp. 371-390. Duckworth, London.

Newman, M. and P. Julig
1989 The Identification of Protein Residues on Lithic Artifacts from a Stratified Boreal Forest Site. *Canadian Journal of Archaeology* 13:119-132.

Osborne, Douglas
1956 Evidence of Early Lithic in the Pacific Northwest. *Research Studies of the State College of Washington* 24(1):38-44. Pullman, WA.

Osborne, D., W. W. Caldwell, and R. H. Crabtree
1956 The Problem of Northwest Coastal-Interior Relationships as Seen from Seattle. *American Antiquity* 12:117-128.

Percy, Richard C. W.
1972 Miscellaneous Archaeological Work: 1971. In *Salvage '71*, edited by R. L. Carlson, pp. 157-175. Publication No. 1. Department of Archaeology, Simon Fraser University, Burnaby, BC.

Perry, Madilane
1992 What Is That Black Stuff? Identification of Black Argillite in the Northern Columbia Plateau. *Northwest Anthropology Research Notes* 26:203-208.

Phillips, Earl L.
1966 *Washington Climate for These Counties: Northeast Clallam, Northeast Jefferson, Island, San Juan, Skagit, Snohomish, and Whatcom*. E.M. 2626. Cooperative Extension Service, College of Agriculture, Washington State University, Pullman.

Porter, Stephen C., Kenneth L. Pierce, and Thomas D. Hamilton
1983 Late Wisconsin Mountain Glaciation in the Western United States. In *Late-Quaternary Environments*, Vol. 1, The Late Pleistocene, edited by H. E. Wright Jr., pp. 71-111. The University of Minnesota Press, Minneapolis.

Post, Richard H. and Rachel S. Commons
1938 Material Culture. In *The Sinkaietk or Southern Okanogan of Washington*, by Walter Cline et al., pp. 37-70. General Series in Anthropology, Number 6, Leslie Spier, general editor. George Banta Publishing Co., Menasha, WI.

Price, T. Douglas and James A. Brown (editors)
1985 *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity.* Academic Press, New York.

Relander, Click (NOW-TOW-LOOK)
1965 Tokens, Tales, and Tepees. *The Mountaineer* 58(4):21-26.

Rice, David G.
1964 Indian Utilization of the Cascade Range in South Central Washington. *Washington Archaeologist*, 8(1):5-20.

1965 *Archaeological Test Excavations in Fryingpan Rockshelter, Mount Rainier National Park.* Report of Investigations No. 33, Laboratory of Anthropology, Washington State University, Pullman.

1969 *Archaeological Reconnaissance, South-Central Cascades, Washington.* Occasional Paper No. 2. Washington Archaeological Society, Seattle.

1972 *The Windust Phase in Lower Snake River Region Prehistory.* Reports of Investigations No. 50. Laboratory of Anthropology, Washington State University, Pullman.

Rice, David G. and M. Leland Stilson
1986 *A Resource Protection Planning Process Identification Component for the Paleoindian Study Unit.* An RP3 document prepared for the Washington State Department of Community Development, Office of Archaeology and Historic Preservation, Olympia, WA.

Rice, Harvey S.
1965 *The Cultural Sequence at Windust Caves.* Unpublished MA thesis, Department of Anthropology, Washington State University, Pullman.

1975 Preservation of Archaeological Resources. In *Washington Environmental Atlas*, 2nd edition, pp. 55-57. US Army Corps of Engineers, Seattle District.

n.d.a. *The Ross High Dam Archaeological Survey*. Report on file, National Park Service, Cultural Resources Division, Pacific Northwest Region, Seattle.

n.d.b. *An Archaeological Survey of the Proposed Roland Point Road and Recreational Development in the Ross Lake National Recreation Area.* Report on file, National Park Service, Cultural Resources Division, Pacific Northwest Region, Seattle.

Richards, Thomas H. and Michael K. Rousseau
1987 *Late Prehistoric Cultural Horizons on the Canadian Plateau.* Publication No. 16. Department of Archaeology, Simon Fraser University, Burnaby, BC.

Riedel, Jon L.
1987 *Chronology of Late Holocene Glacier Recessions in the Cascade Range and Deposition of a Recent Esker in a Cirque Basin, North Cascade Range, Washington.* Unpublished MA thesis, Department of Geography, University of Wisconsin, Madison.

1990 *Skagit River Project, FERC No. 553, Report on Existing Condition of Reservoir and Streambank Erosion.* Report on file, National Park Service, North Cascades National Park, Sedro Woolley, WA.

Riedel, Jon L. and Bruce Stoker
1991 *Skagit River Hydroelectric Project, FERC No. 553, Erosion Control Plan.* National Park Service, North Cascades National Park, Sedro Woolley, WA. Submitted to City of Seattle, City Light Department, Bellevue, WA.

Rousseau, Mike K.
1988 *Heritage Resource Inventory and Mitigation for the Ross Lake Provincial Park Campground Expansion Project, Upper Skagit Valley, British Columbia.* Submitted to Skagit Environmental Endowment Commission, Victoria, BC.

Salo, Lawr V.
1985 Large Scale Analytic Units: Chronological Periods and Types. In *Summary of Results, Chief Joseph Dam Cultural Resources Project*, edited by S. K. Campbell, pp. 183-221. Office of Public Archaeology, Institute for Environmental Studies, University of Washington, Seattle.

1987 *Similkameen River Multipurpose Project Feasibility Study, Cultural Resource Reconnaissance*. Report submitted to U.S. Army Corps of Engineers, Seattle.

Samuels, Stephen R. (editor)
1993 *The Archaeology of Chester Morse Lake: Long-Term Human Utilization of the Foothills in the Washington Cascade Range*. Project Report No. 21. Center for Northwest Anthropology, Department of Anthropology, Washington State University, Pullman.

Sanger, David
1968 Prepared Core and Blade Traditions in the Pacific Northwest. *Arctic Anthropology* V-1:92-120.

1969 Cultural Traditions in the Interior of British Columbia. *Syesis* 2:189-200.

1970 The Archaeology of the Lochnore-Nesikep Locality, British Columbia, *Syesis* 3, Supplement 1.

1970 Mid-Latitude Core and Blade Traditions. *Arctic Anthropology* VII-2:106-114.

Sappington, Robert L.
1985 Appendix 4. X-Ray Fluorescence Trace Element Analysis of Obsidian Artifacts From the Lake Roosevelt Project. In *Kettle Falls: 1978*, by David H. Chance and Jennifer V. Chance, pp. 357-366. Anthropological Report No. 84. Alfred W. Bowers Laboratory of Anthropology, University of Idaho, Moscow.

Sarna-Wojcicki, Andrei M., Duane E. Champion, and Jonathan O. Davis
1983 Holocene Volcanism in the Coterminous United States and the Role of Silicic Volcanic Ash Layers in Correlation of Latest-Pleistocene and Holocene Deposits. In *Late-Quaternary Environments of the United States*, vol. 2, edited by H. E. Wright, Jr., pp. 52-77. University of Minnesota Press, Minneapolis.

Seattle City Light
1991 *Offer of Settlement Concerning Cultural Resources (Archaeological and Historic Resources) Between the City of Seattle and the U.S. Department of Interior, National Park Service; and Upper Skagit Tribe, Sauk-Suiattle Tribe, and Swinomish Indian Tribal Community, Skagit River Hydroelectric Project FERC No. 553, Seattle.* Ms. on file, Seattle City Light Department.

Schalk, Randall F.
1984 Prehistoric Land Use in the Montane Coniferous Forest. In *Cultural Resources Investigations for Libby Reservoir, Lincoln County, Northwest Montana*, vol. 1: Environment, Archaeology, and Land Use Patterns in the Middle Kootenai River Valley, edited by A. V. Thoms, pp. 37-47. Project Report No. 2. Center for Northwest Anthropology, Washington State University, Pullman.

1988 *The Evolution and Diversification of Native Land Use Systems on the Olympic Peninsula.* Institute for Environmental Studies, University of Washington, Seattle. Submitted to the National Park Service, Cultural Resources Division, Pacific Northwest Region, Seattle, Contract No. CX-900-4-EO75

Schalk, Randall F. and Gregory C. Cleveland
1983 A Chronological Perspective on Hunter-Gatherer Land Use Strategies in the Columbia Plateau. In *Cultural Resource Investigations for the Lyons Ferry Fish Hatchery Project, Near Lyons Ferry, Washington*, edited by R. F. Schalk, pp. 11-56. Project Report No. 8. Laboratory or Archaeology and History, Washington State University, Pullman.

Schalk, Randall F. and Robert R. Mierendorf
1984 The Montane Coniferous Forest Ecosystem of Northwest Montana and Vicinity. In *Cultural Resources Investigations for Libby Reservoir, Lincoln County, Northwest Montana*, vol. 1: Environment, Archaeology, and Land Use Patterns in the Middle Kootenai River Valley, edited by A. V. Thoms, pp. 17-36. Project Report No. 2. Center for Northwest Anthropology, Washington State University, Pullman.

Sheppard, J. C., P. Wigand, and M. Rubin
1984 The Marmes Site Revisited: Dating and Stratigraphy. *Tebiwa* 21:45-49.

Shiner, Joel L.
1961 *The McNary Reservoir: A Study in Plateau Archeology.* River Basin Surveys Papers, No. 23, Smithsonian Institution, Bureau of American Ethnology, Bulletin 179, pp. 149-266. U.S. Government Printing Office.

Smith, Marian W.
1941 The Coast Salish of Puget Sound. *American Anthropologist* n.s., 43:197-211.

1950 The Nooksack, the Chilliwack, and the Middle Fraser. *Pacific Northwest Quarterly* 41:330-341.

1956 The Cultural Development of the Northwest Coast. *Southwestern Journal of Anthropology* 12:272-294.

Smith, Allan H.
1987 *Ethnography of the North Cascades*. Project Report No. 7. Center for Northwest Anthropology, Washington State University, Pullman.

Snyder, Warren A.
1956 Sampling at "Old Man House" on Puget Sound. *Research Studies of the State College of Washington* 24:17-37.

Soil Conservation Service
1975 *Soil Taxonomy*. Agriculture Handbook No. 436, U.S. Department of Agriculture, Washington, D.C.

Spier, Leslie
1936 *Tribal Distribution in Washington*. General Series in Anthropology 3. George Banta, Menasha, WI.

Staatz, M. H., P. L. Weis, R. W. Tabor, J. F. Robertson, R. M. Van Noy, E. C. Pattee, and D. C. Holt
1971 *Mineral Resources of the Pasayten Wilderness Area, Washington*. Geological Survey Bulletin No. 1325.

Staatz, M. H., R. W. Tabor, P. L. Weiss, J. F. Robertson, R. M. Van Noy, and E. C. Pattee
1972 *Geology and Mineral Resources of the Northern Part of the North Cascades National Park, Washington*. Geological Survey Bulletin No. 1359.

Stilson, M. Leland and James C. Chatters
1981 *Excavations at 45-SN-48N and 45-SN-49N Snohomish County, Washington*. Reports in Highway Archaeology No. 6. Office of Public Archaeology, University of Washington, Seattle.

Stevens, Rebecca A. and Jerry R. Galm
1991 *Archaeological Investigations near Rock Island Rapids: Excavations at 45CH309*. Reports in Archaeology and History 100-63. Archaeological and Historical Services, Eastern Washington University, Cheney, WA.

Stryd, Arnoud H.
1973 *The Later Prehistory of the Lillooet Area, British Columbia*. Unpublished Ph.D. dissertation, Department of Archaeology, University of Calgary, Alberta.

Stryd, Arnoud H. and Michael Rousseau
1996 *The Early Prehistory of the Mid Fraser-Thompson River Area.* In Early Human Occupation in British Columbia, edited by Roy L. Carlson and Luke Dalla Bona, pp. 177-204, University of British Columbia Press, Vancouver.

Stuiver, Minze and Paula J. Reimer
1993 Extended ^{14}C Data Base and Revised Calib 3.0 ^{14}C Age Calibration Program. *Radiocarbon* 35:215-230.

Stuiver, Minze and G. W. Pearson
1993 High-precision Calibration of the Radiocarbon Time Scale, AD 1950-500 BC and 2500-6000 BC. *Radiocarbon* 35:215-230.

Suttles, Wayne
1957 The "Middle Fraser" and "Foothills" Cultures: A Criticism. *Southwestern Journal of Anthropology* 13(2):156-183.

Suttles, Wayne and Aldona Jonaitis
1990 History of Research in Ethnology. In *Northwest Coast*, edited by Wayne Suttles, pp. 73-87. Handbook of North American Indians, vol. 7, William C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.

Suttles, Wayne and Barbara Lane
1990 Southern Coast Salish. In *Northwest Coast*, edited by Wayne Suttles, pp. 485-502. Handbook of North American Indians, vol. 7, William C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.

Swanson, Earl H., Jr.
1959 Archaeological Survey of the Methow Valley, Washington. *Tebiwa* 2(1):72-87.

1961 Appendix, The Old Cordilleran Culture Hypothesis: A Problem in Environmental Archaeology. In *The Old Cordilleran Culture in the Pacific Northwest*, by B. Robert Butler, pp. 104-111. Occasional Paper No. 5. Idaho State College Museum, Pocatello.

1962 *The Emergence of Plateau Culture.* Occasional Paper No. 8. Idaho State College Museum, Pocatello.

Swanton, John R.
1952 *The Indian Tribes of North America.* Bureau of American Ethnology Bulletin 145. Smithsonian Institution, Washington, DC.

Taber, Richard D.
1971 *Biotic Survey of the Ross Lake Basin.* Report on file, National Park Service, North Cascades National Park, Sedro Woolley, WA.

Taylor, Herbert C. Jr.
1974 *Anthropological Investigations of the Makah Indians Relative to Tribal Identity and Aboriginal Possession of Lands.* Coast Salish and Western Washington Indians III. Garland Publishing Inc., New York.

Teit, James A.
1900 The Thompson Indians of British Columbia. *American Museum of Natural History Memoirs* 2:4. New York.

1909 The Shuswap. *American Museum of Natural History Memoirs* 4:7. New York.

1930 The Salishan Tribes of the Western Plateaus. *Annual Report of the Bureau of American Ethnology* 45:295-396. US Government Printing Office, Washington, D.C.

Thomas, David H.
1978 Arrowheads and Atlatl Darts: How the Stones Got the Shaft. *American Antiquity* 43:461-472.

1989 Diversity in Hunter-Gatherer Cultural Geography. In *Quantifying Diversity in Archaeology*, edited by R. D. Leonard and G. T. Jones, pp. 85-91. Cambridge University Press, Cambridge.

Thompson, Gail
1978 *Prehistoric Settlement Changes in the Southern Northwest Coast: A Functional Approach.* University of Washington, Department of Anthropology, Reports in Archaeology No. 5, Seattle.

Thoms, Alston V.
1984 The General Nature and Distribution of Cultural Resources. In *Cultural Resources Investigations for Libby Reservoir, Northwest Montana*, vol. 1: Environment, Archaeology, and Land Use Patterns in the Middle Kootenai River Valley, edited by Alston V. Thoms, pp. 69-105. Project Report No. 2. Center for Northwest Anthropology, Washington State University, Pullman.

1989 *The Northern Roots of Hunter-Gatherer Intensification: Camas and the Pacific Northwest.* Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

Thoms, Alston V. and Greg C. Burtchard
1987 *Prehistoric Land Use in the Northern Rocky Mountains: Perspective From the Middle Kootenai River Valley*. Project Report No. 4. Center For Northwest Anthropology, Washington State University, Pullman.

Thorson, R. W.
1980 Ice-sheet Glaciation of the Puget Lowland, Washington, During the Vashon State (late Pleistocene). *Quaternary Research* 13:303-312.

Treganza, Alan E.
1963 *An Archaeological Survey of the Aboriginal and Early Historic Sites of Lassen Volcanic National Park, California*. Frederic Burk Foundation for Education. Submitted to the National Park Service, Lassen Volcanic National Park, Contract No. 14-10-0434-856.

Turner, Nancy J. and Roy Taylor
1972 A Review of the Northwest Coast Tobacco Mystery. *Syesis* 5:249-257.

Turner, Nancy J., Laurence C. Thompson, M. Terry Thompson, and Annie Z. York
1990 *Thompson Ethnobotany*. Memoir No. 3. Royal British Columbia Museum, Victoria.

U.S. Department of Interior
1990 *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. National Park Service, Interagency Resources Division, Washington, DC.

1991 *Guidelines for Completing National Register of Historic Places Forms, Part B, How to Complete the National Register Multiple Property Documentation Form*. National Register Bulletin 16B. National Park Service, Interagency Resources Division, Washington, DC.

Valley, Derek R.
1975 *Archaeological Salvage of the Rock Island Overlook Site, 45CH204*. Washington Archaeological Research Center, Washington State University, Pullman.

Vanbianchi, Ronald and Steven J. Wagstaff
1988 A Floristic Survey of Big Beaver Valley. In *Plant Life of Washington State: Big Beaver Valley and the Kettle Range*, Douglasia Occasional Papers, pp. i-61, Washington Native Plant Society, Volume Three, Seattle.

Vivian, Brian C.

1989a *A Survey and Assessment of the Prehistoric Cultural Resources of the Princeton Basin, Upper Similkameen Valley, British Columbia.* Report prepared for the Archaeology and Outdoor Recreation Branch, Victoria, BC, Permit No. 1987-9.

1989b *A Survey and Assessment of the Cultural Resources in Cathedral Provincial Park, BC.* Report prepared for the British Columbia Ministry of Environment and Parks, Southern Interior Region, Kamloops, Permit No. 1988-80.

1992 *Similkameen Valley Prehistory: Cultural Interaction Across the Interior Plateau of British Columbia and Washington State.* Unpublished MA thesis, Department of Archaeology, University of Calgary, Alberta.

Watanabe, Hitoshi

1968 Subsistence and Ecology of Northern Food Gatherers with Special Reference to the Ainu. In *Man the Hunter*, edited by Richard B. Lee and Irven DeVore, pp. 69-77. Aldine Publishing Co., Chicago.

Waitt, R. B., Jr.

1977 Evolution of Glaciated Topography of Upper Skagit Drainage Basin, Washington. *Arctic and Alpine Research* 9:183-192.

1979 Rockslide-Avalanche Across a Distributary Lobe of Cordilleran Ice in the Pasayten Valley, Northern Washington. *Arctic and Alpine Research* 11:33-40.

Waitt, R. B., Jr. and R. M. Thorson

1983 The Cordilleran Ice Sheet in Washington, Idaho, and Montana. In *Late Quaternary Environments of the United States*, vol. 1: The Late Pleistocene, edited by S. C. Porter, pp. 54-70. University of Minnesota Press, Minneapolis.

Wendorf, Fred and John P. Miller

1959 Artifacts From High Mountain Sites in the Sangre de Cristo Range, New Mexico. *El Palacio* 66:37-52.

Whitlock, Cathy

1992 Vegetational and Climatic History of the Pacific Northwest During the Last 20,000 Years: Implications for Understanding Present-Day Biodiversity. *The Northwest Environmental Journal* 8(1):5-28.

Willig, Judith A., C. Melvin Aikens, and John L. Fagan (editors)
1988 *Early Human Occupation in Far Western North America: The Clovis-Archaic Interface.* Anthropological Papers No. 21. Nevada State Museum, Carson City, NV.

Wilson, Robert L. and Catherine Carlson
1980 *The Archaeology of Kamloops.* Publication No. 7. Department of Archaeology, Simon Fraser University, Burnaby, BC.

Wood, W. Raymond and Donald Lee Johnson
1978 A Survey of Disturbance Processes in Archaeological Site Formation. In *Advances in Archaeological Method and Theory*, vol. 1, edited by Michael B. Schiffer, pp. 315-381. Academic Press, New York.

Wormington, H. Marie
1957 *Ancient Man in North America.* Popular Series No. 4. Denver Museum of Natural History.

Wright, Robin K.
1991 *A Time of Gathering.* Monograph No. 7. Thomas Burke Memorial Washington State Museum, Seattle.

Zweifel, Matthew K. and Connie S. Reid
1991 Prehistoric Use of the Central Cascade Mountains of Eastern Washington State: An Overview of Site Types and Potential Resource Utilization. *Archaeology in Washington* 3:3-16.

APPENDIX A: DEFINITIONS OF ARTIFACT CATEGORIES FOR THE PROJECT AREA

This appendix is divided into two sections. The first section (I) is a listing of artifact category names that have been used during recording of sites on field forms and in the object name field of the artifact catalog record. The artifact catalog record is created as each object is cataloged in the NPS Automated National Catalog System (ANCS). Many of the definitions employed here are specific to the sample of artifacts from the project area, and they may have been more broadly defined in other localities or regions.

The second section (II) is a list of artifact category names and definitions that were used in the comparative lithic analysis of sites 45WH262 and 45WH224. In some cases, the same term and definition are used in both sections. Also, some of the terms listed in section I are subdivided for analytic purposes in section II into a series of more precisely and narrowly defined categories.

I. Terms and Definitions Used in Site Recording and Testing

A. **Abrading Stone**

Lithic artifact class exhibiting cultural wear patterns such as grooves, striations, or smoothness resulting from use to grind, smooth, or abrade another object. Morphologically, this category exhibits a variety of shapes, including tabular, spherical, polyhedral, and irregular. Objects in this category are usually made of coarse-grained or gritty rock types.

B. **Adz Blade**

Lithic artifact class shaped by some combination of cutting, grinding, abrading, and polishing. Morphologically, adz blades are variable depending on a number of factors, including, among others, the intended function of the finished blade, the stage of manufacture, the hardness of the material, and the way it was shaped. Objects in this category must have a beveled bit (acute-angled edge) that functioned as a cutting or chopping tool. A tough stone belonging to the nephrite-jadeite-serpentenite series was most often used as the raw material.

C. **Biface**

A flaked lithic artifact class having a roughly tabular shape, resulting in the appearance of two distinct faces or sides. Each face exhibits flake scars, indicating shaping of both sides by the flaking process. The margins are formed at the junction of the faces, and are more-or-less acute-angled. A broad artifact category that covers a range of more specifically defined functional or technological categories, such as projectile point or biface stage I.

D. **Cobble, Flaked**

Lithic artifact class consisting of a whole or fragmentary piece of lithic material exhibiting a naturally smoothed cortex on some part of its surface and flake scars resultant from intentional flaking on other portions of its surface.

E. **Cobble Tool**

Flaked lithic artifact class consisting of a flaked cobble having a bifacially or unifacially flaked margin (or some other shaped feature, such as a projection), especially if this margin exhibits crushing, battering, smoothing, grinding, polishing, flaking, or any other wear pattern resultant from its use as a tool.

F. **Core**

Flaked lithic artifact class defined by use as the nucleus for the production of flakes. Exhibits a series of adjacent scars indicating flake removal from the same platform, or exhibits a series of flake scars removed from multiple platforms, or both.

G. **Core, Microblade**

Flaked lithic artifact class defined as a core specialized for the production of microblades. This category exhibits at least one series of adjacent blade scars.

H. **Core, Modified**

Flaked lithic artifact class consisting of a core that exhibits secondary flaking, grinding, abrading, smoothing, polishing, or some other intentional shaping or wear indicative of use in addition to flake production, such as for scraping.

I. **Debitage**

Flaked lithic artifact class consisting of a whole or broken flake, shatter, or possibly other lithic category. A broad artifact category that covers a range of more specifically defined categories of flakes and flaking debris.

J. **Drill**

Flaked lithic artifact class having morphological characteristics that include a narrow, straight-to-slightly-tapering bit. The bit is diamond-shaped in cross-section and is thick relative to width and length. The distal end is weakly pointed. The proximal end flares in outline and the cross-section is lenticular, to form a distinct "flattened" area (same as "key-shaped"). A drill was rotated by hand or mechanically in order to make holes in softer materials.

K. Faunal Remains

Organic artifact class consisting of fish or animal parts. Within the project area, all faunal remains are animal bones, whole or broken, that with these three characteristics: they are directly associated with artifact-bearing deposits or archeological features, they occur as small fragments, and they are charred or calcined.

L. Fire-Modified Rock (FMR)

Lithic artifact class of objects that are culturally modified by intentional heating. Morphological properties consist of angular-blocky or curvilinear breaks and heat-alteration of minerals in the rock (made apparent by reddening or darkening due to oxidation of iron and other metallic minerals). Occasionally, carbon or soot-stained rock surfaces are observed. This is a difficult artifact category to recognize due to the variety of natural processes that can result in this morphology. Within the project area, a more certain criterion for recognition is archeological context. Contextual criteria include the occurrence of FMR in *in situ* deposits, in direct association with artifact-bearing charcoal-enriched strata; in direct association with reddish-brown, heat-oxidized sediments; and in discrete geometric patterns or arrangements of groups of FMR (such as circular hearths and rock-lined hearths).

M. Flake

Lithic artifact class consisting of a piece removed by flaking from a larger nodule, block, or artifact of stone. A flake is recognized by the presence of the morphological attributes which are characteristic of a conchoidal fracture (Hertzian cone). A complete flake exhibits a platform (same as point of contact) at the proximal end, a bulb of force on the ventral surface, and the flake terminal margin at the distal end. A flake fragment is recognized by the presence of any portion of a ventral flake surface. A variety of more specific kinds of flakes are recognized on the basis of technological and functional criteria, and are referred to as bipolar, edge-modified or pressure flakes.

N. Graver

Flaked lithic artifact class of with morphological characteristics that include a tapering, curved bit projecting from a more or less circular mass. It is plano-convex in cross-section, which reflects the fact that it is a uniface (manufactured by removing flakes from one face of a flake). The distal end is narrowly tapered and sharply pointed. The proximal end flares in outline to form a distinct "flattened" round or tear-drop shaped end, where it is presumed to have been held between the fingers during use. These are believed to have been used to score, engrave, or groove softer materials.

O. **Ground Uniface**

Lithic artifact class characterized by the use of grinding, abrasion, or polish to shape the object by removal of material from one face.

P. **Ground Biface**

Lithic artifact class characterized by the use of grinding, abrasion, or polish to shape the object by removal of material from both faces. Functionally, this artifact class appears to have been used as a knife.

Q. **Hammerstone**

Lithic artifact class defined by morphological properties indicating use as a percussion tool. Properties include shape and texture of the surface. Shape (and size) is variable; hammerstones that have seen little use are the shape of the unmodified rock, while those that are well used assume a regular or geometric shape. A large number of percussion impacts results in a pitted and pecked surface texture, often in a nonrandom pattern or concentrated on a restricted part of the surface. Texture is a more reliable indicator than shape. On well-used hammerstones, both shape and textural properties are prominently displayed.

R. **Hammerstone Spall**

Lithic artifact class consisting of a hammerstone fragment.

S. **Hearth Stones**

Lithic artifact class consisting of FMR that form a geometric pattern or discrete concentration, found in association with non-lithic artifacts indicative of food preparation, such as faunal remains.

T. **Knife**

Flaked or groundstone lithic artifact class of objects that functioned as cutting tools. This class is variable and can encompass unifaces, bifaces, flakes, or other morphological types. Criteria for inferring function include use-wear pattern, shape, and size. In this project, size and shape criteria were used. The term knife was assigned to bifaces technological typed as IV or V (see definitions in section II) and matching one of these two properties: they are too large for use as projectile points, and they exhibit an asymmetrical blade and/or hafting segment.

U. **Microblade**

A narrowly-defined type of flake. Morphologically, this class consists of flakes that are more than twice as long as they are wide, are thin relative to length and width, have nearly parallel lateral margins, and are < 10 mm wide. However, this morphological type can be produced incidentally in low frequencies during the production of other flaked tools. Using technological criteria, this class consists of blades removed from a prepared microblade core. Physical characteristics required for inclusion using technological criteria include the morphological criteria above, plus either the presence of two dorsal ridges (same as "trapezoidal in cross-section"), or evidence at the proximal blade end for lipping or other evidence for intentional preparation of a blade platform.

V. **Ornament, Groundstone**

Lithic artifact class that has been ground into a geometric shape and that appears to have had no other function other than as an ornament. This class most often displays incised or engraved lines.

W. **Pestle**

Groundstone lithic artifact class morphologically defined by shape and wear pattern. Although size is variable, this class is rod- or cylinder-shaped. The wear pattern consists of at least one pecked, battered, or smoothed surface at the distal or proximal end. Occasionally, similar textural patterns are observed along the sides of the cylinder. In the project area, geometrically-shaped or flaring tops were not observed. These tools are believed to have been used to grind and pulverize organic materials.

X. **Pigment**

Lithic artifact class defined by color and material. Size and shape are highly variable. Soft (hardness of ~ 2 or less on Moh's scale), fine-grained rock or mineral that is reddish-brown, to yellowish-red, to red (due to a high Fe_2O_3 content).

Y. **Pipe**

Groundstone lithic artifact class defined morphologically by the presence of a bowl or stem. The bowl is thin-walled and forms either a sphere or flares to form a funnel-shape. The stem is a hollowed-out tube. Both specimens from the project area are bowl fragments. One of these is decorated with incised lines. Both are inferred to have functioned as smoking pipes.

Z. **Preform**

Flaked lithic artifact class representing the middle stages of biface tool manufacture. Morphologically, nearly equivalent to biface stage III or IV (see definitions in section II). This class of biface is inferred to be an unfinished tool that requires further modification prior to becoming functional.

AA. **Projectile Point**

Flaked lithic artifact class that functioned as the piercing tip of an arrow, dart, or spear. Morphologically, this class exhibits the criteria of a biface III, IV, or V (see definitions in section II), it has a sharp point (on complete specimens), and it has a more or less symmetrical hafting shape at its proximal end. The hafting design elements include notches, shoulders, and stems.

BB. **Quarry Blank**

Flaked lithic artifact class representing the early stages of biface tool manufacture. Morphologically, nearly equivalent to biface stage I and II (see definitions in section II). From a technological standpoint, this class of biface is inferred to be only partially flaked in order to reduce weight and waste material, and it requires subsequent manufacturing prior to formation of a finished tool. From a functional standpoint, however, this class of objects could serve as a flake core, a wedge, or some other tool.

CC. **Quartz Crystal, Modified**

Flaked lithic artifact class consisting of a broken or complete, euhedral (having well-formed, regular crystal faces) quartz crystal that exhibits, on some portion of it, physical attributes of a conchoidal fracture. In most cases, multiple flake scars are present.

DD. **Scraper (Edge-Modified Flake)**

Flaked lithic artifact class defined on the basis of edge shaping and wear pattern. Overall shape and size are variable, as these reflect the morphology of the core from which the flake was removed. The edge is shaped by unifacial (usually from dorsal side) removal of a series of short flakes along some portion of the flake margin, creating a more or less steeply-beveled and thickened edge, as compared with the unaltered margin. A particular wear pattern is the product of a variety of variables, such as the kind of material worked and the angle of tool edge relative to the worked material. Most often, a wear pattern appears as a series of micro-flake scars that blunt the edge or polishing and smoothing that results in rounding of the tool edge. Artifacts from the project area are assigned to this class on the basis of edge shaping alone; some exhibit prominent wear patterns and some do not.

EE. **Shatter**

Flaked lithic artifact class defined morphologically according to the following attributes: Overall shape is irregular, but angular blocky shapes predominate. One or more surfaces are covered by conchoidal fracture attributes (eg., compression rings, radial striations, negative bulb of force, etc.), but the object does not meet the criteria that permit inclusion in another category, such as flake. The production of shatter is a function of the flaking techniques used and the fracture characteristics of any particular lithic raw material.

FF. **Shatter, Edge-Modified**

Flaked lithic artifact class consisting of shatter that has been modified by removal of flakes. Edge modification can result from intentional flaking of the edge or from use of the edge as a tool, but the degree of modification does not meet criteria that permit inclusion in another flaked lithic category.

GG. **Stone, Ground**

Lithic artifact class shaped by any combination of the processes of abrasion, grinding, or pecking, as inferred from morphological criteria. Physical properties useful for recognition include surfaces that exhibit pitting, a roughened texture caused by crushing and dislodgment of some portion of the crystalline matrix, scratches, grooves, and striations. Artifacts in this class do not meet criteria that permit inclusion in another groundstone category.

HH. **Tested Nodule**

Flaked lithic artifact that has been minimally altered by intentional shaping. This class is irregular in shape (spherical, tabular, cylindrical, discoidal, blocky) and size (cobble to boulder). Distinguishing morphological properties include an exterior surface covered almost entirely by weathered cortex; the interior (subcortex) is exposed on flaked surfaces following removal of some cortex. Flaked surfaces are recognized by the presence of conchoidal fracture attributes (eg., compression rings, radial striations, negative bulb of force). This class is the product of deliberate examination of lithic raw material characteristics, such as texture, homogeneity, color, and flakeability.

II. **Tool, Unspecified**

Lithic artifact class of flaked or groundstone object of unusual shape and unknown function. The variability in form, raw material, and any other physical attributes requires unique description of each item in the class.

JJ. **Utilized Flake**

Flaked lithic artifact category that is a specific type of flake. The class is defined by a unifacial or bifacial wear pattern. Overall shape and size are variable, as these reflect the morphology of the core or other object from which the flake was removed. The wear pattern is expressed as a series of micro-flake scars that blunt, crush, or dull the edge, or by polishing and smoothing that results in rounding of the tool edge. It may or may not be possible to infer the nature of the material that was worked or processed by the tool.

KK. **Wedge (*pièce esquillée*)**

Flaked lithic artifact category defined on the basis of overall morphology. Although variable in size and shape, physical characteristics consist of two converging planes (or faces) forming an acute angle at the distal end and a wide, or blunt, proximal end. Wear marks at the distal end include micro-flake scars and a crushed or blunted edge. Wear marks at the distal end include crushed mineral grains and crystals, pecked areas, pits, and related impact marks. The class may have functioned to split bone, antler, and other materials.

II. Terms and Definitions Used For Comparative Lithic Analysis of Sites 45WH262 and 45WH224

The definitions that follow are those that were used to classify chipped stone flaking debris and formed tools from sites 45WH262 and 45WH224. Each category listed below is defined according to physical or morphological properties observed on each classified item. The properties are not listed as necessary or sufficient for inclusion within a defined category, instead, a preponderance of the physical properties are required for inclusion.

The purpose of the lithic analysis is to describe the cultural process (the technology) of transforming stone raw materials into functional stone objects, whether they be tools or have some other nonutilitarian use. The definitions thus reflect a series of morphological changes in stone raw materials that begins with a relatively unformed mass of stone and that eventually ends in the form of a finished tool or some other desired shape. The series of steps or stages represented by the definitions are analytical and descriptive; they are neither intended nor assumed to reflect equivalent stages or recognized forms within the culture or society that produced them.

The definitions for biface categories are derived partially from Callahan (1979) and Ahler (1986). They have been modified here to describe assemblages in North Cascades National Park Service Complex. The use of these and other flaked lithic categories does not differ substantially from conventional usage, but the modifications reflect the somewhat distinctive fracture mechanics of Hozomeen chert and other locally available raw materials utilized by the prehistoric inhabitants of the northern Cascade Range.

Other chipped stone categories are related to distinctive flaking technologies or techniques that have widespread and common use by prehistoric populations, including those of the upper Skagit River Valley (such as blade production [micro- or macro-] production and river cobble reduction). The flake and debitage categories defined here have been modified somewhat to reflect the characteristic fracture properties of Hozomeen chert, which is brittle, nonhomogeneous, and permeated with macrocrystalline quartz veins. Consequently, when flaking Hozomeen chert, unintended and unpredictable fractures are common, which results in relatively high rates of debitage production.

A. Biface Categories

1. The first step in biface manufacture requires selection of the object to be further reduced. These **stage I** forms are referred to as "blanks" and usually consist of a flake, a more or less spherically shaped nodule, or a tabular piece. A blank can be any piece of stone material that can be worked into a biface, and as a category has any number of physical properties and shapes, none of which are necessarily diagnostic because they may or may not display evidence of having been flaked. No artifacts from 45WH262 were classified as stage I biface.

2. A **stage II biface** results from the initial creation of the acute-angled edge or margin wherein the original shape of the blank is altered in order to prepare the stone for removal of thick, and subsequently, thinner flakes. The physical properties observed in this category include:

    a. Short, broad flake scars
    b. Margins are very sinuous with some segments ground or otherwise blunted for platform preparation
    c. Some edges not yet narrowed to an acute angle and some margin segments show the removal of an adjacent series of flakes along only part of the total margin length
    d. Biface lacks bilateral and bifacial symmetry
    e. Cross-sections are thick and irregular
    f. For various lengths along margin segments, there are numerous stacked step fractures, consisting of composite step or hinge terminations at the distal flake scars
    g. Bulbous, irregular-shaped masses on both faces are common
    h. Along the sinuous margins are many prominent and thick platforms
    i. Shaping is predominately by percussion techniques.

3. A **stage III biface** has gone through the primary thinning process, wherein large irregular masses of stone and cortex have been removed,

resulting in a symmetrical shape. The physical properties observed in this category include:

a. Flake scars travel at least to the midline of the biface
b. Margins are nearly straight with low sinuosity
c. Most of the total margin length is narrowed to an acute angle
d. Cross-sections are mostly regular, lenticular, and moderately thinned
e. Plan view outlines are nearly symmetrical
f. Platforms and blunt margin segments are smaller and less frequent than in Stage II
g. Composite hinge and step terminations are common, especially adjacent to irregular or protruding masses that would not detach as a flake
h. Irregular or protruding masses of stone have been removed for the most part, but one or both faces may retain these
i. Shaping is predominately by percussion techniques.

4. A **stage IV biface** has been secondarily thinned and have become longitudinally and transversely symmetrical. The physical properties observed in this category include:

a. Flake scars travel beyond the midline of the biface
b. Margins are straight, regular, and even
c. All lateral margins are narrowed to an acute angle
d. Cross-sections are symmetrical, lenticular, and thin relative to width
e. Plan view outlines are mostly symmetrical, with bilateral and bifacial symmetry well-developed
f. Remnant platforms and blunt margin segments have disappeared
g. Negative flakes scars and outline morphology show that some outrepasse flakes and thin, expanding biface thinning flakes were removed
h. Margins are sharp, even, and symmetrical
i. Final shaping is predominately by pressure flaking techniques and grinding.

5. A **stage V biface**, as defined here, has been shaped in preparation for use as a tool by creation of features, such as notches or flutes, for hafting in a handle or for other needs. It differs from stage IV biface by the presence of such features, or evidence for additional workmanship, consisting of physical properties that include:

a. Percussion flake scars are entirely overlain or obliterated by pressure flake scars
b. Margins are straight, even, and sharp
c. Cross-sections are very thin relative to length and width
d. Bilateral and bifacial symmetry is highly developed.

6. **Outrepasse flake** is a type of biface thinning flake that, during detachment, removed a portion of the margin opposite to the platform margin. It is thus characterized by having a platform consisting of a biface margin at the proximal end and a distal termination that includes a portion of the other biface margin. In more simple words, the flake spans the width of the biface. Although outrepasse flake is a category having relatively few members, it was treated in the analysis as a biface, and where the morphological attributes allowed, was typed according to the biface stage sequence defined above.

B. Flake and Debitage Categories

1. **Thick flake** has these physical characteristics:

a. Is visually judged as thick relative to width (most are broken along the length [longitudinal axis])
b. Dorsal surface shows sharp ridges, bulbous masses, single and multiple step fractures, and hinge terminations
c. Platform is large and acute angled or flat (platform and dorsal surface form a near right angle.

2. **Thin flake** has these physical characteristics:

a. Is visually judged as thin relative to width
b. Platform is small and a remnant of the acute edge of a biface (it appears faceted due to remnant flake scars removed from the opposite face of biface)
c. Dorsal surface is covered with multiple flake scars, subdued ridges, and lacks bulbous masses and multiple step and hinge terminations.

3. **Bifacial thinning flake** has these physical attributes:

a. Flake longitudinal axis is gently curving, with the dorsal surface convex and the ventral surface concave (i.e., the dorsal flake surface is the curved surface of one face of the biface that it was removed from)
b. Flake transverse axis is thin and nearly flat

c. Negative flake scars on dorsal surface show compression rings emanating from platforms on the opposite margin
d. Broken items can be classified, as long as they exhibit clear evidence of flaking from two opposite margins, including flake scars on the dorsal surface showing flake removal from an opposite margin, or the item is large enough to retain the biface curve on the dorsal surface along with multiple flake scars.

4. **Pressure flake** has these physical attributes:

a. Is extremely thin and small (usually < 1 cm long)
b. A very small platform, often lipped, and consisting of the acute margin of the biface
c. A diffuse (as distinct from prominent) bulb of force
d. Dorsal surface is flat and thin in transverse section and thin and curving in longitudinal section (reflecting the biface surface, as do biface-thinning flakes)
e. Dorsal surface is covered by many flake scars.

5. **Small percussion flake** has the following physical attributes:

a. Short, broad flake
b. Relatively large, acute or flat platform
c. Prominent bulb of force
d. Often irregular in shape
e. Dorsal surface frequently shows multiple step or hinge fractures, thick masses, and relatively few negative flake scars.

6. **Blade** has these physical attributes (includes both microblades and macroblades):

a. More than twice as long as wide
b. Lateral margins are nearly parallel
c. At least one dorsal keel, which is parallel to the lateral margins
d. Often has an overhanging lip on the platform above the negative bulb impression
e. Evidence of grinding or other means of blunting the platform margin to remove the overhanging lip or other projections prior to blade removal.

7. **Shatter** has these physical attributes:

a. Blocky in overall shape, often with near right-angle corners between flat faces

b. Lacks bulb of force (ventral surface) or platform
c. At least one face exhibits a partial flake scar or other evidence of flaking or fracturing.

8. **Unclassified flake**: is so fragmented that it cannot be classified beyond the recognition that it is a piece of what was once a larger, complete flake. Some broken flakes are large enough to be classified as either thick or thin. It has these attributes:

   a. Flake is so broken as to lack any other attributes that permit classification
   b. The fragment exhibits a clear dorsal and ventral surface (most often exhibiting compression rings or other flake attributes)
   c. Lateral, distal, and proximal margins are missing.

APPENDIX B: DESCRIPTION OF RADIOCARBON-DATED SAMPLES

Collected charcoal samples were placed in labeled, plastic zip-lock bags. In the lab they were dried and cleaned of lithic and organic materials (most often this was plant rootlets). If at all possible, samples selected for dating were divided in order to retain a portion for long-term curation. In most cases this was not possible due to small sample sizes that required burning of the entire sample to get a reliable age estimate.

The dates are reported in radiocarbon years before AD 1950 as they were received from Beta Analytic, Inc. This date is referred to in the report as the uncorrected date. Each uncorrected date has been converted into calendar years through the use of the a software program called CALIB V 3.0.3, developed by Stuiver and Riemer (1993) that adjusts uncorrected dates by calibration with tree-ring dates. This provides a corrected before present (BP) date and a corrected calendar (BC/AD) date. It also provides the age range spanned by one standard deviation. These samples were calibrated using Dataset 1, Method A (Stuiver and Pearson 1993). The information below is present in ascending order by sample number.

The abbreviations used in the provenience section of the samples are as follows. "B.U.D." means: below unit datum. "B.U.S." means: below unit surface. More detailed information about artifacts associated with the dates can be found in the individual site descriptions in Section 10.2 of this report.

Sample Number: Beta-33508

Age Estimate

Uncorrected Date: 310±70
Corrected BP Date: 312 (468-290)
Corrected Calendar Date: AD 1638 (1660-1482)

Provenience

Site: 45WH228
Test Unit: TU3
Unit Quad: N/A
Level: L-3
Depth: 44 cm B.U.D.

Stratigraphic Context

Matrix: Thermally altered reddish-brown (no Munsell), poorly sorted, gravelly silty sand.
Soil Horizon: B

Depositional Environment: Alluvial
Landform Type: Alluvial Fan

Cultural Context

Artifacts: No cultural material in this level, but cultural material was present in the overlying levels 1 and 2.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 27.1 g
Dated Carbon Wt: 2.1 g
Counting Time: Standard

Interpretation and Comments

Tephra sample NOCA 7712 in level 2, Mount St.Helens-W 500 years BP.

Sample Number: Beta-33509

Age Estimate

Uncorrected Date: 2670±70
Corrected BP Date: 2763 (2844-2747)
Corrected Calendar Date: 814 BC (894-797)

Provenience

Site: 45WH296
Test Unit: TP1
Unit Quad: None
Level: L-10
Depth: 100-120 cm from screen

Stratigraphic Context

Matrix: Brown (no Munsell), poorly sorted, coarse sand and gravel.
Soil Horizon: C
Depositional Environment: Alluvial
Landform Type: Flood plain

Cultural Context

Artifacts: None in this level.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 23.9 g
Dated Carbon Wt: 0.9 g
Counting Time: Extended

Sample Number: Beta-33510

Age Estimate

Uncorrected Date: 2530±130
Corrected BP Date: 2717 (2760-2357)
Corrected Calendar Date: 768 BC (917-372)

Provenience

Site: 45WH303
Test Unit: TU6
Unit Quad: East half
Level: L-7
Depth: 70-80 cm B.U.D.

Stratigraphic Context

Matrix: Brown to reddish-brown (no Munsell), well sorted silty sand loam.
Soil Horizon: B or BC
Depositional Environment: Alluvial
Landform Type: Flood plain

Cultural Context

Artifacts: No cultural material in this level.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 5.7 g
Dated Carbon Wt: 0.44 g

Counting Time: Extended

Sample Number: Beta-40693

Age Estimate

Uncorrected Date: 230±80
Corrected BP Date: 287 (312-0)
Corrected Calendar Date: AD 1663 (1954-1638)

Provenience

Site: 45WH237
Test Unit: TU2
Unit Quad: NE
Level: L-4
Depth: 45 cm B.U.D.

Stratigraphic Context

Matrix: Dark brown (7.5YR 3/4m), sandy clay loam
Soil Horizon: B
Depositional Environment: Colluvium
Landform Type: Bedrock Bench

Cultural Context

Artifacts: Hozomeen chert debitage excavated in association with this date, as were the following formed tools: NOCA 7894 (Hozomeen chert biface), NOCA 7902 (Hozomeen chert biface).
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 3.7 g
Dated Carbon Wt: 0.6 g
Counting Time: Standard

Sample Number: Beta-40695

Age Estimate

Uncorrected Date: 1890±90
Corrected BP Date: 1825 (1925-1710)
Corrected Calendar Date: AD 125 (240-25)

Provenience

Site: 45WH241
Test Unit: TU1
Unit Quad: NE/NW
Level: L-4
Depth: 40-50 cm B.U.D.

Stratigraphic Context

Matrix: Brown to reddish-brown (7.5YR 4/5m), poorly sorted, gravelly sand loam
Soil Horizon: B
Depositional Environment: Poorly sorted alluvium
Landform Type: Alluvial Fan

Cultural Context

Artifacts: Same as sample Beta-40696
Features: Same as sample Beta-40696

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 9.0 g
Dated Carbon Wt: 1.6 g
Counting Time: Standard

Sample Number: Beta-40696

Age Estimate

Uncorrected Date: 1430±90
Corrected BP Date: 1309 (1398-1278)
Corrected Calendar Date: AD 641 (552-672)

Provenience

Site: 45WH241
Test Unit: TU1
Unit Quad: NW
Level: L-4
Depth: 40-50 cm B.U.D.

Stratigraphic Context

Matrix: Brown to reddish-brown (7.5YR 4/5m), poorly sorted, gravelly sand loam.
Soil Horizon: B
Depositional Environment: Poorly sorted alluvium
Landform Type: Alluvial Fan

Cultural Context

Artifacts: Same as for Beta 40695
Features: Same as for Beta 40695

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 3.7 g
Dated Carbon Wt: Unknown
Counting Time: Standard

Sample Number: Beta-40697

Age Estimate

Uncorrected Date: 580±80
Corrected BP Date: 550 (648-519)
Corrected Calendar Date: AD 1400 (1431-1302)

Provenience

Site: 45WH253
Test Unit: TU1
Unit Quad: NW
Level: L-2
Depth: 20-30 cm B.U.D.

Stratigraphic Context

Matrix: Strong brown to reddish-brown (7.5-5YR 4/6m), very well sorted, silt loam.
Soil Horizon: B
Depositional Environment: Eolian loess deposit
Landform Type: Terrace

Cultural Context

Artifacts: Hozomeen chert and obsidian debitage excavated from this same level.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 7.6 g
Dated Carbon Wt: 1.7 g
Counting Time: Standard

Interpretation and Comments

Volcanic ash sample NOCA 10192 from levels 1 and 2.

Sample Number: Beta-40698

Age Estimate

Uncorrected Date: 180±50 BP
Corrected BP Date: 272, 178, 149, 9, 0 (287-0)
Corrected Calendar Date: AD 1678, 1772, 1801, 1941, 1954 (1663-1954)

Provenience

Site: 45WH255
Test Unit: TU1
Unit Quad: Feature 1
Level: L-1
Depth: 10-20 cm B.U.D.

Stratigraphic Context

Matrix: Very dark grayish-brown (10YR 3/1.5m), loam to sandy loam
Soil Horizon: n/a

Depositional Environment: Feature fill (hearth)
Landform Type: Terrace

Cultural Context

Artifacts: No cultural material in this level.
Features: Feature 1 (FMR concentration).

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 37 g
Dated Carbon Wt: Unknown
Counting Time: Standard

Sample Number: Beta-40699

Age Estimate

Uncorrected Date: 500±90
Corrected BP Date: 519 (552-487)
Corrected Calendar Date: AD 1431 (1463-1398)

Provenience

Site: 45WH255
Test Unit: TU1
Unit Quad: SW
Level: L-3
Depth: 35-40 cm B.U.D.

Stratigraphic Context

Matrix: Dark brown (7.5YR 3.5/4m), well sorted loam
Soil Horizon: B
Depositional Environment: Loess
Landform Type: Terrace

Cultural Context

Artifacts: No cultural material in this level.
Features: None.

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 6.1 g
Dated Carbon Wt: 0.9 g
Counting Time: Standard

Sample Number: Beta-40700

Age Estimate

Uncorrected Date: 430±100
Corrected BP Date: 501 (535-319)
Corrected Calendar Date: AD 1449 (1631-1415)

Provenience

Site: 45WH264
Test Unit: TU3
Unit Quad: SW
Level: L-3
Depth: 34-38 cm B.U.D.

Stratigraphic Context

Matrix: Brown (10YR 5/3.5m), very poorly sorted, pebbly sand and silt.
Soil Horizon: BC or C
Depositional Environment: Glacial till
Landform Type: Terrace

Cultural Context

Artifacts: No cultural material excavated from this level.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 6.6 g
Dated Carbon Wt: 0.28 g
Counting Time: Extended

Sample Number: Beta-40701

Age Estimate

Uncorrected Date: 1760±80
Corrected BP Date: 1694, 1654, 1631 (1736-1552)
Corrected Calendar Date: AD 256, 296, 319 (398-214)

Provenience

Site: 45WH268
Test Unit: TU1
Unit Quad: SW
Level: L-5
Depth: 60-66 cm B.U.D.

Stratigraphic Context

Matrix: Dark brown to strong brown (7.5YR 4/5m), poorly sorted, gravelly sandy loam.
Soil Horizon: Weakly developed B
Depositional Environment: Glacial till
Landform Type: Rocky Bench

Cultural Context

Artifacts: Hozomeen chert and metasediment debitage excavated in association with date, as were the following formed tools: NOCA 10027 (metasediment cobble tool), NOCA 10029 (metasediment cobble tool), NOCA 10030 (Hozomeen chert edge-modified flake).
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 9.8 g
Dated Carbon Wt: 1.4 g
Counting Time: Standard

Sample Number: Beta-40702

Age Estimate

Uncorrected Date: 1380±110
Corrected BP Date: 1290 (1350-1178)

Corrected Calendar Date: AD 660 (888-438)

Provenience

Site: 45WH283
Test Unit: TU1
Unit Quad: NW/N Wall
Level: L-3
Depth: 30-40 cm B.U.D.

Stratigraphic Context

Matrix: Reddish-brown (5YR 4/4m), well sorted, silt loam with matrix-supported angular to subrounded clasts.
Soil Horizon: B
Depositional Environment: Loess and colluvium
Landform Type: Bedrock Bench

Cultural Context

Artifacts: Hozomeen chert and metasediment debitage excavated in association with this date.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 4.9 g
Dated Carbon Wt: 0.23 g
Counting Time: Extended

Sample Number: Beta-40703

Age Estimate

Uncorrected Date: 330±70
Corrected BP Date: 424, 392, 319 (478-296)
Corrected Calendar Date: AD 1525, 1558, 1631 (1654-1472)

Provenience

Site: 45WH304
Test Unit: TU1
Unit Quad: NE
Level: L-3

Depth: 30-34 cm B.U.D.

Stratigraphic Context

Matrix: Dark grayish-brown (2.5YR 4.5/2m), poorly sorted, sandy clay.
Soil Horizon: A
Depositional Environment: Alluvial
Landform Type: Flood plain

Cultural Context

Artifacts: Hozomeen chert debitage and faunal remains excavated in association with this date.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 36.1 g
Dated Carbon Wt: 1.9 g
Counting Time: Standard

Sample Number: Beta-53859

Age Estimate

Uncorrected Date: 1430±120
Corrected BP Date: 1309 (1409-1265)
Corrected Calendar Date: AD 641 (685-541)

Provenience

Site: 45WH239
Test Unit: TU2
Unit Quad: SW
Level: L-2
Depth: 17-20 cm B.U.S.

Stratigraphic Context

Matrix: Dark reddish-brown (5YR 3/4m), granular silty fine sand
Soil Horizon: B
Depositional Environment: Colluvial and alluvial deposit
Landform Type: Alluvial Fan

Cultural Context

Artifacts: Hozomeen chert and metasediment debitage excavated from this level.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 3.8 g
Dated Carbon Wt: 0.2 g
Counting Time: Extended

Sample Number: Beta-64820

Age Estimate

Uncorrected Date: 580±120
Corrected BP Date: 550 (657-509)
Corrected Calendar Date: AD 1400 (1441-1293)

Provenience

Site: 45WH230
Test Unit: TU6
Unit Quad: From North Wall Stratigraphic Profile
Level: L-3
Depth: 25 cm B.U.S.

Stratigraphic Context

Matrix: Charcoal pocket, black (N 2/0m), moist, within a volcanic ash deposit.
Soil Horizon: B
Depositional Environment: Alluvial deposition
Landform Type: Terrace

Cultural Context

Artifacts: No cultural material in this level or in lower levels. Cultural material present in levels 1 and 2.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 6.3 g
Dated Carbon Wt: 0.2 g
Counting Time: Extended

Sample Number: Beta-64821

Age Estimate

Uncorrected Date: 1120±80
Corrected BP Date: 1052, 1044, 989 (1079-939)
Corrected Calendar Date: AD 898, 906, 961 (871-1011)

Provenience

Site: 45WH262
Test Unit: TU3
Unit Quad: SE
Level: L-3
Depth: 10-15 cm B.U.S.

Stratigraphic Context

Matrix: Reddish-brown (no Munsell), sandy, some angular gravels present
Soil Horizon: B
Depositional Environment: Alluvium
Landform Type: Alluvial Fan

Cultural Context

Artifacts: Some debitage was recovered from same level.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 2.5 g
Dated Carbon Wt: 0.4 g
Counting Time: Extended

Interpretation and Comments

Charcoal sample was located just above a rodent-disturbed area.

Sample Number: Beta-64822

Age Estimate

Uncorrected Date: 1020±80
Corrected BP Date: 933 (978-797)
Corrected Calendar Date: AD 1017 (1153-972)

Provenience

Site: 45WH262
Test Unit: TU3
Unit Quad: SE
Level: L-4
Depth: 32 cm B.U.D.

Stratigraphic Context

Matrix: Reddish-brown (5YR 4/4m), gravelly sandy loam
Soil Horizon: B
Depositional Environment: Loess, colluvium
Landform Type: Alluvial Fan

Cultural Context

Artifacts: Same as sample Beta 64821
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 3.1 g
Dated Carbon Wt: 0.5 g
Counting Time: Extended

Interpretation and Comments

Charcoal samples comes from rodent-disturbed area.

Sample Number: Beta-64824

Age Estimate

Uncorrected Date: 1650±70 BP

Corrected BP Date: 1535 (1610-1418)
Corrected Calendar Date: AD 415 (340-532)

Provenience

Site: 45WH300
Test Unit: TU4
Unit Quad: Feature 3
Level: L-2
Depth: 2-12 cm B.U.S.

Stratigraphic Context

Matrix: Black (7.5YR N2/0), charcoal-rich silty sand
Soil Horizon: B or B/C
Depositional Environment: Feature fill (hearth)
Landform Type: Terrace

Cultural Context

Artifacts: One bone fragment; some debitage found in surrounding matrix.
Features: Feature 3 (FMR concentration)

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 16.7 g
Dated Carbon Wt: Unknown
Counting Time: Standard

Sample Number: Beta-64825

Age Estimate

Uncorrected Date: 1940±90 BP
Corrected BP Date: 1874 (1982-1755)
Corrected Calendar Date: AD 76 (32 BC - AD 195)

Provenience

Site: 45WH300
Test Unit: TU4
Unit Quad: Feature 3
Level: L-2
Depth: 2-12 cm B.U.S.

Stratigraphic Context

Matrix: Black (7.5YR N2/0), charcoal-rich silty sand
Soil Horizon: B or B/C
Depositional Environment: Feature fill (hearth)
Landform Type: Terrace

Cultural Context

Artifacts: One bone fragment; some debitage found in surrounding matrix.
Features: Feature 3 (FMR concentration)

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 30.9 g
Dated Carbon Wt: Unknown
Counting Time: Standard

Interpretation and Comments

Associated with a mixed tephra (Glacier Peak B, St. Helens WN, Mazama O. Beta-64824 is also from this level.

Sample Number: Beta-64826

Age Estimate

Uncorrected Date: 1750±60
Corrected BP Date: 1690, 1661, 1626 (1716-1560)
Corrected Calendar Date: AD 260, 289, 324 (234-390)

Provenience

Site: 45WH300
Test Unit: TU4
Unit Quad: SW
Level: L-3
Depth: 12-22 cm B.U.S.

Stratigraphic Context

Matrix: Black (N2/0m), charcoal-rich loam to sandy loam
Soil Horizon: Not a soil
Depositional Environment: Feature matrix

Landform Type: Terrace

Cultural Context

Artifacts: Same as sample Beta 64824
Features: FMR feature

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 23.1 g
Dated Carbon Wt: 2.9 g
Counting Time: Standard

Interpretation and Comments

Tephra sample NOCA 10821 from strat unit 3C, Mount St.Helens Y 3,350-3,510 BP.

Sample Number: Beta-64828

Age Estimate

Uncorrected Date: 370±80
Corrected BP Date: 462, 341, 339 (507-306)
Corrected Calendar Date: AD 1488, 1609, 1611 (1443-1644)

Provenience

Site: 45WH473
Test Unit: TU1
Unit Quad: All
Level: L-1
Depth: 0-5 cm B.U.S.

Stratigraphic Context

Matrix: Yellowish-brown (no Munsell), sandy silt.
Soil Horizon: n/a
Depositional Environment: Feature fill (hearth)
Landform Type: Rocky bench

Cultural Context

Artifacts: Metasediment debitage and faunal remains excavated in association with this date.
Features: FMR/calcined bone feature.

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 3.1 g
Dated Carbon Wt: 0.4 g
Counting Time: Extended

Sample Number: Beta-65229

Age Estimate

Uncorrected Date: 310±70
Corrected BP Date: 312 (468-290)
Corrected Calendar Date: AD 1638 (1482-1660)

Provenience

Site: 45WH262
Test Unit: TU1
Unit Quad: NW
Level: L-3, Matrix 2
Depth: 10-15 cm B.U.S.

Stratigraphic Context

Matrix: Reddish-brown (no Munsell), silty sand
Soil Horizon: n/a
Depositional Environment: Mixed or turbated deposit
Landform Type: Alluvial Fan

Cultural Context

Artifacts: Although a number of artifacts were found in the same level, it is thought that Matrix 2 represents a turbated deposit of unknown origin and that the charcoal found in it is unrelated to the cultural remains.
Features: None

Sample Data

Material Type: Charred wood chunks
Submitted Sample Wt: 10.5 g
Dated Carbon Wt: Unknown
Counting Time: Standard

APPENDIX C: DESCRIPTION OF VOLCANIC ASH SAMPLES

Tephra samples collected during excavation were dried; the intrusive lithic and organic material, if present, were separated by hand from the samples; and they were then stored in plastic ziplock bags. Samples selected for analysis were split in order to retain a portion for future reference. In some cases, due to small sample sizes, this was not possible, and the entire collected sample was sent for analysis. The results of the tephra analysis received from the laboratory are reported according to vent name and age of vent before present (BP).

Analysis of samples was performed by Dr. Franklin F. Foit, Jr. at Washington State University (WSU), Pullman. Glass chemistry was reported as percentage oxides of Si, Al, Fe, Ti, Na, K, Mg, Ca, and Cl. The number of individual shards analyzed per sample varied between 16 and 23.

Two unknown tephra are identified in the analyses. One is labeled variously as "ROLA 89 229-1" or "ROLA-89 229-1, Tephra A". The chemical signature of this sample is reflected in the bulk composition of a few of the project area tephra samples and in individual glass shards mixed with tephra from other sources. The other unknown tephra is variously labeled as "ROLA 89 229-2" or "ROLA-89 229-2, Tephra B". The chemical signature of this tephra has been derived only from glass shards mixed within known tephra.

The abbreviations used in the provenience section of the samples are as follows. "B.U.D." means below unit datum. "B.U.S." means below unit surface. In some cases several vents are represented, all are named, and the most probable date is presented. More detailed information about artifacts associated with the dates can be found in the individual site descriptions in Section 10.2 of this report.

NOCA Number: 7710

Vent and Date

Mazama O 6,850 BP

Provenience

Site: 45WH227
Test Unit: TU3
Unit Quad: NE
Level: L-1
Depth: 0-10 cm B.U.S.

Stratigraphic Context

Matrix: Red-brown to red/yellow-brown silty sand.
Soil Horizon: B
Depositional Environment: Alluvial deposition
Landform Type: Alluvial fan

Cultural Context

Artifacts: One bone fragment and 4 pieces of lithic debitage were found in the same level. A Hozomeen chalcedony flake and Hozomeen chalcedony shatter were found on the surface level above this one. Four debitage and one possible hammerstone were found in the two levels below this sample.
Features: None

Sample Data

Collected sample weight: N/A
Analyzed sample weight: N/A
Remaining sample weight: 15.7 g

Interpretation and Comments

Sample was not removed from a continuous, well defined tephra layer therefor it is uncertain if the tephra was in a primary or secondary depositional context.

NOCA Number: 7712

Vent and Date

St. Helens W 505 BP

Provenience

Site: 45WH228
Test Unit: TU3
Unit Quad: south wall, 45 cm East
Level: L-2
Depth: 23 cm B.U.D.

Stratigraphic Context

Matrix: Thermally altered reddish-brown (no Munsell), poorly sorted, gravelly silty sand.
Soil Horizon: B

Depositional Environment: Alluvial
Landform Type: Alluvial Fan

Cultural Context

Artifacts: One lithic debitage. Cultural material present on surface and level 1. Charred wood chunks collected for radiocarbon dating in level 3 (Beta-33508, dated at 310±70 BP).
Features: None.

Sample Data

Collected sample weight: Unknown
Analyzed sample weight: Unknown
Remaining sample weight: 4.9 g

Interpretation and Comments

This sample appeared to be clean and unmixed, but it did not form a continuous, well-defined layer, and therefore, it is uncertain if the tephra was in a primary depositional context.

NOCA Number: 7714

Vent and Date

Mazama O	6,850 BP
Glacier Peak B, M or G	12,750-11,200 BP

Provenience

Site: 45WH229
Test Unit: TU2
Unit Quad: SW
Level: L-1
Depth: 10-20 cm B.U.D.

Stratigraphic Context

Matrix: Light gray, silty-sand.
Soil Horizon: B
Depositional Environment: Loess
Landform Type: Terrace

Cultural Context

Artifacts: Debitage and bone recovered from same level
Features: None

Sample Data

Collected sample weight: Unknown
Analyzed sample weight: Unknown
Remaining sample weight: Unknown

NOCA Number: 7719

Vent and Date

Mazama 0	6,850 BP
Glacier Peak B,M or G	12,750-11,200 BP

Provenience

Site: 45WH234
Test Unit: TP8
Unit Quad: West half
Level: L-4
Depth: 46.5 cm B.U.D.

Stratigraphic Context

Matrix: Reddish-brown, silty sand with some pebbles and cobbles
Soil Horizon: B
Depositional Environment: Stream-cut alluvial fan
Landform Type: Alluvial fan

Cultural Context

Artifacts: Lithic debitage present in this level as well as levels 5 and 6.
Features: None

Sample Data

Collected sample weight: Unknown
Analyzed sample weight: Unknown
Remaining sample weight: 6.1 g

Interpretation and Comments

Two vents are represented in this sample. They appear to be redeposited Glacier Peak and Mt. Mazama eruptions.

NOCA Number: 7723

Vent and Date

St. Helens Y 3,350-3,510 BP

Provenience

Site: 45WH303
Test Unit: TU6
Unit Quad: N/A
Level: L-8
Depth: 87 cm B.U.D.

Stratigraphic Context

Matrix: Yellowish-brown, predominately silt with mottled heat oxidized sand
Soil Horizon: BC or C
Depositional Environment: Fluvial
Landform Type: Flood plain

Cultural Context

Artifacts: None in this level. One lithic debitage found in level 1 of this unit.
Features: None

Sample Data

Collected sample weight: Unknown
Analyzed sample weight: Unknown
Remaining sample weight: 0.8 g

Interpretation and Comments

This is a deeply buried primary tephra layer.

NOCA Number: 7726

Vent and Date

St. Helens Y	3,350-3,510 BP
Glacier Peak B,M or G	12,750-11,200 BP
Mazama 0	6,850 BP

Provenience

Site: 45WH229
Test Unit: TU3
Unit Quad: N/A
Level: L-4
Depth: 40-50 cm B.U.D.

Stratigraphic Context

Matrix: Yellowish-brown, silty sand red/brown mottling
Soil Horizon: C
Depositional Environment: Loessial sandy silts atop a small, flat terrace remnant; loess probably derived from the Skagit River flood plain. An abandoned flood plain or stream channel is at the base of the terrace escarpment.
Landform Type: Terrace

Cultural Context

Artifacts: None in this level. Cultural material encountered in levels 1 and 2 of this unit.
Features: None

Sample Data

Collected sample weight: N/A
Analyzed sample weight: N/A
Remaining sample weight: 26.5 g

Interpretation and Comments

The chemical signature of the tephra correlated with a number of known and one unknown tephra (ROLA 89 229-1). We can only assume that these are redeposited tephras, or possibly culturally collected and mixed for some unknown purpose. Krotovina present.

NOCA Number: 10421

Vent and Date

ROLA 89 229-1	Unknown
ROLA 89 229-2	Unknown
Mazama 0	6,850 BP

Provenience

Site: 45WH262
Test Unit: TU3
Unit Quad: N/A
Level: Stratigraphic Unit 2A
Depth: 3-18 cm B.S.

Stratigraphic Context

Matrix: Variable colored grains; 10YR 7/2 dominate; well-sorted, medium to very fine sand
Soil Horizon: B
Depositional Environment: Colluvial, alluvial
Landform Type: Alluvial fan

Cultural Context

Artifacts: Lithic debitage, pecked stone, core from level 1. One Hozomeen chert flake from level 2. Lithic debitage, one hammerstone and one metasediment core from level 3. Lithic debitage from level 4. Two cores and lithic debitage from level 5.
Features: None

Sample Data

Collected sample weight: 71.7 g
Analyzed sample weight: 1 g
Remaining sample weight: 70.7 g

Interpretation and Comments

Three chemically different tephra were represented in this sample. Two chemical signatures from analyzed shards did not match any known source and are tentatively listed as ROLA 89 229-1 and 229-2. The other shards analyzed in the sample were chemically similar to Mazama O (similarity coefficient 0.98).

NOCA Number: 10422

Vent and Date

St. Helens WN	505 BP
St. Helens Y	3,350-3,510 BP
Mazama 0	6,850 BP
ROLA-89 229-2, Tephra B	Unknown

Provenience

Site: 45WH302
Test Unit: TU5
Unit Quad: NE
Level: L-5
Depth: 40-50 cm B.U.S.

Stratigraphic Context

Matrix: Reddish-brown, heat oxidized, mottled with tephra
Soil Horizon: B
Depositional Environment: Alluvial
Landform Type: Alluvial fan

Cultural Context

Artifacts: None
Features: None

Sample Data

Collected sample weight: 161.8 g
Analyzed sample weight: 1 g
Remaining sample weight: 160.8 g

Interpretation and Comments

Four different chemical signatures were observed in this sample. Three could be identified from known sources while the fourth matched tephra samples previously sent for identification in 1989 from site 45WH229.

NOCA Number: 10549

Vent and Date

St. Helens Y 3,510-3,350 BP

Provenience

Site: 45WH239
Test Unit: Bank Profile 1
Unit Quad: N/A
Level: Stratigraphic unit 1
Depth: 97-102 cm B.U.S.

Stratigraphic Context

Matrix: Brown to gray, fine sand, moderately well sorted
Soil Horizon: N/A
Depositional Environment: Alluvium
Landform Type: Alluvial Fan

Cultural Context

Artifacts: None
Features: None

Sample Data

Collected sample weight: 57.6 g
Analyzed sample weight: 1 g
Remaining sample weight: 56.6 g

Interpretation and Comments

This sample was collected from a continuous layer of primary tephra.

NOCA Number: 10550

Vent and Date

Mazama 0 6,850 BP

Provenience

Site: 45WH239

Test Unit: Bank Profile 1
Unit Quad: N/A
Level: Stratigraphic unit 2
Depth: 125 cm B.U.S.

Stratigraphic Context

Matrix: Yellowish-brown, silt
Soil Horizon: N/A
Depositional Environment: Alluvium
Landform Type: Alluvial Fan

Cultural Context

Artifacts: None
Features: None

Sample Data

Collected sample weight: 36.9 g
Analyzed sample weight: 1 g
Remaining sample weight: 35.9 g

Interpretation and Comments

This sample was collected from a continuous layer of primary tephra.

NOCA Number: 10552

Vent and Date

ROLA 89 229-1, Tephra A Unknown

Provenience

Site: 45WH239
Test Unit: TU1
Unit Quad: SE
Level: L-4
Depth: 30-34 cm B.U.S.

Stratigraphic Context

Matrix: Light brownish-gray (10YR 6/2m), silt-sandy silt
Soil Horizon: BC

Depositional Environment: Eolian and colluvial
Landform Type: Alluvial Fan

Cultural Context

Artifacts: None in level, but debitage was recovered from overlying levels.
Features: None

Sample Data

Collected sample weight: 501 g
Analyzed sample weight: 1 g
Remaining sample weight: 500 g

NOCA Number: 10820

Vent and Date

Glacier Peak B	11,300-11,200 BP
ROLA 89 229-2	Unknown
St. Helens Wn	505 BP
Mazama O	6,850 BP

Provenience

Site: 45WH300
Test Unit: TU4
Unit Quad: SE
Level: L-2
Depth: 2-12 cm B.U.S.

Stratigraphic Context

Matrix: Pinkish-gray (7.5YR 6/2)
Soil Horizon: B
Depositional Environment: Colluvial and alluvial
Landform Type: Terrace

Cultural Context

Artifacts: Lithic debitage found within the feature and non-feature matrix
Features: Feature 3 in same level, SW corner

Sample Data

Collected sample weight: 6.1 g
Analyzed sample weight: 1 g
Remaining sample weight: 5.1 g

Interpretation and Comments

This sample was collected from a discontinuous lens along the lower boundary of an FMR feature. Pockets of tephra were also present throughout the upper portion of the test unit stratigraphy.

NOCA Number: 10821

Vent and Date

St. Helens Y 3,350-3,510 BP

Provenience

Site: 45WH300
Test Unit: TU4
Unit Quad: Strat unit 3C
Level: N/A
Depth: 21-26 cm B.U.S.

Stratigraphic Context

Matrix: Pinkish-gray, (7.5YR 6/2)
Soil Horizon: B
Depositional Environment: Colluvial and alluvial
Landform Type: Terrace

Cultural Context

Artifacts: Lithic debitage found within the feature and non-feature matrix.
Features: Stratigraphically along the lower boundary of feature 3.

Sample Data

Collected sample weight: 18.3 g
Analyzed sample weight: 1 g
Remaining sample weight: 17.3 g

Interpretation and Comments

This sample was collected from a discontinuous lens along the lower boundary of an FMR feature. Pockets of tephra were also present throughout the upper portion of the test unit stratigraphy.

NOCA Number: 10822

Vent and Date

Glacier Peak B	11,300-11,200 BP
St. Helens Wn	505 BP
ROLA 89 229-1	Unknown
Mazama 0	6,850 BP

Provenience

Site: 45WH496
Test Unit: TU2
Unit Quad: NW
Level: L-2, stratigraphic unit 3
Depth: 10-20 cm B.U.S.

Stratigraphic Context

Matrix: Dark grayish-brown (10YR 4/2m), moderately sorted fine sand
Soil Horizon: BC
Depositional Environment: Colluvial, alluvial
Landform Type: Terrace between two alluvial fans

Cultural Context

Artifacts: Lithic debitage from same level.
Features: None

Sample Data

Collected sample weight: 3.8 g
Analyzed sample weight: 1 g
Remaining sample weight: 2.8 g

Interpretation and Comments

The chemical signature of the tephra correlated with a number of known and one unknown tephra (ROLA 89 229-1). We can only assume that these are

redeposited tephras, or possibly culturally collected and mixed for some unknown purpose.

NOCA Number: 10823

Vent and Date

St. Helens WN	505 BP
St. Helens Y	3,350-3,510 BP
ROLA 89 229-1	Unknown
Mazama 0	6850 BP

Provenience

Site: 45WH496
Test Unit: TU2
Unit Quad: N/A
Level: Stratigraphic unit 5
Depth: 17-23 cm B.U.S.

Stratigraphic Context

Matrix: Dark yellowish-brown (10YR 4/4m), moderately sorted fine sand
Soil Horizon: possibly BC
Depositional Environment: Colluvial, alluvial
Landform Type: Terrace between two alluvial fans

Cultural Context

Artifacts: Lithic debitage from surface, L-1 and L-2 of TU
Features: None

Sample Data

Collected sample weight: 4.9 g
Analyzed sample weight: 1 g
Remaining sample weight: 3.9 g

Interpretation and Comments

The chemical signature of the tephra correlated with a number of known and one unknown tephra (ROLA 89 229-1). We can only assume that these are redeposited tephras, or possibly culturally collected and mixed for some unknown purpose.

APPENDIX D: PROJECTILE POINT TYPOLOGY AND CHRONOLOGY

Introduction

The purpose of this typology is to present, in an orderly way, the information that is derived from chronologically sensitive projectile points that have been characterized and dated by archeologists. The typology presented here is compiled from regional and local studies from across the Pacific Northwest and adjacent regions of North America. The most useful typologies for dating purposes are those based on the physical association of radiocarbon dates and defined types from within a given area. If a well-dated typology does not exist for a locality or region, those from adjacent areas may be used. In this typology, we refer to other regional typologies as needed, but emphasis is placed on independently derived associations of chronometric dates and point types from local studies. In a few cases we have been able to used dated associations of a projectile point series from our recent, as yet unpublished, results of excavations in North Cascades National Park Service Complex.

Virtually all of the types and subtypes described in the typology have been recognized by archeologists working in other areas of the Pacific Northwest and beyond. These typologies have been described and proposed by researchers who used different physical attribute and nonattribute criteria to define types. What we have attempted here is to emphasize primarily morphological and technological attributes of projectile points, but like others, we use nonattribute criteria, particularly association with a chronometric date, to separate types. Likewise, geologic techniques of stratigraphic dating and tephrochronology (dating through use of volcanic ashes) are considered in distinguishing between some types. Within some types we have chosen to recognize subtypes particularly when this permits finer chronological control. In some series we have combined distinctive types that others have separated. The intent is not to dispute the validity of other typologies, rather, our choice has been to recognize closely related morphologies as subtypes based on the various criteria we use to define types.

Not all types defined below have been found in the project area. This serves the goal of demarcating, as much as possible, an all-inclusive range of morphological types for the project area, one that is flexible enough to encompass types yet to be recognized and defined in the northern Cascade Range. Finally, this typology replaces an earlier one that appeared as Appendix A in the 1991 report of the Ross Lake archeological surveys (Mierendorf 1991).

The types and subtypes presented below are defined according to conventional names given to describe the various attributes of a projectile point. The terminology used for this purpose are illustrated in the projectile point schematic diagrams in Figure D-1.

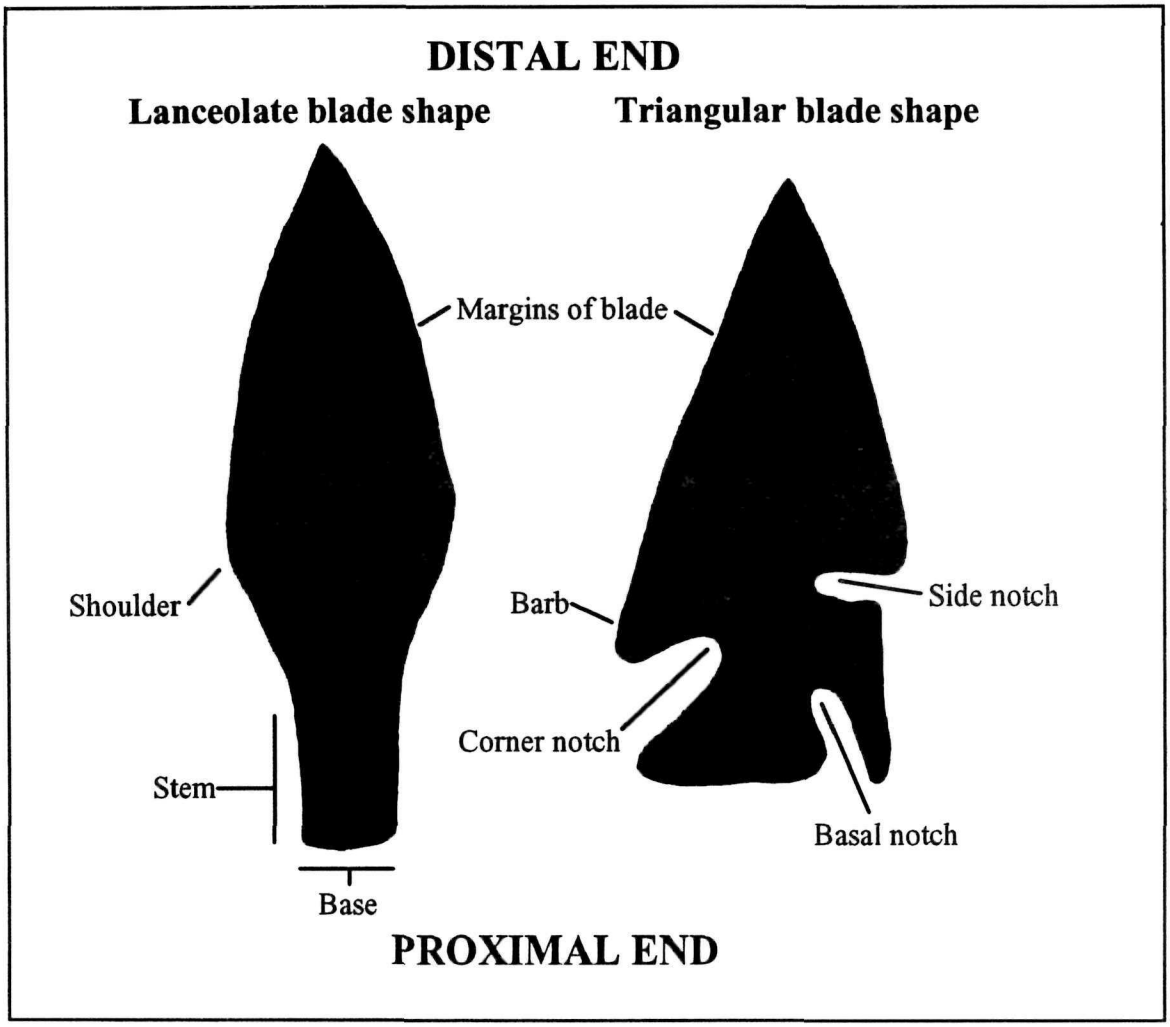


Figure D-1 Descriptive elements of projectile point morphology

TYPE 1: Fluted and basally-thinned lanceolates

Description: Medium to large lanceolate blades characterized by distinctive longitudinal flake scars on each face, called flutes (channels or grooves), used to reduce the cross-sectional thickness at the proximal end; alternatively, this thickness is reduced through removal of a series of thinning flakes from along the basal margin. Clovis points are usually made of high quality lithic raw material varieties of chert, chalcedony, and other siliceous rocks. Points exhibit patterns of flaking technology and manufacture that require a high degree of knowledge and skill to produce.

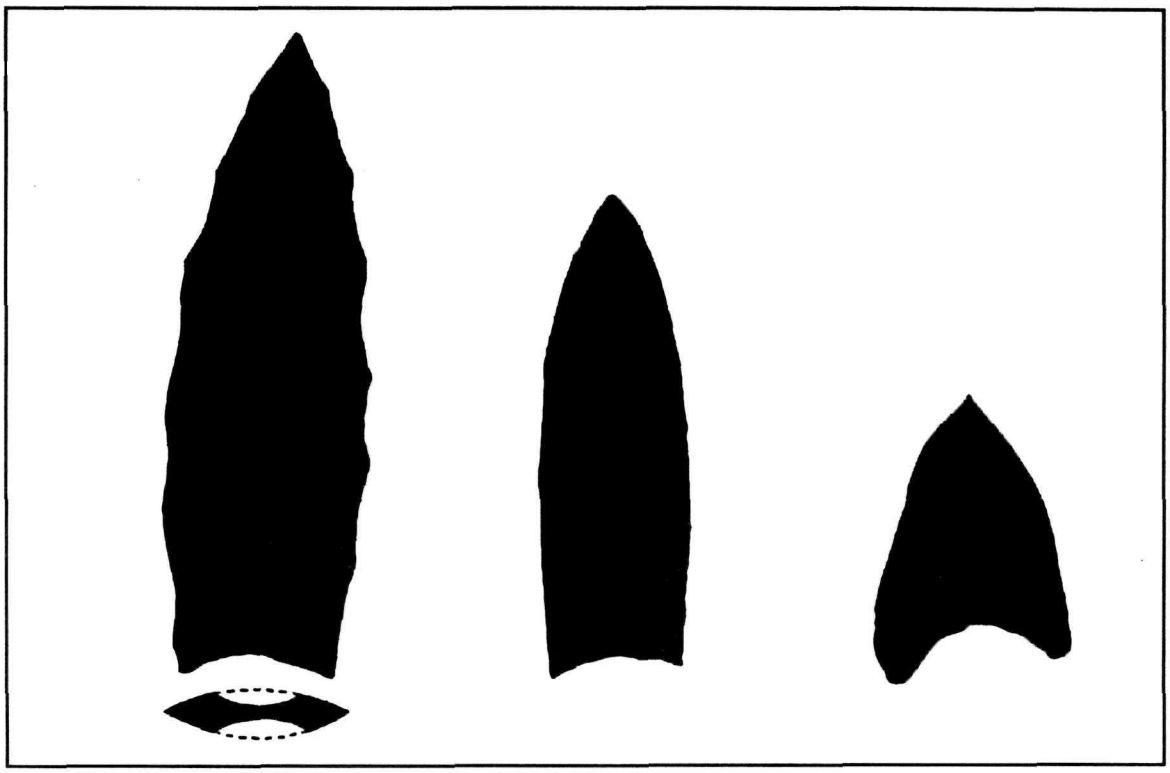


Figure D-2: Type 1: Fluted and basally-thinned lanceolates.

Common Names: Clovis, Folsom

Age Estimate: 12,000 to 10,500 BP

Comments: Although rare, fluted Clovis points have been recorded as surface finds across eastern and western Washington State. Hollenbeck and Carter (1986) report a Clovis point near Lake Cle Elum, in the interior of the central Cascades of Washington. The only recorded Clovis site in Washington is located on the eastern edge of the northern Cascade Range, four miles east of the Columbia River. From the East Wenatchee Clovis cache have been excavated a large assemblage of fluted and basally thinned points, other flaked stone tools, and bone foreshafts (Mehringer 1988, Gramly 1993). Clovis points have been found only in the New World from coast to coast and from the plains of Canada to central Mexico.

References: Avey (1992), Fladmark (1986), Gramly (1993), Hollenbeck and Carter (1986), Mehringer (1988), Osborne (1956), Stryd and Rousseau (1996), Willig et al. (1988), Wormington (1957).

TYPE 2: Early stemmed lanceolates

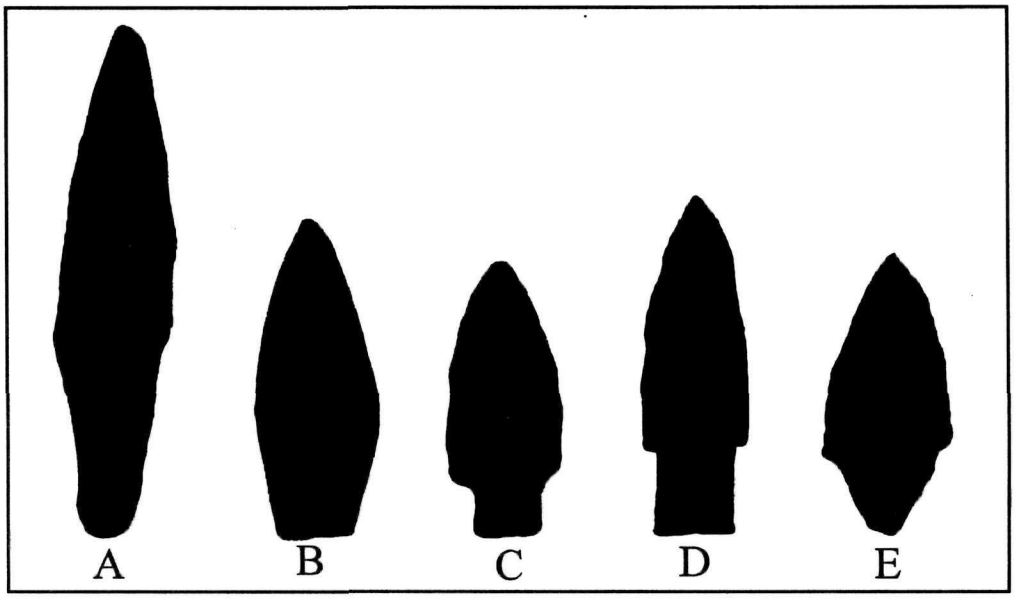


Figure D-3 Type 2: Early stemmed lanceolates.

Description: Medium to large lanceolate points that are stemmed with a pronounced shoulder, have a stem with a pronounced concave base, or are nonstemmed with a concave base (although some specimens are convex-based) (D. Rice 1972:130). The stem and the blade are separated by the prominent shoulders. Stems are straight or tapered; edge grinding along the proximal end is common, whereas basal grinding is not. This type exhibits a wide range of morphological and regional subtypes that have been recognized by a variety of names.

Common Names: There are many local names used to describe the many varieties of this type. A sample of subtypes is represented above as 2A: Haskett, 2B: Windust, 2C: Lind Coulee, 2D: Plano, and 2E: Mahkin Shouldered Lanceolate.

Age Estimate: 10,800 to 7,000 BP. The Mahkin Shouldered Lanceolate is assigned a range between 8,000 and 3,500 BP (Lohse 1985). In the southern Cascades of Washington, they have been associated with radiocarbon-dated components from 6,600 to 5,200 years BP (Lewarch and Benson 1989).

Comments: There are many variants of this type, both in the Pacific Northwest and across the western cordilleras, intermountain basins, and western plains. In Washington State, this type is found in artifact assemblages of the Windust Phase, which constitutes the oldest well-documented archeological time period in

Washington; such sites are infrequent. In the Columbia Plateau, Rice (1972) considers Windust point subtypes to have evolved into Cascade point types.

References: Ames et al. (1981), Bryan (1980), Cressman (1960), Daugherty (1956), Fladmark et al. (1988), Greiser (1984), Irwin and Moody (1978), Lewarch and Benson (1989), Lohse (1985), D. Rice (1972), H. Rice (1965), Sheppard et al. (1984), Stryd and Rousseau (1996), Valley (1975), and Willig et al. (1988).

TYPE 3: Bi-pointed or willow-leaf shaped lanceolates

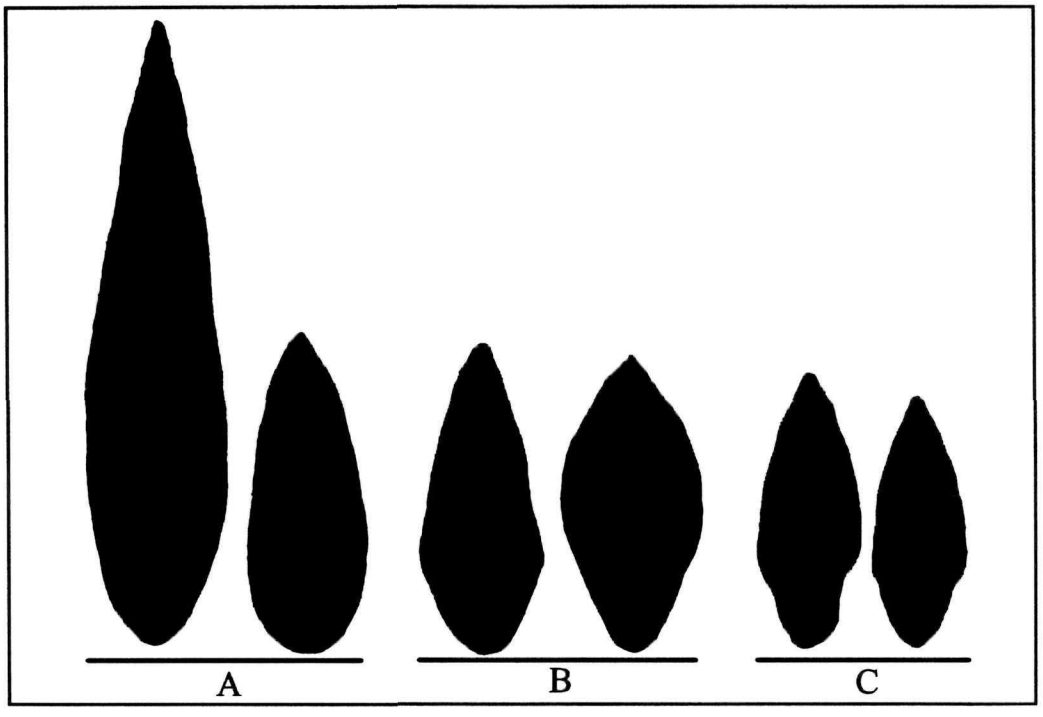


Figure D-4 Type 3: Bi-pointed or willow-leaf shaped lanceolates.

Description: Medium to large lanceolate blades that taper proximally and distally from the widest part of the midsection of the blade to a point. Three subtypes are recognized here. Subtype 3A is characterized by smooth, unshouldered lateral margins forming rounded or pointed ends from a midsection that is widest about 1/3 the length from the proximal to the distal end. Subtype 3B is characterized by lateral margins that are widest from 1/3 to 1/2 the length and that form incipient shoulders that are rounded or very weakly expressed. Subtype 3C is characterized by very weak shoulders and slightly tapering, rounded stems. These types exhibit a wide range of patterns of flaking technology and manufacture, generally reflecting a high degree of skill but occasionally less so. Cross-sections are usually bi-convex, and occasionally, diamond-shaped; basal margins are sometimes ground; blade margins are occasionally serrated.

Common Names: Cascade, Olcott

Age Estimate: 9,000 to 4,000 BP

Comments: There are a variety of subtypes that have been recognized across the state. Compared with the previous two types, the makers of this type much more

frequently used local stone raw materials of varying flaking quality for their manufacture. As a result, this type manifests a wider range of symmetry and control of shape in the finished tool form. This type is widespread throughout the Pacific Northwest and the cordilleras of western North America. It is often used as one of the main diagnostic indicators of Olcott assemblages or the Cascade Phase of western and eastern Washington, respectively. Lewarch and Benson (1989), through seriation of several radiocarbon-dated site components from the southern Cascades of Washington, demonstrate an age range of 6,600-5,200 BP. This type also occurs in contexts that date to later time periods (Ames et al. 1979; Grabert 1983; Leonhardy and Rice 1970; Vivian 1992:101).

References: Borden (1975), Butler (1961), Grabert and Pint (1978), Kidd (1964), LeClaire (1976), Lewarch and Benson (1989), Matson (1976), Nelson (1969), and Stryd and Rousseau (1996).

TYPE 4: Obliquely-notched series

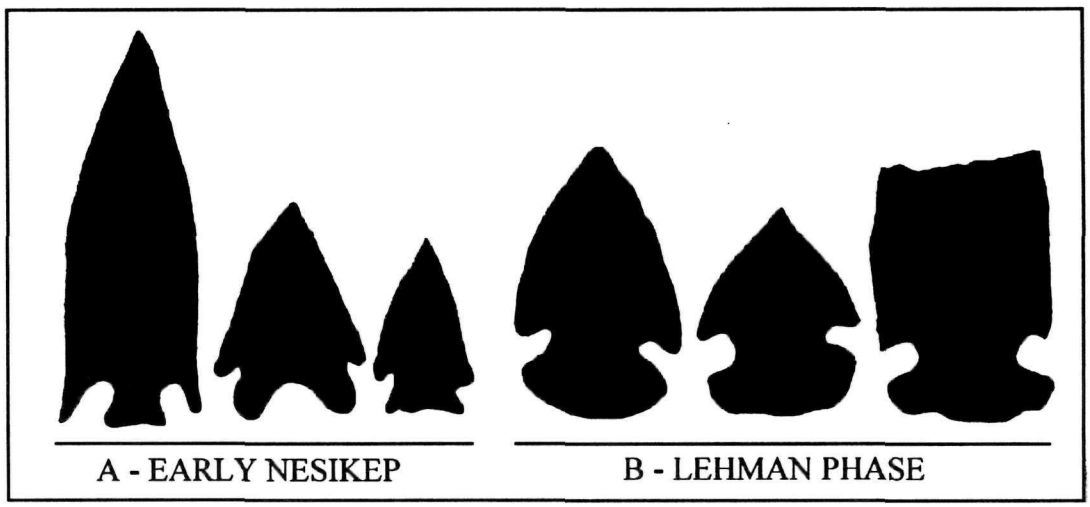


Figure D-5 Type 4: Obliquely-notched series.

Description: Large to small points with lanceolate, triangular, or slightly pentagonal blades; some lanceolate forms exhibit recurved blade margins. Two subtypes are recognized here. Subtype 4A is a larger lanceolate, well-made with corner notches and distinct barbs. The smaller subtype 4B is pentagonal or triangular blades with oblique corner or side notches. Both varieties are noticeably thin in cross-section and have V-shaped, tapering notches.

Common Names: Nesikep tradition points; Lehman obliquely-notched

Age Estimate: 7,000 to 4,500 BP

Comments: The two subtypes recognized here are considered separate types by Stryd and Rousseau (1996). Their distinction is not disputed here, rather, we have chosen to categorize these as varieties of a more general morphological/chronological type. According to Stryd and Rousseau, a continuity in projectile points (among other traits) may represent cultural continuity between the Nesikep tradition and the Lehman phase (1988). Early Nesikep point varieties have not been found outside of the mid-Fraser/Thompson River area of British Columbia.

References: Sanger (1969), Stryd and Rousseau (1996).

TYPE 5: Large side-notched series

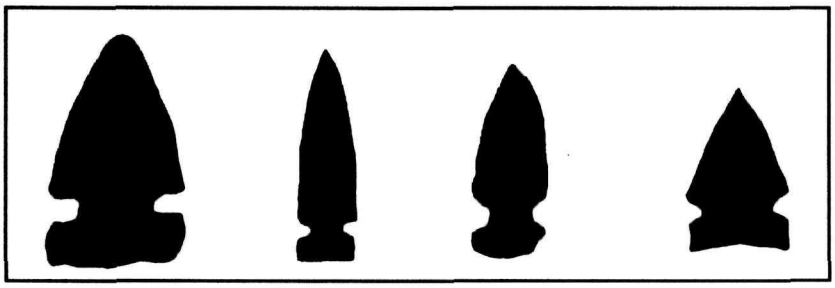


Figure D-6 Type 5: Large side-notched series.

Description: Large to medium size points with lanceolate to triangular blades. They are characterized by deep or shallow side (lateral) notches placed between the medial and basal (proximal) positions. Has prominent, square, or slightly rounded barbs.

Common Names: Cold Springs side-notched, Bitterroot side-notched

Age Estimate: ~7,000 to 3,500 BP

Comments: These types are found most frequently in the southern Columbia Plateau and northern Great Basin, and in low frequencies in the northern Columbia Plateau. Stratigraphically they occur above primary deposits of Mazama volcanic ash, where they have been found in association with Cascade points (Type 3). In the southern Cascades of Washington, they have been associated with an age range of ~6,500 to ~1,600 BP (Lewarch and Benson 1989).

References: Butler (1962), Chatters (1986), Lewarch and Benson (1989), Lohse (1985), Nelson (1969), and Shiner (1961).

TYPE 6: Side-notched lanceolates

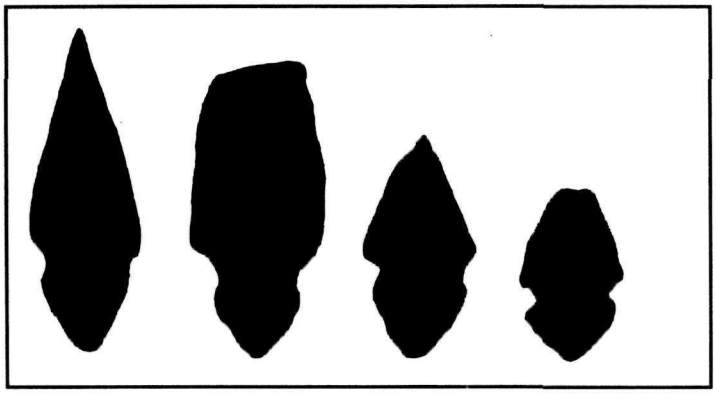


Figure D-7 Type 6: Side-notched lanceolates.

Description: Large to medium points with leaf-shaped to lanceolate blades. The proximal end is unbarbed with wide side-notches, heavy basal grinding, and pointed or convex bases. Some points are narrow and have parallel-sided, denticulate blade margins; all are relatively thick, having biconvex, almost diamond-shaped cross-sections (Stryd and Rousseau 1996).

Common Names: Lochnore side-notched

Age Estimate: ~5,500 to 3,500 BP

Comments: This type is considered by Stryd and Rousseau (1996) as one of the diagnostic traits of the Lochnore phase, which, in their view, is the first manifestation of the Sqlelten tradition, the cultural continuum leading to the historic Interior Salish people of the Pacific Northwest.

References: Stryd and Rousseau (1996).

TYPE 7: Stemmed and shouldered triangular series

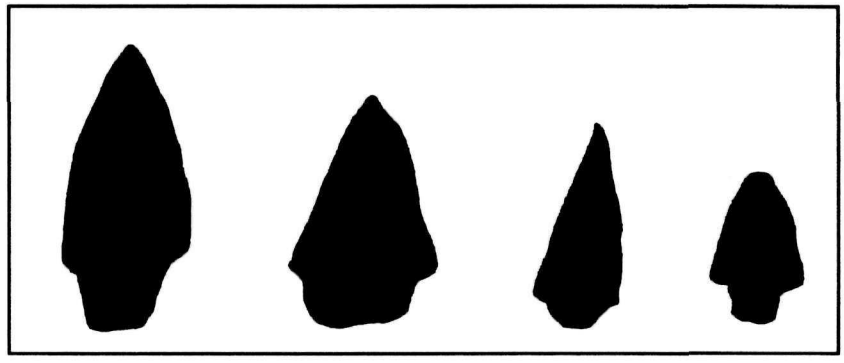


Figure D-8 Type 7: Stemmed and shouldered triangular series.

Description: Large to small points with a triangular blade form, characterized by weak to strongly expressed upward sloping shoulders and thick, irregular cross-sections. The larger varieties are distinguished from the Mahkin Shouldered Lanceolate type by their distinctive triangular outline (Lohse 1985).

Common Names: Nespelem Bar, Shuswap Horizon Types 6 and 7

Age Estimate: 5,000 to 3,000 BP

Comments: Lohse (1985) suggests that these forms are transitional between the Mahkin shouldered lanceolate type and the Rabbit Island stemmed series. As this form is defined in this report, type 7 includes Shuswap horizon types 6 and 7, which are assigned age estimates of ~3,000 to 2,400 BP (Richards and Rousseau 1987).

References: Lohse (1985), Richards and Rousseau (1987).

TYPE 8: Triangular-eared series

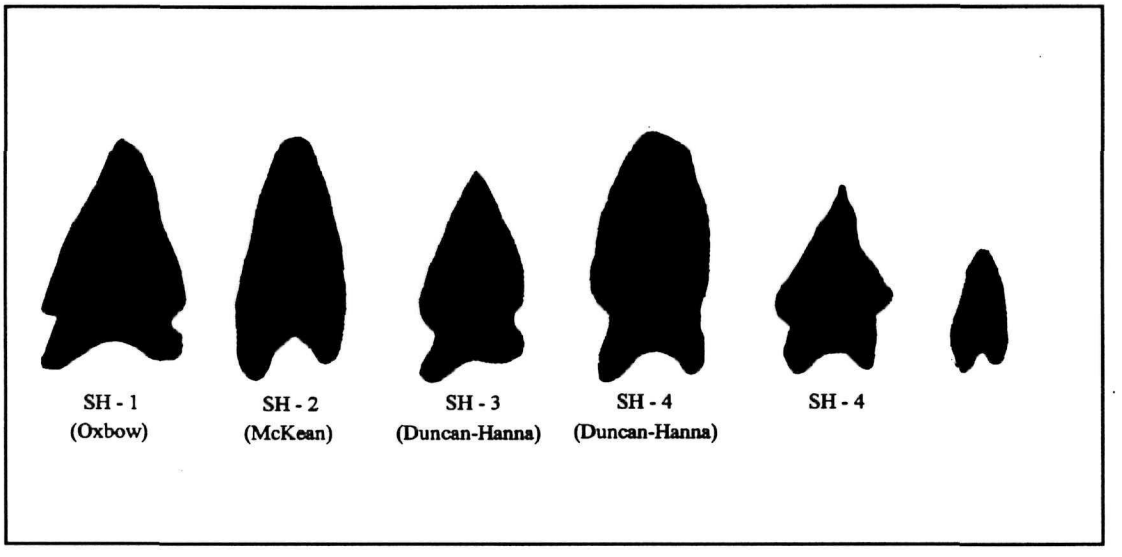


Figure D-9 Type 8: Triangular-eared series.

Description: Points with medium size triangular blades, characterized by a prominent concave base, or shallow corner or side-notches. They have basal or lateral ears. One variety lacks notches of any kind, but has the concave base.

Common Names: Shuswap Horizon Types 1, 2, 3, and 4; Oxbow, Duncan-Hanna, McKean

Age Estimate: 4,000 to 2,800 BP

Comments: This type is rare on the Columbia Plateau, but closely resembles varieties that are common on the Northwestern Plains (Richards and Rousseau 1987). The Northwestern Plains varieties constitute the Oxbow, Duncan-Hanna, McKean series (Greiser 1984). According to Richards and Rousseau (1987:22), the Shuswap horizon is the earliest cultural manifestation of the Plateau Pithouse tradition.

References: Greiser (1984), Richards and Rousseau (1987).

TYPE 9: Stemmed concave base lanceolates

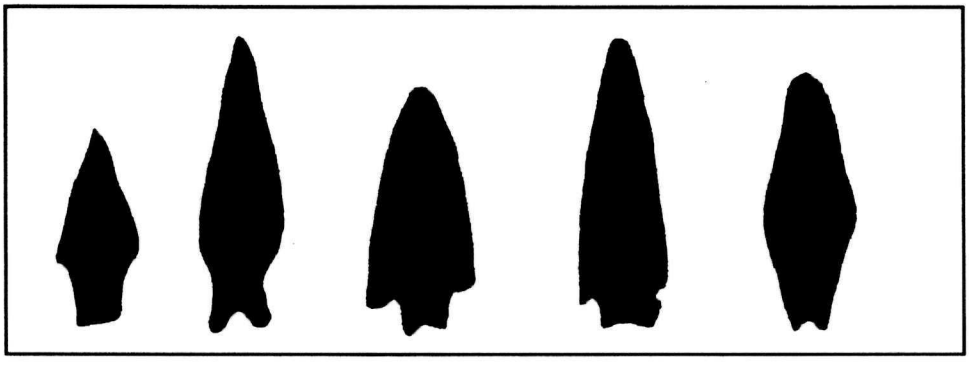


Figure D-10 Type 9: Stemmed concave base lanceolates.

Description: Medium-length points with an overall lanceolate blade form. They have wide corner or side-notches defining rounded shoulders and stems. Bases are concave.

Common Names: Shuswap Horizon types 5 and 8

Age Estimate: ~4,000 to 2,500 BP

Comments: As with the other Shuswap horizon types, these are believed to represent the first manifestation of the Plateau Pithouse tradition, which developed into the historic Salish people of the Pacific Northwest (Richards and Rousseau 1987).

References: Richards and Rousseau (1987).

TYPE 10: Stemmed triangular series

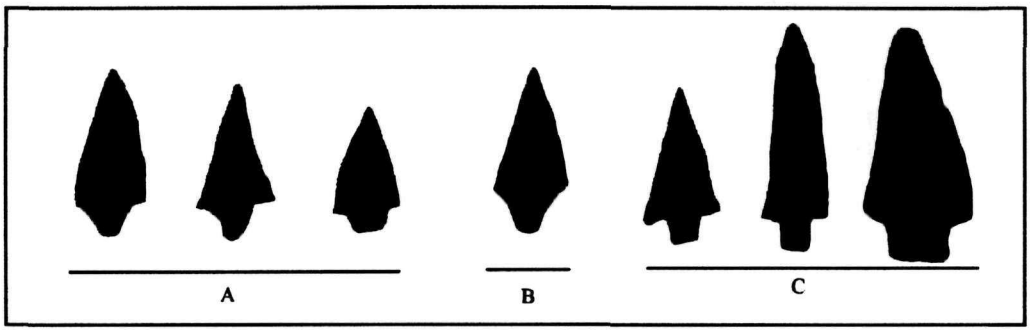


Figure D-11 Type 10: Stemmed triangular series.

Description: Small points characterized by triangular blades, square shoulders, and parallel-sided to contracting stems. They tend to be well made and thin in cross-section. Three subtypes are recognized here based on shoulder and stem form. Subtype 10A is characterized by relatively square shoulders and tapering stems. Subtype 10B is characterized by up-ward sloping shoulders, as is type 7, but exhibits more regular flaking and is thinner and more regular in shape compared with type 7; some of these are serrated. Subtype 10C exhibits straight stems, square to upward-sloping shoulders, and narrow triangular blades.

Common Names: Rabbit Island stemmed

Age Estimate: 4,000 to 1,500 BP

Comments: This series is common throughout the Pacific Northwest. Lohse (1985) recognizes an earlier variant A (4,000 to 2,000 BP) and a later variant B (3,000 to 1,500 BP). Carlson (1982) illustrates numerous examples from southwestern British Columbia.

References: Carlson (1982), Chatters (1986), Crabtree (1957), Lohse (1985), Nelson (1969), Swanson (1962).

TYPE 11: Corner-notched triangular series

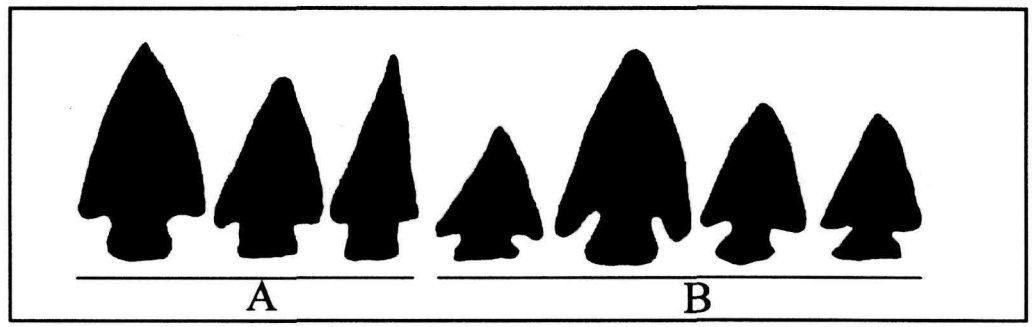


Figure D-12 Type 11: Corner-notched triangular series.

Description: Large to medium points with triangular blades, characterized by wide and deep corner-notches, expanding stems, and downward projecting shoulders. Blade margins are straight to slightly convex. There are many varieties of this morphological type, two of which are recognized here: 11A and 11B. Subtype 11B is morphologically similar to 11A, but larger, more massive, and having deep, broad corner-notches and thick, expanding stems (Lohse 1985).

Common Names: Subtype 11A: Columbia Corner-Notched; subtype 11B: Quilomene Bar Corner-Notched; both varieties are characteristic of the Plateau horizon of the Canadian Plateau.

Age Estimate: Subtype 11A: 4,000 to 2,000 BP (Lohse [1985] recognizes a smaller subvariety of this type that he believes dates 2,000 to 150 BP); in the southern Cascades of Washington, this type is associated with radiocarbon-dated assemblages between ~1,800 and ~1,000 year BP (Lewarch and Benson 1989). Subtype 11B: 3,000 to 2,000 BP; both varieties are assigned to the Plateau horizon of the Canadian Plateau, dated 2,400 to 1,200 BP (Richards and Rousseau 1987).

Comments: Subtype 11 (both varieties) are widespread in the Columbia and Canadian Plateaus. Richards and Rousseau (1987:40) consider this variety to occur earlier on the Columbia Plateau and to have been adopted by groups living on the Canadian Plateau six hundred or so years later. Lohse (1985:349) considers Subtype 11A to overlap in time with Type 10 (Rabbit Island stemmed), but represent a different cultural tradition. The larger varieties are believed to have served as the tip for atlatl darts or spears, and the smaller varieties were used to tip arrows; their use as arrow tips on the Canadian Plateau begins between 1,700 and 1,500 BP (Richards and Rousseau 1987:34).

References: Chatters (1986), Grabert (1968), Lohse (1985), Mierendorf and Bobalik (1983), Nelson (1969), Richards and Rousseau (1987).

TYPE 12: Basal-notched triangular series

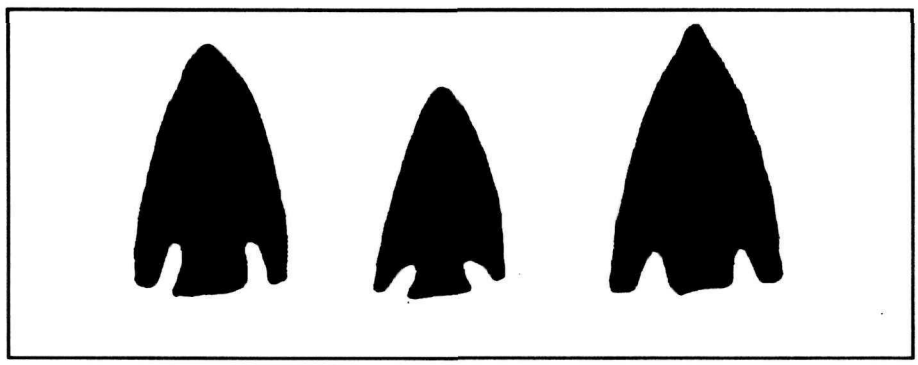


Figure D-13 Type 12: Basal-notched triangular series.

Description: Large points, often tending toward thick and heavy. They have triangular blades with straight to convex margins. They are characterized by deep notches, flaked from the base, forming prominent barbs.

Common Names: Quilomene Bar basal-notched; in the Canadian Plateau these are assigned to the Plateau horizon along with the type 11 varieties.

Age Estimate: 2,500 to 1,200 BP; in the southern Cascades of Washington, the type is associated with radiocarbon dates of ~1,600 and ~1,000 years BP (Lewarch and Benson 1989).

Comments: Like the type 11 varieties, these are common on the Columbia and Canadian Plateaus.

References: Lewarch and Benson (1989), Lohse (1985), Nelson (1969), Richards and Rousseau (1987).

TYPE 13: Small stemmed triangular series

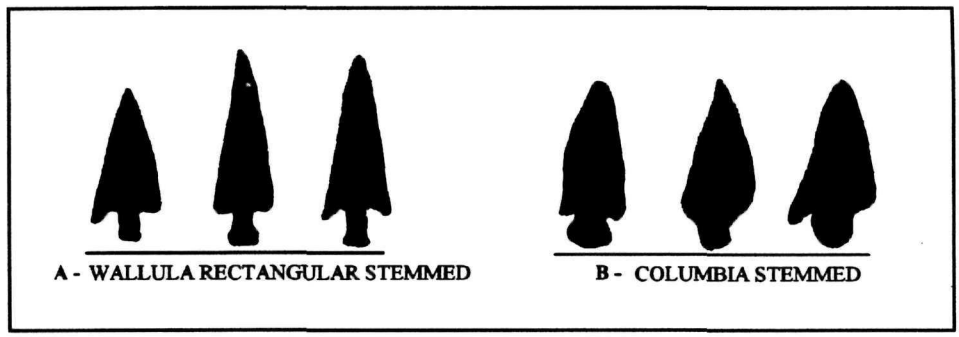


Figure D-14 Small stemmed triangular series.

Description: Small points having nearly straight blade margins, wide corner-notches, and straight (parallel-sided) to slightly expanding stems.

Common Names: Wallula rectangular stemmed, Columbia stemmed

Age Estimate: 2,000 to 150 BP. From sites on the Skagit delta at the river's mouth, this series is associated with radiocarbon dates between 1230 BP and 266 BP (Blukis Onat 1980). In the Skykomish River valley of the northern Cascades, this series is associated with a radiocarbon date of 1,710 BP (Gough and Galm 1988). In the southern Cascades of Washington, the type is associated with a radiocarbon date of 390 BP (Lewarch and Benson 1989).

Comments: Many varieties of this type are recognized by archeologists working in different areas, the distinctions between them resting of the width and origin of the notches, which control the shapes of the barbs and the stems. Although these are most commonly associated with archeological assemblages east of the Cascade Range, they appear in assemblages from western Washington (Blukis Onat 1980) and southwestern British Columbia (Carlson 1982).

References: Blukis Onat (1980), Carlson (1982), Chatters (1984, 1986), Gough and Galm (1988), Grabert (1968), Lewarch and Benson (1989), Lohse (1985), Mierendorf and Bobalik (1983), Nelson (1969), Shiner (1961).

TYPE 14: Corner-notched barbed series

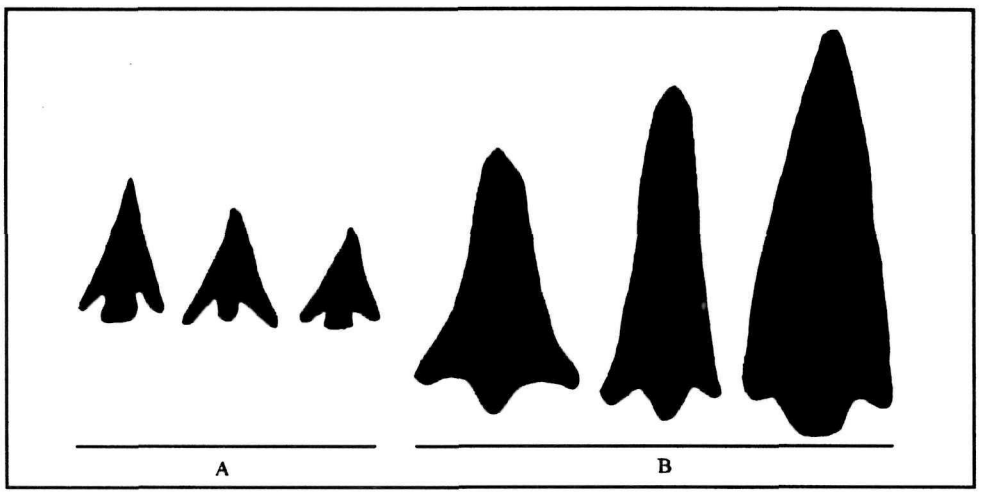


Figure D-15 Type 14: Corner-notched barbed series.

Description: Small to medium points with triangular blades having margins that are straight, slightly convex, or concave. They are characterized by deep corner-notches that form prominent acute angle barbs and stems. Two subtypes are recognized here. Subtype 14A is small, exhibiting long barbs and straight to expanding stems; and subtype 14B is large, having somewhat less prominent, shorter barbs and short tapering stems.

Common Names: Columbia Plateau corner-notched; Plateau horizon points

Age Estimate: 2,000 to 150 BP

Comments: Although subtype 14A is most commonly associated with archeological assemblages east of the Cascade Range, specimens have been found in assemblages from western Washington (Blukis Onat 1980) and southwestern British Columbia (Carlson 1982). From sites on the Skagit delta at the river's mouth, subtype 14A is associated with radiocarbon dates between 1,230 BP and 266 BP (Blukis Onat 1980). In the Skykomish River valley of the northern Cascades, 14A is associated with a radiocarbon date of 1,710 BP (Gough and Galm 1988). Samuels (1993:8.52, Fig. 8.20b) illustrates an example of subtype 14B; Blukis Onat (1980:340, Fig. 26h) illustrates a broken point that could be assigned to 14B.

References: Blukis Onat (1980), Carlson (1982), Chatters (1984, 1986), Gough and Galm (1988), Grabert (1968), Lohse (1985), Mierendorf and Bobalik (1983), Nelson (1969), Richards and Rousseau (1987), Samuels (1993), Shiner (1961).

TYPE 15: Small side-notched series

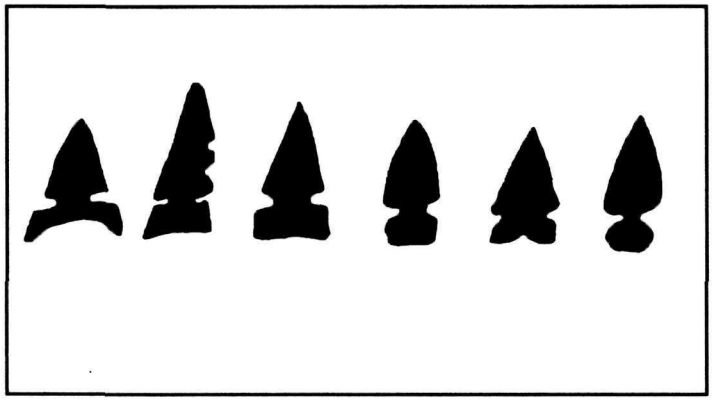


Figure D-16 Type 15: Small side-notched series.

Description: Small triangular points exhibiting straight, convex, or concave blade margins. Notches are from the side and vary from narrow and deep to broad and shallow. Bases vary from straight, to convex to notched.

Common Names: Columbia Plateau side-notched, Desert side-notched, Kamloops side-notched, Kamloops multi-notched

Age Estimate: 1,200 to 150 BP

Comments: Points of this type are common throughout the Pacific Northwest, and much of North America, during the latest prehistoric time period, just prior to the non-Indian settlement of the continent. In North Cascades National Park this series is associated with radiocarbon dates of less than 700 years BP from two sites in the Park Complex. One of these is next to the Skagit River near the mouth of Newhalem Cr.. It dates 660-170 BP (unpublished data for 45WH64). The other is from a prehistoric site at the head of Lake Chelan that is radiocarbon dated at 570 BP (Mierendorf and Harry 1992). Blukis Onat (1980:340, Fig. 26i-k) illustrates this series from a site radiocarbon dated between 1230 BP and 266 BP.

References: Blukis Onat (1980), Carlson (1982), Chatters (1984, 1986), Grabert (1968), Lohse (1985), Mierendorf and Bobalik (1983), Mierendorf and Harry (1992), Nelson (1969).

APPENDIX E: FIELD DESCRIPTIONS OF SITE STRATIGRAPHY

45WH229 (F.S.#46)
TEST UNIT 2

Stratum Number	Field Description
1	Brown (10YR 4/3m), poorly sorted, fine sand (also loamy sand); slightly sticky, nonplastic; weakly stratified with black charcoal flecks and dark yellowish-brown (10YR 3/6m) from B-horizon; abrupt irregular boundary. This is a reservoir-mixed deposit.
2	Black, soft charcoal pieces and diffuse mottles of finely divided charcoal in a discontinuous layer.
3	Light brownish gray (10YR 6/2m), moderately sorted fine sand; nonsticky and nonplastic; volcanic ash; has fine sand-size black crystals or fragments in gray matrix of same texture; black charcoal chunks common; abrupt to clear, wavy boundary; mixed with underlying B-horizon along lower boundary. Note: Tephra sample (NOCA 7714) identified as Mazama-O (17 shards) and Glacier Peak BMG (2 shards).
4	Dark yellowish-brown (10YR 4/6m) silty sand; slightly sticky and nonplastic; mottled with charcoal flecks and irregular inclusions of lower soil horizon; diffuse boundary. This is soil B-horizon (zone of Fe accumulation).
5	Dark yellowish-brown (10YR 4/4m) very fine sandy silt; slightly sticky and slightly plastic; black charcoal flecks common; lower boundary not uncovered. This is a soil BC-horizon (or possibly C-horizon).

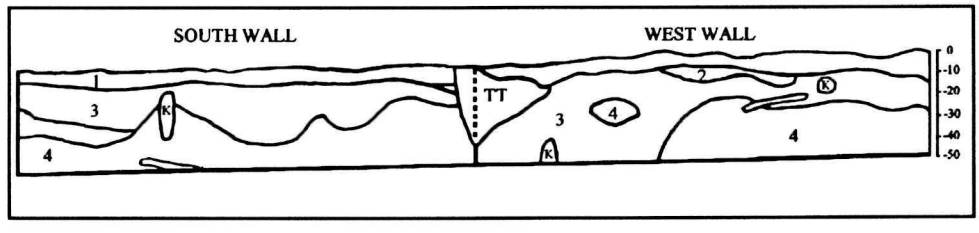


Figure E-1 Stratigraphy from 45WH229

45WH239 (F.S.#59)
BANK PROFILE #1

Stratum Number	Field Description
1	Strong reddish-brown gravelly sand, poorly sorted; alluvial fan deposit, gravels angular to subangular.
2	Strong reddish-brown, to brown, to bluish gray (gleyed) silt to clayey silt. Alluvium.
3	Strong brown (oxidized) poorly sorted sandy gravel.
4	Brown, moderately sorted, fine to coarse sand.
5	Brown to gray volcanic ash; moderately well sorted, fine sand. Sample collected (S-1). Note: Tephra sample identified as St. Helens-Y, 3,350-3,510 BP (NOCA 10549).
6	Horizontal beds of sand, granules, silt, and black organic layers.
7	Yellowish-brown silt (possible volcanic ash). Sample collected as S-2. Tephra sample (NOCA 10550) identified as Mazama O, 6,700-7,000 BP.
8	Sand and angular gravels.

Note: The landform contains a Holocene stratigraphic record with at least two volcanic ashes and numerous depositional events. The information embodied in this record will address paleoenvironmental and paleoclimatic events of the Holocene.

45WH303 (F.S.#123)
TEST UNIT 6

Stratum Number	Field Description
1A	Disturbed sandy silt with mottled burnt matrix.
1B	Yellow-brown sandy silt with light mottling.
2A	Burnt sandy silt.
2B	Yellow-brown compact sandy silt.

3	Red-orange to red-brown burnt sandy silt.
4A	Yellow-brown silty sand.
4B	Yellow-brown sandy silt with brown mottling.
4C	Yellow-brown sandy silt with clay.
5A	Brown to dark brown sand.
5B	Gray-brown medium sand.
6	Yellow-brown medium sand.
7	Burnt sand; mottled dark staining. Note: a charcoal sample from this stratum dated 2,530±150 BP (Beta 33510).
8	Ash: St. Helens-Y, 3,350-3,510 BP (NOCA 7723).
9	Gray-brown silty sand; mottled.
10	Cobbles.

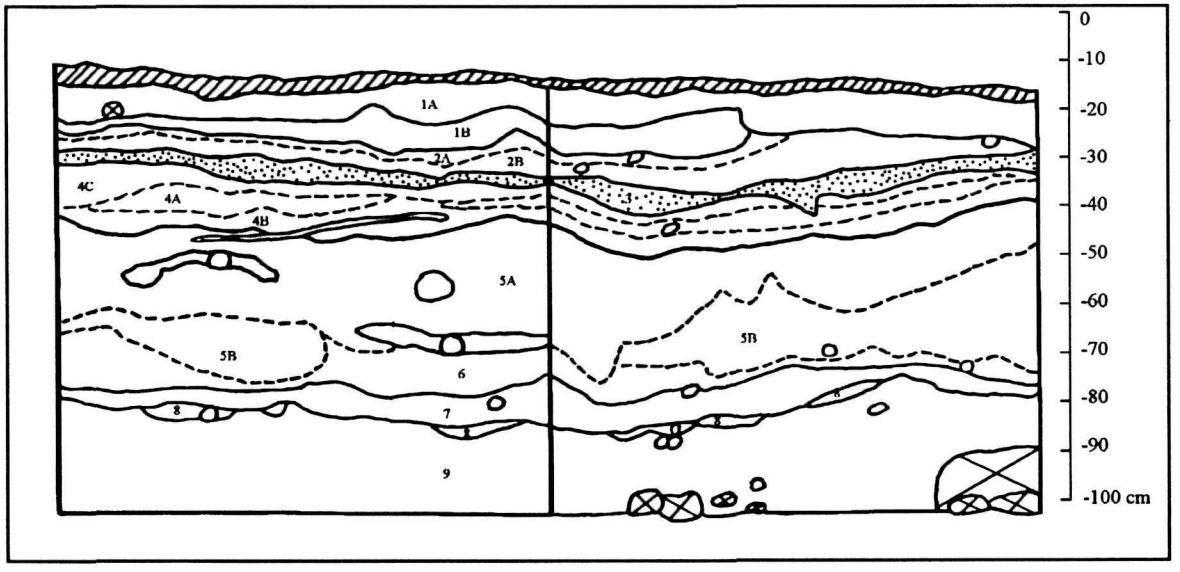


Figure E-2 Stratigraphy from 45WH303

45WH300 (F.S.#120)
TEST UNIT 4

Stratum Number	Field Description
1	Dark brown (10YR 3/4m) silty, fine sand; reservoir deposit.
2	Reddish-black (10R 2.5/1m); 0-horizon (duff layer). Note: numerous small roots.
3A	Pinkish-gray (7.5YR 7/2m) volcanic ash (tephra).
3B	Black (7.5YR N2/0); charcoal. Feature 3 matrix. Charcoal samples from this stratum are as follows: 1,650±70 BP (Beta 64824); 1,940±90BP (Beta 63825); 1,750±60 BP (Beta 64826).
3C	Pinkish gray (7.5YR 6/2m); volcanic ash (tephra). Identified as Mount St. Helens Y, 3,350-3,510 BP (NOCA 10821).
4	Dark brown (7.5YR 4/4) B-horizon; medium to fine sand and silt; moist, firm, nonplastic and nonsticky. Some charcoal staining in pockets and along burnt roots. Numerous roots.
5	Light olive brown (2.5Y 5/4m) BC-horizon. Fine sand and silt fining upward to well sorted medium to fine sand; moist, firm, nonplastic - nonsticky. Numerous roots; pockets of stratum 4 within matrix.

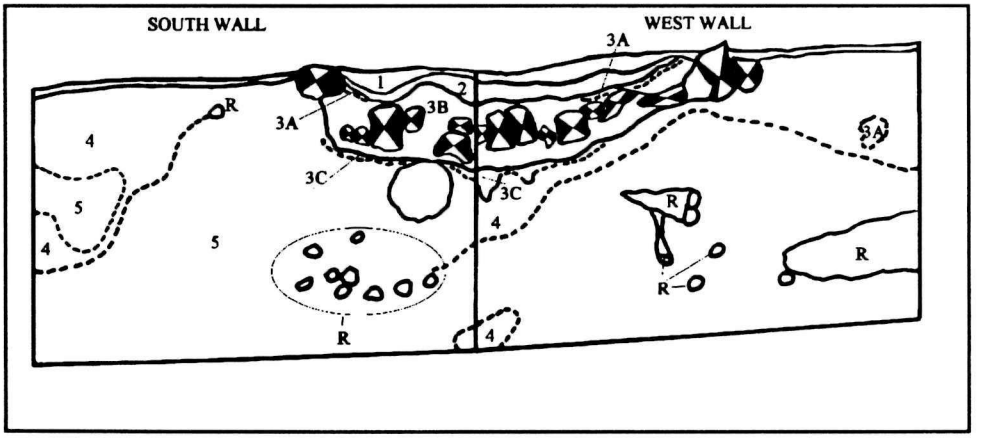


Figure E-3 Stratigraphy from 45WH300

45WH241 (F.S.#61)
TEST UNIT 1

Stratum Number	Field Description
1	Brown to pale brown (10YR 5.5/8), dry, well to moderately sorted, very coarse sand with occasional granules and pebbles and bone fragments; very loose consistency; no soil or sedimentary structure, lower boundary; clear, wavy, no roots. Note: this is reservoir-sorted beach deposit in sandy part of the fan; restricted to east half of unit surface.
1A	Surface accumulation of angular to subangular cobbles and gravel. Probably deflated ~5cm. Alluvial gravels.
2	Very dark gray to black (10YR 3/1); moist, poorly sorted, clay loam with bone fragments and angular granules; soft consistency - slightly sticky and plastic; no soil or sedimentary structure, lower boundary. Clear - wavy; some roots; lots of charcoal; no reaction to HCl. Note: looks like burned 0-horizon; anthrosol with bone fragments which has been reworked to certain extent to get bone into unit 1. Charcoal samples from this stratum dated 1,430±90 BP (Beta 40696) and 1,890±90 BP (Beta 40695).
3	Grayish-brown to dark grayish brown (10YR 4.5/1.5), moist, well sorted matrix with occasional angular pebbles and cobbles; matrix a sandy clay; stiff consistency - slightly sticky and plastic, but gritty fine sand fraction dominates; no soil or sedimentary structure; common roots; some/trace charcoal, lower boundary; clear, wavy. Note: this is E-horizon or concentration of ash.
4	Brown to reddish brown (7.5YR 4/5), moist, poorly sorted gravelly sand loam with common angular to subangular granules and pebbles (clasts in contact with each other); stiff consistency; very slightly sticky and nonplastic, no soil or sedimentary structure; some roots, trace charcoal flecks. Notes: looks undisturbed by reservoir. This is a weakly developed Bs-horizon in coarse, poorly sorted alluvium from Roland Creek.
5	Brown (10YR 4.5/3) moist, very poorly sorted, sandy gravel, gravels dominate, clast contact; hard consistency; nonsticky and nonplastic; no soil or sedimentary structure; lower boundary not observed; some roots; no charcoal. This is a coarse, poorly sorted alluvium from Roland Creek.

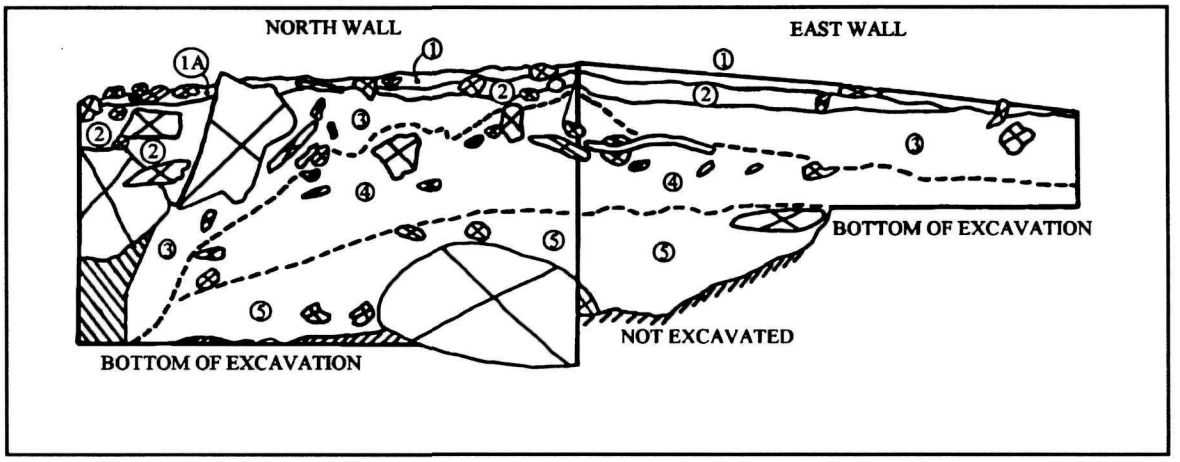


Figure E-4 Stratigraphy from 45WH241

45WH262 (F.S.#82)
TEST UNIT 1

Stratum Number	Field Description
1	Dark brown, sandy, silty gravel; very poorly sorted, angular clasts, reservoir worked unit 4 - colluvium.
2	Dark yellowish brown (10YR 4.5/4); moist; very faint, few grayish mottles; very poorly sorted; gravelly, silty sand; clasts angular granules and pebbles of local lithology; matrix a loamy sand with loose consistency and very slight stickiness, plasticity (i.e. very gritty, but formed rod when rolled moist); no soil or sedimentary structure; lower boundary abrupt, wavy, contains many fine (<1mm) roots; one large root penetrates through; contains some charred root-bark; upper part of unit disturbed, reworked by reservoir. Note: this is colluvium composed of angular local and rare rounded exotic clasts very similar to unit 4.
3	Dark strong brown (7.5YR 4/5); lenses of orange wood fiber, moist, very poorly sorted gravelly silty sand, clasts angular granules; matrix a loamy sand; loose consistency; no soil or sedimentary structure; lower boundary abrupt, wavy, contains abundant masses of charred (root) bark, abundant rootlets (<1mm). Note: this appears to be a weakly developed Bs-horizon in colluvium with some color due to heat/fire oxidation, particularly adjacent to charcoal. Charcoal from this stratum dated at 310 ±90 BP (Beta 65229).

4	Brown (10YR 4.5/s); gray mottles around roots and clasts; moist; very poorly sorted gravelly sandy silt; clasts matrix supported; clasts mostly angular granules but pebbles common and angular local/subrounded exotic clasts occur, matrix a loam with friable consistency and slight stickiness and plasticity; no soil structure or sedimentary structure; lower boundary unconformity abrupt, wavy; has large (>2cm) roots and common rootlets (<1mm); no charcoal; contains dark red zones (unit 7 is example - also in west wall) that may be root casts filled with unit 5 material. Note: this is an accumulation of colluvium composed of loess matrix and primarily angular local lithology clasts. No soil development within massive unit (with possible exception unit 3) suggests continual deposition of this unit on top of loess (unit 5).
5	Strong brown (7.5YR 4/6); moist; very well sorted silt loam and contains occasional clast in upper part (from unit 4); friable consistency; massive, homogenous sedimentary structure; lower boundary gradual, wavy (bleeds into unit 6); rare fine rootlets and roots; rare charcoal flecks. Note: This is a buried Bs-horizon that developed in loess (glacial origin at end of Fraser glaciation); also has distinct krotovinas; has shot pellets developed in it.
6	Brown (10YR 5/3); moist; very well sorted; silt loam; friable consistence with moderate stickiness and slight plasticity; moist; massive, homogenous sedimentary structure; lower boundary gradual, wavy (although no well exposed); no roots or other evidence of disturbance. Note: this is a BC-horizon, loess parent material, grades into 6A, loess parent material of C-horizon.
7	Strong brown (7.5YR 4/6); very well sorted loam; very friable consistence; very slight sticky and plasticity; boundary gradual - pendant into unit 4; rare small (50mm) roots. Note: this is a root cast apparently filled with Bs material (loess) of unit 5.

45WH255 (F.S.#75)
TEST UNIT 1

Stratum Number	Field Description
1	Pale brown (10YR 6/3); dry, silty fine sand; poorly sorted with widely varying rounded granules and pebbles and cobbles in feature; very loose; no soil or sedimentary structure; lower boundary a function of moisture. This is recently reworked reservoir/unit 2 material. Surface clasts define a feature.

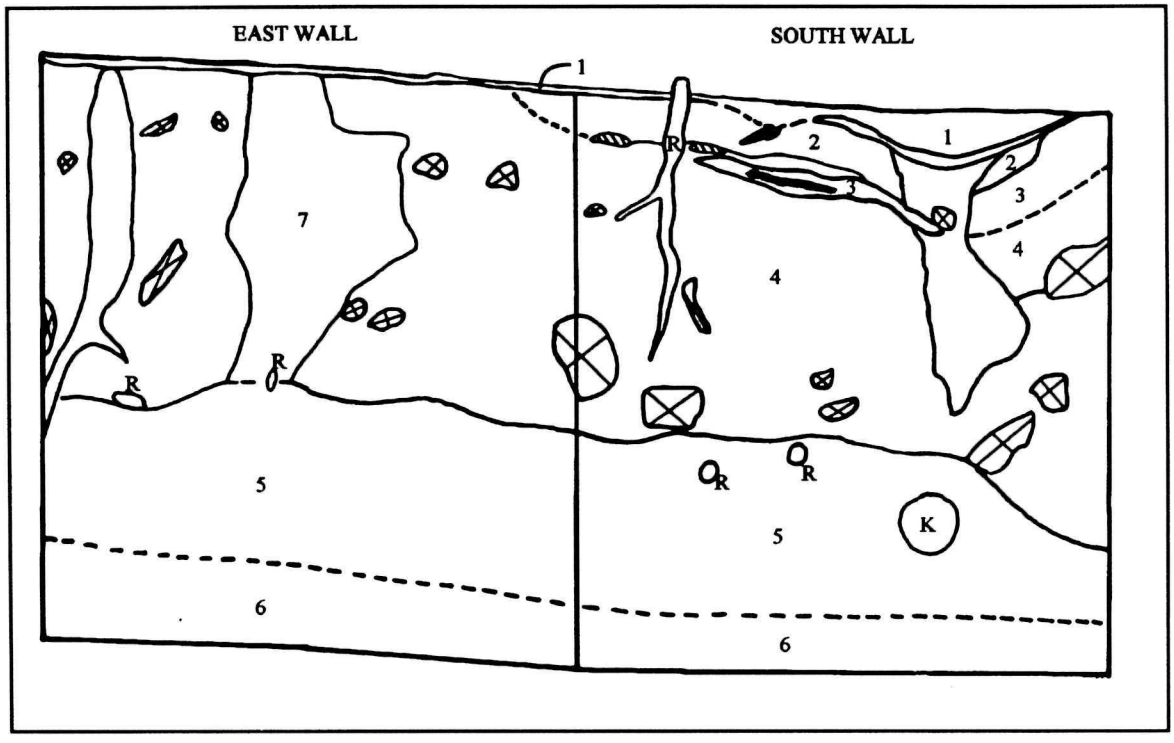


Figure E-5 Stratigraphy from 45WH262

2 Very dark grayish brown (10YR 3/1.5); fire stained (mottled with charcoal stain and reddish oxidized). Moist, very well sorted; loam to sandy loam with occasional pebbles. Loose to very friable; slightly sticky and nonplastic; no soil or sedimentary structure; lower boundary clear and wavy; contains roots and charcoal (sampled). Occurs only under clasts of feature. Appears undisturbed by reservoir. This is a thermally altered B-horizon. Charcoal from this stratum dated at 180±50 BP (BETA 40698).

3 Dark brown to reddish-brown (5YR 3.5/4). Moist; well sorted matrix; loam to sandy loam; occasional pebble to cobble clasts, primarily under feature, subrounded to subangular; slightly sticky and nonplastic; slightly developed blocky structure; lower boundary is gradual, wavy, has fine roots that are burned; no noticeable krotovina or other disturbance. This is a Bs-horizon developed in loess parent material.

4 Dark brown (7YR 3.5/4); moist; well sorted; loam; slightly sticky and plastic; no soil or sedimentary structures; loose; lower boundary not excavated; some fine roots; charcoal concentration in SW corner/ level 3. This is a BC-horizon developed in loess. It rests on glacial till in east wall where boundary is distinct, wavy. Charcoal from this stratum dated at 500±90 BP (BETA 40699).

5	Dark yellowish-brown (10YR 4/4); moist; very poorly sorted (gravelly/pebbly) sandy clay loam; slightly sticky and plastic; clasts subrounded to subangular; medium to dense consistency; no soil structure; sedimentary structure massive/homogenous, although only ~5cm of unit observed; lower boundary not excavated; few fine roots; no charcoal; no obvious disturbances. This looks like a fairly unweathered till. Clasts have some clay/silt coating.

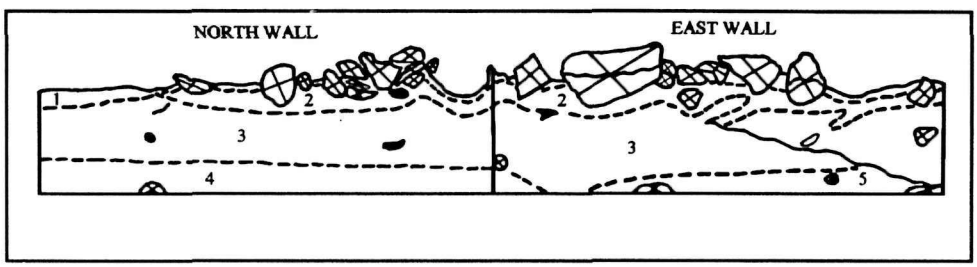


Figure E-6 Stratigraphy from 45WH255

45WH283 (F.S.#103)
TEST UNIT 1

Stratum Number	Field Description
1	Brown (10YR 5.5/3), dry; very poorly sorted; gravelly sand loam; clasts are angular; loose consistence; nonsticky, nonplastic; no soil or sedimentary structures; lower boundary clear, wavy; some roots; no charcoal. This unit is distinguished from that below by desiccation and disturbance (both human foot and reservoir disturbed); may be either a reservoir deposit or reworked material from below.
2	Dark yellowish-brown (10YR 4/4), mottled gray (ash); moist; well sorted; silt loam; slightly sticky and slight plasticity; no soil or sedimentary structures; lower boundary is clear, wavy; lots of root activity, especially in south end of west wall; lots of charcoal and burned organic matter; is probably from pre-reservoir clearing, burned O-horizon.
3	Reddish-brown (5YR 4/4), moist; well-sorted matrix with matrix supported clasts (angular to subrounded); silt loam; slightly sticky and very slightly plastic (firm); weakly developed granular (silt ball) soil structure; sedimentary structure massive, homogenous; lower boundary is

gradual, wavy; few fine roots and occasional charcoal flecks and larger accumulations. This looks like an undisturbed Bs-horizon that is fairly compacted and undisturbed. Probably loess parent material and tephras and decomposed organic material. Charcoal from this level dated at 1,380 ±110 BP (Beta 40702).

4 Dark brown to brown (10YR 4/3), moist; very well sorted; silty clay loam; sticky and plastic;firm to friable; no soil structure; massive sedimentary structure; lower boundary on bedrock; large to fine roots occasional and burned on outer surface. This is a BC-horizon that has some clay enrichment; parent material is loess.

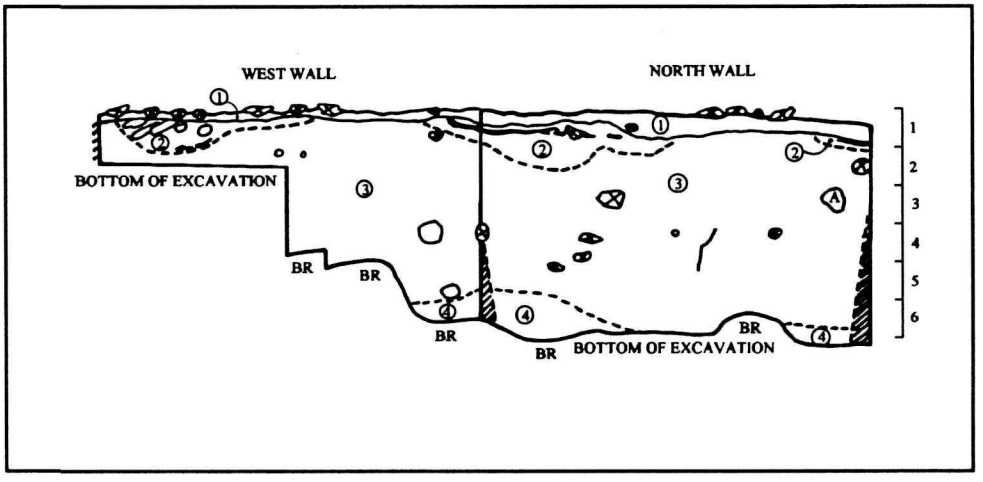


Figure E-7 Stratigraphy from 45WH283

45WH286 (F.S.#106)
TEST UNIT 2

Stratum Number	Field Description
1A	Dark brown and brown, well-stratified sand and sandy silt; reservoir deposits.
1B	Greenish gray, clayey silt. Reservoir deposit. Abrupt smooth boundary.
2	Strong brown (7.5YR 3/4m), moderately sorted silty sand; nonsticky and nonplastic; no soil or sedimentary structures; the top of this unit is weakly charcoal stained and is associated with some organic duff from the pre-

reservoir ground surface; unit mixed with occasional angular to rounded cobbles and pebbles. Soil B-horizon; faint boundary.

3 Olive brown (2.5Y 4/4m), moderately sorted; silty sand with occasional granules; pebbles and small cobbles. This sandy matrix becomes the interstitial matrix of the gravel unit below. Soil BC-horizon.

4 Sandy gravel; matrix supported; rounded and subrounded river gravels. Soil C-horizon.

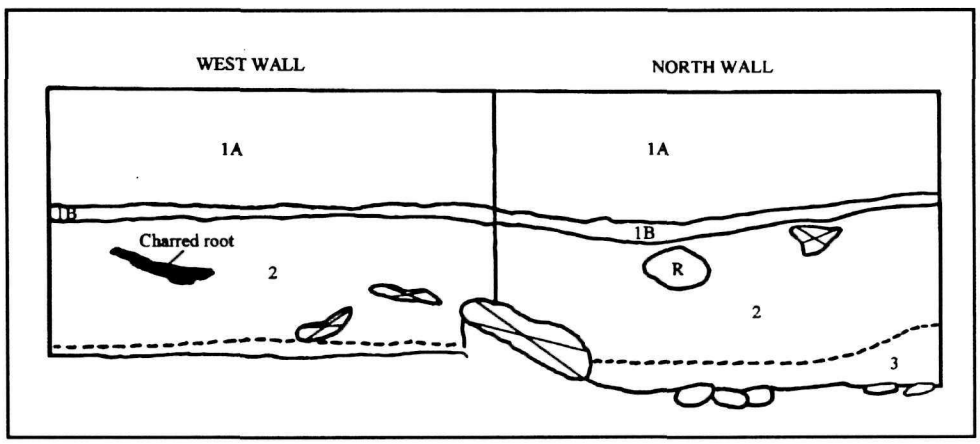


Figure E-8 Stratigraphy from 45WH286

45WH286 (F.S.#106)
TEST UNIT 2

Stratum Number	Field Description
1A	Dark brown and brown. Well stratified sand and sandy silt; reservoir deposits.
1B	Greenish gray, clayey silt. Reservoir deposit. Abrupt, smooth boundary.
2	Strong brown (7.5YR 3/4m), moderately sorted silty sand; nonsticky and nonplastic; no soil or sedimentary structures; the top of this unit is weakly charcoal stained and is associated with some organic duff from the pre-reservoir ground surface; unit mixed with occasional angular to rounded cobbles and pebbles. Soil B-horizon; faint boundary.

3	Olive brown (2.5Y 4/4m), moderately sorted, silty sand with occasional granules; pebbles and small cobbles. This sandy matrix becomes the interstitial matrix of the gravel unit below. Soil BC-horizon.
4	Sandy gravel; matrix supported, rounded and subrounded river gravels. Soil C-horizon.

45WH496 (F.S.#214)
TEST UNIT 2

Stratum Number	Field Description
1	Dark brown (10YR 3/3m); sandy silt with organic lenses; nonsticky and slightly plastic; no soil or sedimentary structures; clear to abrupt, wavy boundary. Notes: reservoir deposit.
2	Black (10YR 2/1m); sandy loam; nonsticky and nonplastic; no soil structure, weak, discontinuous laminations; clear to diffuse, irregular. Notes: sediments that fill a root burn-mixed organic and mineral soil; pre-reservoir.

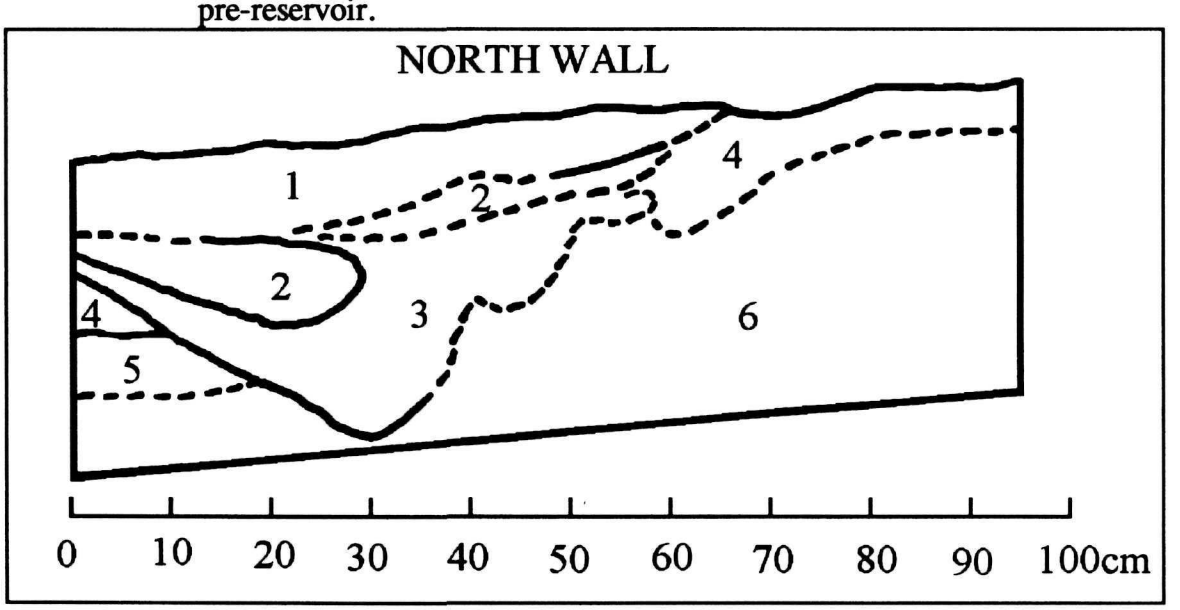


Figure E-9 Stratigraphy from 45WH496

3	Dark grayish brown (10YR 4/2m); moderately sorted fine sand; nonplastic and nonsticky; no soil or sedimentary structures; clear to diffuse, irregular boundary. Notes: primary volcanic ash with mottles of secondary or

mixed ash; a sample of primary ash was taken; photos on Roll 93-14. Tephra sample identified as Glacier Peak-B, St. Helens-WN, ROLA 89 229-1 and Mazama-O (NOCA 10822).

4 Dark yellowish-brown (10YR 3.5/4m); moderately sorted fine sand; nonsticky and nonplastic; no soil or sedimentary structures; clear to diffuse, smooth boundary. Notes: thin soil B-horizon.

5 Dark yellowish-brown (10YR 4/4m); moderately well sorted fine sand; nonsticky and plastic; no soil or sedimentary structures; clear, smooth boundary. Notes: a possible volcanic ash; possibly soil BC-horizon. Tephra from this level identified as St. Helens-WN, St. Helens-Y, ROLA 89 229-1, and Mazama-O (NOCA 10823).

6 Dark grayish brown (2.5Y 4/2m); silt; nonsticky and nonplastic; no soil or sedimentary structures. Notes: soil BC-horizon.

APPENDIX F: INVENTORY OF ISOLATED FINDS IN THE PROJECT AREA

IF#	YR	OBJECT DESCRIPTION	MATERIAL	NOCA NO.	LANDFORM
1	88	Core Tool,	Chalcedony	N/A*	RB**
2	88	Core/shatter	Hozo Chert	N/A	RB
3	88	Flake	Hozo Chert	N/A	RB
4	88	Flake	Hozo Chert	N/A	SS
5	88	Shatter	Hozo Chert	N/A	SS
6	88	Biface	Hozo Chert	N/A	SS
7	88	Shatter	Hozo Chert	N/A	SS
8	88	Flake	LBG Chert?	N/A	SS
9	88	Scraper	H. Chalced	6355	SS
10	88	Flake	Metased	N/A	RB
11	88	Core, turtle-back	Metased or Basalt	N/A	SS
12	88	Core, multi-direction	Quartzite or Chert	N/A	SS
13	88	Cobble tool	Metased	N/A	RB
14	88	Core	Metased	N/A	T
15	88	Rock Cairn	N/A	N/A	T
18	88	Flake tool, no cortex	Hozo Chert	N/A	AF
19	88	Shatter	Hozo Chert	N/A	AF
20	88	Flake, no cortex	Hozo Chert	N/A	T
21	88	Cobble tool	Metased	N/A	T
22	88	Flake, no cortex	Hozo Chert	N/A	T
23	88	Shatter, cortex	Hozo Chert	N/A	T
24	88	Cobble tool	Metased	N/A	T
25	88	Scraper	Hozo Chert	N/A	AF
26	88	Biface fragment, corner notched	Metased	N/A	T
27	88	Shatter, cortex	Hozo Chert	N/A	SS
28	88	Adz, ground stone	Nephrite	6381	AF
29	88	Flake, no cortex	Hozo Chert	N/A	AF
30	88	Flake, no cortex	Hozo Chert	N/A	AF
31	88	Flake, no cortex	Hozo Chert	N/A	AF
32	88	Core, no cortex	Hozo Chert	N/A	AF
33	88	Flake, no cortex	Hozo Chert	N/A	AF
34	88	Flake, no cortex	Hozo Chert	N/A	AF
35	88	Shatter, cortex	Hozo Chert	N/A	AF
36	88	Projectile point, side notched	Metased	N/A	AF
37	88	Flake, cortex	Hozo Chert	N/A	AF
38	88	Possible FCR concentration	N/A	N/A	FP

		2 m diameter			
39	88	Flake, no cortex	Metased	N/A	FP
40	88	Projectile point	Metased	N/A	FP
41	88	Flake, utilized, no cortex	Metased	N/A	FP
42	88	Flake, no cortex	Metased	N/A	FP
43	89	Flake	Hozo Chert	N/A	SS
44	89	Flake	Hozo Chert	N/A	T
45	89	Flake	Metased	N/A	RB
46	89	Biface	Hozo Chert	7105	AF
47	89	Flake	Hozo Chert	N/A	AF
48	89	Biface	Hozo Chert	N/A	T
49	89	Flake	Hozo Chert	N/A	AF
50	89	Flake	Hozo Chert	N/A	SS
51	89	Core	Metased	N/A	AF
52	89	Flake	Metased	N/A	FP
53	89	Projectile point, corner notched, expanding stem, convex base	Metased	7104	AF
64	90	Microblade Core	Qtz. Crystal	7968	?
65	90	Ground stone	Granitic	7969	?
66	90	Flake	Hozo Chert	N/A	AF
67	90	Flake	Hozo Chert	N/A	RB
69	90	Flake	Hozo Chert	N/A	SS
70	90	Flake	Hozo Chert	N/A	RB
71	90	Flake	Metased	N/A	SS
72	90	Flake	Obsidian	N/A	RB
73	90	Flake	Hozo Chert	N/A	SS
74	90	Flake	Hozo Chert	N/A	SS
75	90	Flake	Metased	N/A	SS
77	91	Flake, no cortex	Hozo Chert	N/A	T
78	91	Biface, no cortex	Hozo Chert	6370	?
80	91	Microblade core	Hozo Chert	10387	T
		Biface fragment	Metased	N/A	
90	93	Projectile point	Metased	10740	?

TOTAL IFs = 66
TOTAL IFs COLLECTED = 9

*N/A=not collected
**Landform type abbreviations: RB (bedrock bench), SS (steep slope), T (terrace), AF (alluvial fan), FP (flood plain)

APPENDIX G: ANALYSIS OF LITHIC RAW MATERIALS

G.1 Petrographic Analysis of Rock Samples

North Cascades
Lithic Classification Report

May 1, 1994

Edward F. Bakewell
Department of Anthropology
University of Washington

Summary Report

The main body of this report consists of the modal analyses, the classifications (Table 1), the major and minor element composition for the igneous rocks (Table 2), and a figure representing the relative positions of the igneous samples projected against a plot of total alkalis vs. silica.

To summarize, there are six igneous samples represented in the materials submitted. Two of those igneous samples (Reference 7093 and 10680) match the reference standard (21) which you submitted very closely, at least with respect to major element composition. One or two of the other igneous samples may also be related to this material (Reference 7133 and 10786). Reference 6342 is an andesite of distinctively different character.

There were four metamorphic rocks in the materials submitted. The two reference samples (Reference 45 and 67) are decidedly unrelated to any of the archaeological materials. One (Reference 45) is a hornfels, and the other, a serpentinite. The two metamorphics in the archaeological samples are both argillites (Reference 6083 and 6170), although one (Reference 6170) may have been orginally fossiliferous. One or both of these argillites may have been thermally altered as a result of cultural manipulation (one thin section of Reference 6083 appeared to have a heat aureole).

Reference 7236 is a radiolarian chert, similar to the "Rabbit Point" material.

Modal Analysis
NC-1
Reference #21

Trachydacite

Phenocryst Phases

Range	Phase	Description
0-1%	Orthopyroxene (Hypersthene)	Euhedral crystals, accicular, faintly pleochroic.

Groundmass Phases

Range	Phase	Description
40-50%	Plagioclase	Euhedral, lath-shaped microlites
50-60%	Opaques and Glass	Includes glass and cryptocrystaline minerals.

Description

Extremely fine-grained, glassy with virtually no phenocrysts except for rare orthopyroxene. Highly trachyitic texture.

Modal Analysis
NC-2
Reference #45

Cordierite Hornfels

40-50%	Cordierite
20-30%	Biotite
5-10%	Quartz
5-10%	Plagioclase
15-25%	Graphite dust Cryptocrystaline minerals

Description

A low-grade contact-metamorphic rock. Distinctively "spotted" appearance in thin section.

Modal Analysis
NC-3
Reference #67

Serpentinite

70-80%	Serpentine (Lizardite)
15-20%	Carbonate (Magnesite or Dolomite)
0-5%	Pyroxene
5-10%	Chromite (rimmed or replaced by magnetite)

Description

Green in hand specimen with "slickensides". Pale green in thin section. Highly sheared, with oblique-fiber veins.

Modal Analysis
NC-4
Reference #6083

Argillite

Mode

65-80%	Cryptocrystalline argiliceous minerals
5-10%	Plagioclase
5-10%	Quartz
5-10%	Carbonaceous inclusions

Description

Dark gray in hand specimen, brownish in thin section. Very fine-grained.

Modal Analysis
NC-5
Reference #6170

Argillite

75-85%	Cryptocrystalline argiliceous minerals
5-10%	Aggregates (Biotite/Cordierite?)
5-10%	Carbonaceous inclusions

Description

Dark gray in hand specimen, brownish in thin section. Very fine-grained. Lacks plagioclase and quartz clasts. "Semi-schistose" texture. Aggregates may be recrystallized radiolaria, but minerals are cryptocrystalline and further identification would require EDS microprobe scan.

Modal Analysis
NC-6
#6342

Andesite

Phenocryst Phases

Range	Phase	Description
0-1%	Plagioclase	Euhedral laths.
2-3%	Orthopyroxene (Hypersthene)	Euhedral crystals, accicular-skeletal, faintly pleochroic.

Groundmass Phases

Range	Phase	Description
40-50%	Plagioclase	Euhedral, lath-shaped microlites
50-60%	Opaques and Glass	Includes glass and cryptocrystaline minerals.

Description

Extremely fine-grained, glassy with few phenocrysts (orthopyroxene), rare plagioclase. Slightly trachyitic texture.

Modal Analysis
NC-7
#7093

Trachydacite

Phenocryst Phases

Range	Phase	Description
2-5%	Orthopyroxene (Hypersthene)	Euhedral crystals, accicular-skeletal, faintly pleochroic.

Groundmass Phases

Range	Phase	Description
40-50%	Plagioclase	Euhedral, lath-shaped microlites
50-60%	Opaques and Glass	Includes glass and cryptocrystaline minerals.

Description

Extremely fine-grained, glassy with few phenocrysts (orthopyroxene). Slightly trachyitic texture.

Modal Analysis
NC-8
#7133

Dacite

Phenocryst Phases

Range	Phase	Description
0-1%	Clinopyroxene	Euhedral. accicular.
1-2%	Plagioclase	Euhedral-subeuhedral. undulose extinction
2-3%	Orthopyroxene	Euhedral crystals. accicular. ,cumulophyric.

Groundmass Phases

Range	Phase	Description
40-50%	Plagioclase	Euhedral, lath-shaped microlites
50-60%	Opaques and Glass	Includes glass and cryptocrystaline minerals.

Description

Extremely fine-grained, glassy with sparse phenocrysts orthopyroxene, plagioclase, and clinopyroxene. Pilotaxitic texture.

Modal Analysis
NC-9
Reference #7236

Radiolarian Chert

85-90%	Cryptocrystalline quartz
2-5%	Rhombohedral Carbonate (Dolomite)
5-10%	Argilliceous minerals and apatite
5-10%	Carbonaceous inclusions

Description

Black in hand specimen, with reddish-orange specks. Fossiliferous texture (Recrystallized). Tectonized, with carbonaceous material in veins.

Modal Analysis
NC-10
#10680

Trachydacite

Phenocryst Phases

Range	Phase	Description
0-1%	Clinopyroxene	Accicular, euhedral.
2-5%	Orthopyroxene (Hypersthene)	Euhedral crystals, accicular-skeletal, faintly pleochroic.

Groundmass Phases

Range	Phase	Description
40-50%	Plagioclase	Euhedral, lath-shaped microlites
50-60%	Opaques and Glass	Includes glass and cryptocrystaline minerals.

Description

Extremely fine-grained, glassy with few phenocrysts (orthopyroxene), rare clinopyroxene. Slightly trachyitic texture.

Modal Analysis
NC-11
#10786

Trachydacite

Phenocryst Phases

Range	Phase	Description
0-1%	Clinopyroxene	Euhedral.
5-7%	Orthopyroxene (Hypersthene)	Euhedral crystals, accicular, faintly pleochroic, cumulophyric.

Groundmass Phases

Range	Phase	Description
40-50%	Plagioclase	Euhedral, lath-shaped microlites
50-60%	Opaques and Glass	Includes glass and cryptocrystaline minerals.

Description

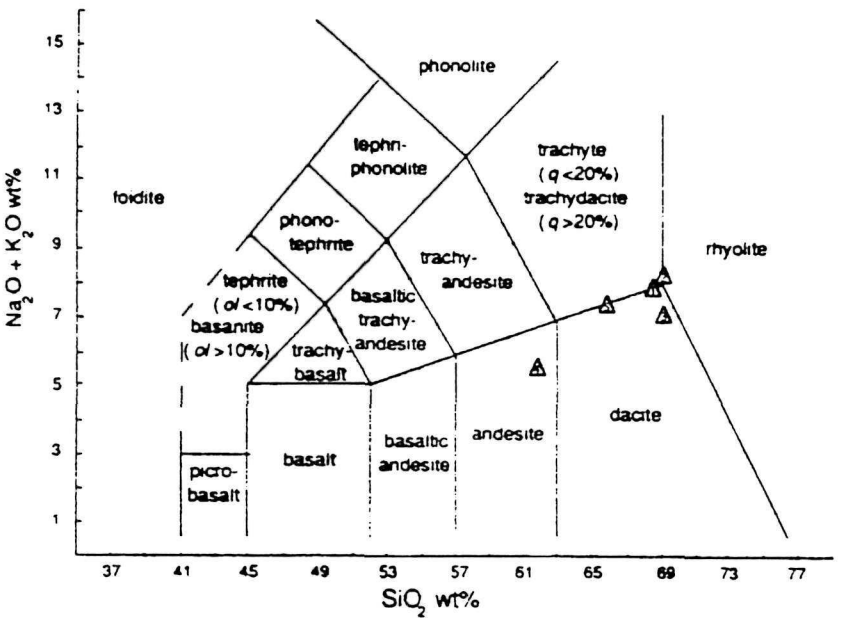
Extremely fine-grained, glassy with sparse phenocrysts (orthopyroxene), rare clinopyroxene. Slightly trachyitic texture.

Table 1: Classifications

Sample Number	Reference Number	Classification
NC-1	21	Trachydacite
NC-2	45	Cordierite Hornfels
NC-3	67	Serpentinite
NC-4	6083	Argillite
NC-5	6170	Argillite
NC-6	6342	Andesite
NC-7	7093	Trachydacite
NC-8	7133	Dacite
NC-9	7236	Radiolarian Chert
NC-10	10680	Trachydacite
NC-11	10786	Trachydacite

Table 2
North Cascades Igneous
Major and Minor Elements
(Wt.% Oxide)

Oxide	NC-1 Ref. 21	NC-6 #6342	NC-7 #7093	NC-8 #7133	NC-10 #10680	NC-11 #10786
SiO_2	68.5	61.8	69.0	69.0	69.1	65.8
TiO_2	.46	.79	.37	.38	.36	.53
Al_2O_3	15.8	16.5	15.3	15.6	15.4	15.9
Fe_2O_3	2.78	4.67	2.76	2.46	2.67	3.59
MnO	0.05	0.14	0.07	0.08	0.07	0.07
MgO	1.25	3.32	1.23	0.92	1.18	2.74
CaO	3.08	5.17	2.72	2.74	2.66	3.71
Na_2O	4.73	3.72	4.38	3.42	4.37	4.39
K_2O	3.06	1.82	3.73	3.54	3.72	2.90
P_2O_5	0.18	0.15	0.12	0.15	0.12	0.17
LOI	0.30	0.92	0.30	0.77	0.20	0.45
Total	100.2	99.0	100.0	100.0	99.1	99.8



Abreviations: q = normative quartz; ol = normative olivine.

I. U. G. S. Classification

(after LeMaitre 1989)

1. Reference Sample 21 (NC-1)
2. #7093 (NC-7) and #10680 (NC-10)
3. #7133 (NC-8)
4. #6342 (NC-6)
5. #10786 (NC-11)

G.2 Obsidian X-Ray Flourescence

Greg Sullivan
Archaeologist,
North Cascades National Park,

Dear Greg,

Enclosed you will find a report on the X-ray Fluorescence analysis of 14 artifacts undertaken on your behalf. This includes the raw data in both spectrum printouts and the summary statistics of the analyzed artifacts and their identified sources. Also included is a map showing the location of the sources identified, and a probability statement derived from the SPSS program measuring the statistical association between the artifact and the identified source. In addition to the peaks we use for characterisation of the samples, I have included the potassium (K), titanium (Ti), and Manganese (Mn) peaks since they are present in varying amounts and they may be used by other researchers for characterising sources.

Summary: Felso-vitrophyres

To summarize the findings, it would seem that there are between three and five characterisations represented by the seven felso-vitrophyre samples. Samples NOCA-10777 and NOCA-6363 are clearly statistically distinct from any of the other felso-vitrophyres, as well as from one another.

Of the remaining 6 felso-vitrophyres, there are two possible interpretations. One is that the source material is highly variable and that all the samples are derived from a single source or formation. Alternatively, they represent three distinct material types or at the very least, three unique, widely separated quarries from the same formation. The latter interpretation is generally not true of volcanic glasses. My feeling is that there is an unusual degree of chemical variability within the source and that samples NOCA-6353, NOCA-6365, NOCA-6368 and NOCA-7174 are from the same source. If this is true, the source has considerable variability in its iron (Fe) ratios.

NOCA-7173 is a bit anomalous. It broadly conforms with the previous felso-vitrophyres however, both the rubidium (Rb) and strontium (Sr) peaks suggest that while it is statistically related, it is too distinct to automatically group it with the others. I suggest that for the time being, it be considered as a related, but not identical, material type. Many other volcanic glass sources that have multiple flows have greater inter-flow variability but less internal homogeneity. If the formation is composed of two flows that are almost contemporaneous (on a geological time scale), this might explain the observed variability between NOCA-7173 and the other group of 4 felso-vitrophyres.

Due to the small sample sizes of these material types and the fact that they are distinct from any other glass characterisations that we have on file, the probability values derived from running these through an SPSS analysis would be meaningless and are therefore not performed for these samples.

Summary: Obsidians

NOCA-6372 probably originates from Sugar Mtn. 1 in northern California. We obtained a very similar characterisation from a cobble near Revelstoke B.C. However, since the cobble is an isolated find with no known source provenance and no archaeological distribution as yet identified, Sugar Mtn. is the most likely source. Sugar Mtn. obsidian artifacts are often found in the Pacific Northwest (California, Oregon and Washington) and in southern British Columbia. Therefore, the excavation of this material type in North Cascades Park is consistent with the known archaeological distribution of Sugar Mtn. obsidian.

The Sugar Mtn. source has a fair degree of internal chemical variability which may account for the low P(D/G) value given by the discriminant functions analysis. The value indicates a low probability of the sample belonging to the library source group from Sugar Mountain. This variabilty suggests either that there is a single flow with patterned variability or that there are two chemically similar flows at the source area. Until we increase our sample size from Sugar Mountain, we will not know which is correct. Our source samples seem to have a bi-modal distribution. Most of our source samples represent the first of the two closely related variants while only a few flakes are from the second. NOCA-6372 fits very nicely with the second, smaller group. As we have grouped both of these into one source type, discriminant functions views NOCA-6372 as an outlier of the collective source sample.

NOCA-7121 is statistically identical to, and in all probability originates from, the Three Sisters source in central Oregon. Three Sisters obsidian is widely traded throughout the Pacific Northwest and as far north as the Central Coast area of British Columbia.

NOCA-7387 and NOCA-7565 are correlated to the Game Hut flow on Newberry Caldera. This source is also widely distributed and is found in archaeological contexts through the Pacific Northwest and well into British Columbia.

NOCA-10003 matches several sources. The primary prediction according to discriminant analysis is the Sugar Mtn. 2 source which has a very limited archaeological distribution. While Sugar Mountain 2 is the best match from our library [P(G/D) = 0.937], there is a relatively low statistical probability of the sample belonging to the same data set generated from our Sugar Mountain source samples [P(D/G) = 0.114]. Both of the Sugar Mountain sources display a relatively large degree of internal variabilty. Thus, there are three factors which, when considered together, make this identification suspect: limited archaeological distribution, low P(G/D) value, and source variabilty.

There are three other statistical possibilities: Glass Butte 5, Glass Butte 2 and Yellowstone 1. While each of these three predicted sources have low p(g/d) values, they have almost

equivalent p(d/g) values. This indicates somewhat similar degrees of statistical association of the artifact with each of the data sets of these secondary predicted sources. Of these three, Glass Buttes 5 matches quite well. Both Sr and Fe values are high but acceptable for Glass Butte 5, and the Y value lies just outside the observed range of the 22 samples that we have characterized for this flow. Nonetheless the Y value is close enough that it may just represent a statistical outlier.

Also, NOCA-10003 is very thin. This tends to skew results in a predictable manner. The lower elements will tend to be over-represented while the upper range may be accurately represented or even slightly underrepresented. If this is the case, a correction would make the NOCA-10003 conform more concisely with Glass Butte 5. In support of this interpretation: a) Glass Butte obsidians are more commonly traded into the Cascades region than is Yellowstone obsidian; b) two of the other artifacts in this study are also from Glass Butte, demonstrating that a diffusion route existed for importing Glass Butte obsidian to this exact area; and c) macroscopic comparisons which, while not definitive, provide a further piece of circumstantial evidence that indicates a closer association with Glass Butte than with Yellowstone.

NOCA-10450 and NOCA-10451 match both Glass Buttes (flow D) and, to a slightly lesser degree, Yellowstone Park (source 2). In both cases, the statistical correlation is closer to the Glass Buttes source and, since the Yellowstone 2 source has no known archaeological distribution, the Glass Buttes source is the most likely source of origin. The probability values for NOCA-10450 are almost equal in predicting an association with Glass Butte D and Yellowstone 2. However, given the archaeological association of NOCA-10540 and NOCA-10451, their very similar appearance, and the significantly stronger association of NOCA-10451 with Glass Butte D, this source is the more likely of the two predicted sources. Glass Buttes is well recorded archaeologically in British Columbia, and in the Pacific Northwest.

NOCA-10168 did not fit well with any source in our library. It was only after my telephone conversation with you that I referred back to my lab notes to find that this was the source sample from the North Cascades source. As I mentioned on the telephone, the only correlation, albeit very remote, was with a minor flow on Newberry Caldera. Thank you for sending this sample. I will run it several more times to try to build up some idea of the variability within the flake for the purpose of adding the source to our library.

SPSS Analysis

You will note that, on the spreadsheet, there are three additional columns with the normalised obsidian data: P(D/G), P(G/D) and p(g/d). Each of these probability values is expressed in percentages.

1) P(D/G) is the conditional probability. This indicates the probability that the sample belongs to, or is a member of, the primary group predicted by discriminant analysis.

2) P(G/D) is the primary posterior probability. It measures the highest probability of the sample belonging to a specific group within the groups contained in the library. This value alone can be misleading since SPSS will ascribe the artifact to one of the sources in the library, even if the sample comes from a source that we have not yet characterised in the library. In essence, it gives the best match available.

3) p(g/d) is the secondary posterior probability. This value measures the second best match in the library. Just as with the other two values, this value cannot be considered in isolation. There may also be tertiary or even more remote posterior probabilities; however, we only use the primary and secondary values. The posterior probabilities will collectively equal 1.0.

SAMPLE	P(D/G)	SOURCE 1st	P(G/D)	SOURCE 2nd	p(g/d)
NOCA-6372	0.027	Sugar Mtn.	0.612	Revelstoke	0.275
NOCA-7121	0.786	Three Sisters	1.000	na	0.000
NOCA-7387	0.927	Newberry 1	0.922	Newberry 2	0.075
NOCA-7565	0.962	Newberry 1	0.965	Newberry 2	0.035
NOCA-10003	0.114	Yellowstone 1	0.937	Sugar Mtn.1	0.061
NOCA-10450	0.253	Glass Butte D	0.515	Yellowstone 2	0.488
NOCA-10451	0.382	Glass Butte D	0.621	Yellowstone 2	0.243

The enclosed map references are as follows: Oregon #1 is Three Sisters, Oregon # 3 is Newberry Caldera, Oregon #9 is Glass Butte, California #2 is Sugar Mountain and Wyoming #1 is Yellowstone (Obsidian Cliff). I hope this is of help to you. If there are any questions about the analysis please do not hesitate to contact me.

Sincerely,



Malcolm A. James
Research Associate

APPENDIX H: FAUNAL REMAINS FROM THE PROJECT AREA

Tables H-1 and H-2 provide a complete listing of all faunal remains encountered in prehistoric sites in the project area. This listing includes both the drawdown and forested tracts of the project area.

These data are separated according to tested and untested sites. Many more bone fragments were observed at untested sites than have been recorded in Table H-2 due to the limited time for examination. Except for F.S. #182, faunal remains were not collected from untested sites. The category "No Identification" under the IDENTIFICATION column indicates that the element could not be identified to a size group or taxon.

No human bone was observed or recorded in the project area.

Table H-1 Faunal Remains From Tested Sites

F.S.#	TU #	QTY	IDENTIFICATION	NOCA#
44	2	1	No identification	7674
45	Surface	1	Medium mammal; calcined, ulnar notch	7671
	Surface	1	*Castor canadensis* (beaver)	7672
	1	2	No identification	7675
	2	28	21 no identification 1 skull fragment: small mammal 3 incisor fragments: rodent 3 fragments hypsodont teeth	7678
	2	11	No identification	7679
	2	14	No identification	7677
	2	16	13 no identification 3 small mammal	7676
46	1	6	3 no identification 3 *Oreamnos americanus* (mtn. goat)	7670
	1	12	No identification	7209

46	1	17	No identification	7694
	1	7	2 no identification 5 long bone, medium mammal	7688
	1	6	No identification	7692
	1	14	11 no identification 3 long bone, medium mammal	7684
	1	26	10 no identification 16 long bone, medium mammal	7693
	1	14	12 no identification 2 long bone, sm. to med mammal	7682
	1	1	Long bone, medium mammal	7686
	1	7	5 no identification 2 long bone, medium mammal	7689
	1	6	No identification	7687
	1	7	5 no identification 1 *Oreamnos americanus* (mtn. goat) 1 long bone, medium mammal	7669
	1	13	8 no identification 5 long bone, medium mammal	7685
	1	1	Medium mammal	7690
	1	5	No identification	7691
	2	2	No identification	7680
47	Surface	1	Medium mammal	10697
	Surface	1	Medium mammal	10698
54	Surface	24	23 *Castor canadensis* (beaver) mandible 1 rodent incisor	7673
	Surface	4	No identification	7695
	1	2	No identification	7697

54	1	2	No identification	7696
	2	3	No identification	7702
	2	1	No identification	7698
	3	16	No identification	7699
	3	8	No identification	7700
	3	8	No identification	7701
	3	9	No identification	7703
61	1	344	343 calcined long bone, medium mammal	
			1 artiodactyl	10096
	1	12	Medium mammal	10097
	1	16	Medium mammal	10098
	1	39	Medium mammal	10099
	1	1163	Medium mammal	10100
	1	201	Medium mammal	10101
	1	587	Medium mammal	10102
	1	377	Medium mammal	10103
	1	Bulk	Soil/bone bulk sample	10182
	1	10	Medium mammal	10104
	1	28	Medium mammal	10105
	1	11	Medium mammal	10106
	1	7	Medium mammal	10107
	1	7	Medium mammal	10108
	1	75	1 artiodactyl; medium mammal	10109
	1	2	Tooth fragments, artiodactyl	10110
	1	1	Medium mammal	10111
	1	9	Medium mammal	10112
	1	6	Medium mammal	10113
62	Surface	4	Medium mammal	
			Not collected	N/A
67	2	2	Medium mammal	10114
82	1	1	No identification	10396
83	4	16	No identification	10397

103	Surface	1	Medium mammal	10117
	1	1	No identification	10115
	1	1	Antler fragment, Cervidae	10116
106	1	1	Mammal	10494
116	2	2	No identification	7708
	2	12	11 no identification 1 medium mammal	7709
	2	22	No identification	7704
	2	10	No identification	7706
	2	2	No identification	7707
	8	1	No identification	7705
120	4	1	Mammal	10812
	4	1	Mammal	10813
	4	1	Small fragment; calcined	10814
122	Surface	>200	No identification	Not Collected
123	Surface	3	2 no identification 1 possible vertebrae, medium mammal	7659
	Surface	13	3 no identification 6 small mammal 2 medium mammal 2 *Oreamnos americanus* (mtn. goat)	7661
	Surface	26	Medium mammal	10118
	4	26	No identification (possibly Aves)	7658
	9	1	No identification	7662
	9	1	No identification	7663
	11	1	Small mammal	7664
	12	3	*Oreamnos americanus* (mtn. goat)	7665
123	12	20	2 No identification 18 *Oreamnos americanus* (Goat)	7666
	14	2	Medium mammal, possible goat	7667

	15	1	Medium mammal, possible goat	7668
124	1	3	No identification	10140
	1	21	13 no identification 8 small to medium mammal	10119
	1	78	Tooth fragments, artiodactyl	10120
	1	2	1 No identification 1 small to medium mammal	10122
197	1	25	24 no identification 1 long bone fragment, medium mammal	10398
	1	29	28 No identification 1 *Odocoileus sp.* (deer)	10394
		TOTAL 3726		

Table H-2 Faunal Remains From Untested Sites

F.S.#	TU #	QTY	IDENTIFICATION	NOCA#
6	Surface	1	Small fragment, calcined, mammal; not collected	N\A
58	Surface	1	Calcined fragment, not collected	N\A
62	Surface	4	Calcined fragments, mammal; 2 cm compact mammal bone; not collected	N\A
89	Surface	1	Calcined; not collected	N\A
151	Surface	>50	Calcined fragments; not collected	N\A
156	Surface	1	Fragment; not collected	N\A
163	Surface	1	No identification; not collected	N\A
165	Surface	18	No identification; not collected	N\A
167	Surface	3	No identification; not collected	N\A
168	Surface	3	No identification; not collected	N\A
169	Surface	13	No identification; not collected	N\A
171	Surface	5	Calcined; 1 possible antler; not collected	N\A
174	Surface	8	No identification; not collected	N\A
182	Surface	8	6 fragments long bone, medium mammal 1 fragment crania 1 (half) tooth *Cervus elaphus* (elk)	7974
199	Surface	3	No identification; not collected	N\A
	TOTAL 120			

APPENDIX I: INVENTORY OF UNTESTED SITES IN THE PROJECT AREA

45WH80 (FS#4) Big Beaver Creek

Elevation: 488 m Landform: Terrace Area: 41,400 m^2
Year Recorded: 1977 Aspect/Slope: E, 0-5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	6323	1
Recorded:	Flake	Metasediment		1
	Flake, Edge Modified	Hozomeen Chert		1
	Cobble Tool	Metasediment		1
	Flake	Hozomeen Chert		2
	Flake	Allenby Chert		3
	Microblade Core	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			9

45WH220 (FS#6) Little Beaver Creek

Elevation: 503 m Landform: Bedrock Bench Area: 800 m^2
Year Recorded: 1985 Aspect/Slope: S, 0-5%

	Object	Material	NOCA#	Count
Collected:	Blade	Metasediment	6714	1
Recorded:	Flake	Metasediment		1
	Flake	Hozomeen Chert		18
	Flake, Edge Modified	Hozomeen Chert		1
	Faunal	Bone		1
	TOTAL ARTIFACTS RECORDED			22

45WH225 (FS#34) Green Point

Elevation: 491 m Landform: Bedrock Bench Area: 350 m^2
Year Recorded: 1986 Aspect/Slope: E, 0-10%

	Object	Material	NOCA#	Count
Collected:	Core	Hozomeen Chert	6527	1
	Biface	Hozomeen Chert	6528	1

Recorded:	Shatter	Hozomeen Chert	3
	TOTAL ARTIFACTS RECORDED		5

45WH226 (FS#40) North Rainbow Point

Elevation: 488 m Landform: Terrace Area: 1460 m^2
Year Recorded: 1986, 1988 Aspect/Slope: SW, 0-10%

	Object	Material	NOCA#	Count
Collected:	Flake, Edge Modified	Basalt	6526	1
	Biface	Metasediment	6326	1
Recorded:	Core (w/cortex)	Hozomeen Chert		3
	Core (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Metasediment		3
	Flake	Hozomeen Chert		1
	Projectile Point	Metasediment		1
	Shatter (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			13

45WH444 (FS#41) May Creek

Elevation: 519 m Landform: Terrace Area: 1200 m^2
Year Recorded: 1986 Aspect/Slope: W, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Pit Features	n/a		5

45WH445 (FS#42) Roland Arm

Elevation: 506 m Landform: Bedrock Bench Area: 200 m^2
Year Recorded: 1986 Aspect/Slope: N, 0-10%

	Object	Material	NOCA#	Count
Collected:	Core	Metasediment	6524	1
Recorded:	Fire-Cracked Rock Scatter			1

	TOTAL ARTIFACTS RECORDED	2

Comment Fire-cracked rock scatter consists of more than 100 rocks.

45WH231 (FS#49) North Lightning Creek No. 1

Elevation: 468 m Landform: Alluvial Fan Area: 400 m^2
Year Recorded: 1987 Aspect/Slope: SW, 0-5%

	Object	Material	NOCA#	Count
Collected:	Biface (w/o cortex)	Basalt or Metasediment	6336	1
	Projectile Point	Metasediment	6332	1
	Projectile Point	Metasediment	6337	1
	Projectile Point	Basalt or Metasediment	6339	1
	Projectile Point	Basalt or Metasediment	6340	1
	TOTAL ARTIFACTS RECORDED			6

45WH233 (FS#51) North Lightning Creek No. 3

Elevation: 482 m Landform: Alluvial Fan Area: 11,000 m^2
Year Recorded: 1987, 1988 Aspect/Slope: S, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		2
	Core (w/cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		11
	Shatter (w/cortex)	Hozomeen Chert		4
	Shatter (w/o cortex)	Hozomeen Chert		2
	Quartz Crystal	Quartz Crystal		1
	TOTAL ARTIFACTS RECORDED			22

45WH235 (FS#55) Ruby Creek No. 1

Elevation: 482 m Landform: Bedrock Bench Area: 100 m^2
Year Recorded: 1988 Aspect/Slope: SW, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Exotic Chalcedony		1

	Flake, Edge Modified	Quartz Crystal	1
	TOTAL ARTIFACTS RECORDED		2

45WH236 (FS#56) Ruby Creek No. 2

Elevation: 468 m Landform: Bedrock Bench Area: 6 m^2
Year Recorded: 1986 Aspect/Slope: SE-S-SW, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		3
	Shatter (w/cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			4

45WH238 (FS#58) Casino Bay No. 2

Elevation: 476 m Landform: Alluvial Fan Area: 7200 m^2
Year Recorded: 1988 Aspect/Slope: S, 0-10%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Exotic Chalcedony	10673	1
Recorded:	Flake (w/cortex)	Hozomeen Chert		5
	Shatter	Hozomeen Chert		35
	Flake	Metasediment		10
	Flake (w/o cortex)	Hozomeen Chert		14
	Core	Metasediment		2
	Chopper	Metasediment		1
	Shatter	Metasediment		2
	Biface	Metasediment		1
	Biface	Hozomeen Chert		2
	Faunal, Fragment, Calcined	Bone		1
	TOTAL ARTIFACTS RECORDED			74

45WH240 (FS#60) Roland Point No. 1

Elevation: 464 m Landform: Bedrock Bench Area: 350 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-10%

	Object	Material	NOCA#	Count
Recorded:	Core	Metasediment		1
	Flake (w/cortex)	Metasediment		2
	Biface	Metasediment		1
	TOTAL ARTIFACTS RECORDED			4

45WH242 (FS#62) Roland Point No. 2

Elevation: 476 m Landform: Bedrock Bench Area: 700 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-2%

	Object	Material	NOCA#	Count
Recorded:	Biface Fragment	Hozomeen Chert		3
	Flake (w/o cortex)	Hozomeen Chert		7
	Flake (w/cortex)	Hozomeen Chert		1
	Faunal Remains	Bone		4
	TOTAL ARTIFACTS RECORDED			15

45WH243 (FS#63) Skymo Creek

Elevation: 461 m Landform: Terrace Area: 1760 m^2
Year Recorded: 1988 Aspect/Slope: SE, 0-10%

	Object	Material	NOCA#	Count
Recorded:	Biface or Projectile Point	Hozomeen Chert		1
	Cobble Tool or Chopper	Metasediment		1
	Scraper	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		2
	Flake (w/cortex)	Hozomeen Chert		6
	Flake	Metasediment		7
	Core	Hozomeen Chert		2
	Shatter	Hozomeen Chert		2
	Flake	Quartz Crystal		1
	TOTAL ARTIFACTS RECORDED			23

45WH244 (FS#64) Roland Point No. 3

Elevation: 476 m Landform: Bedrock Bench Area: 825 m^2

Year Recorded: 1988 Aspect/Slope: N-NW, 0-15%

	Object	Material	NOCA#	Count
Recorded:	Projectile Point	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		4
	Projectile Point	Vitrophyre		1
	Flake (w/o cortex)	Unspecified		1
	Flake (w/cortex)	Unspecified		1
	Core	Unspecified		1
	Shatter	Unspecified		1
	TOTAL ARTIFACTS RECORDED			10

45WH248 (FS#68) South Lightning Creek No. 1

Elevation: 464 m Landform: Terrace Area: 3900 m^2
Year Recorded: 1989 Aspect/Slope: SW-W, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		9
	Shatter (w/o cortex)	Hozomeen Chert		7
	Shatter (w/cortex)	Hozomeen Chert		1
	Quarry Blank (w/cortex)	Hozomeen Chert		1
	Biface (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		3
	Flake (w/cortex)	Metasediment		2
	Core	Metasediment		3
	Flake (w/o cortex)	Hozomeen Chalcedony		2
	Flake (w/cortex)	Hozomeen Chalcedony		1
	TOTAL ARTIFACTS RECORDED			30

45WH249 (FS#69) South Tenmile Island No. 2

Elevation: 467 m Landform: Alluvial Fan Area: 1000 m^2
Year Recorded: 1988 Aspect/Slope: S-SW, 10-90%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		12
	Shatter (w/o cortex)	Hozomeen Chert		2
	Core (w/cortex)	Metasediment		2

	Flake (w/o cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			18

45WH251 (FS#71) North Tenmile Island No. 1

Elevation: 478 m Landform: Alluvial Fan Area: 1125 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Hozomeen Chert		2
	Flake (w/o cortex)	Hozomeen Chert		13
	Shatter (w/cortex)	Hozomeen Chert		4
	Shatter (w/o cortex)	Hozomeen Chert		4
	Core (w/cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			24

45WH252 (FS#72) Spencer Bay No. 2

Elevation: 467 m Landform: Terrace Area: 600 m^2
Year Recorded: 1988 Aspect/Slope: W, 2-10%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Chert		1
	Shatter	Chert		1
	Core (w/cortex)	Metasediment		2
	Flake (w/o cortex)	Metasediment		1
	Flake	Chalcedony		1
	TOTAL ARTIFACTS RECORDED			6

45WH254 (FS#74) Spencer Bay No. 3

Elevation: 464 m Landform: Terrace Area: >2000 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-20%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7088	1
Recorded:	Projectile Point	Metasediment		1

Core	Metasediment	1
Flake	Metasediment	1
Shatter	Hozomeen Chert	1
TOTAL ARTIFACTS RECORDED		5

45WH256 (FS#76) Spencer Bay No. 4

Elevation: 461 m Landform: Terrace Area: 300 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-5%

	Object	Material	NOCA#	Count
Collected:	Biface, Broken	Hozomeen Chert	7092	1
Recorded:	Biface (Knife?)	Hozomeen Chert		1
	Biface	Metasediment		1
	Biface Fragments	Hozomeen Chert		2
	"Debitage"	Hozomeen Chert		>50
	TOTAL ARTIFACTS RECORDED			>55

Comment: "Debitage" in this case includes shatter, cores, flakes, and thinning flakes.

45WH257 (FS#77) North Tenmile Island No. 4

Elevation: 474 m Landform: Terrace Area: 1 m^2
Year Recorded: 1988 Aspect/Slope: W, 1-3%

	Object	Material	NOCA#	Count
Recorded:	Core (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			2

45WH258 (FS#78) May Creek

Elevation: 459 m Landform: Terrace Area: 1 m^2
Year Recorded: 1988 Aspect/Slope: W-SW-S, 100%

Object	Material	NOCA#	Count

Recorded:	Flake (w/cortex)	Hozomeen Chert	2
	TOTAL ARTIFACTS RECORDED		2

45WH259 (FS#79) North Tenmile Island No. 5

Elevation: 476 m Landform: Terrace Area: 300 m^2
Year Recorded: 1988 Aspect/Slope: W-SW-S, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Core (w/cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		4
	Flake (w/o cortex)	Hozomeen Chert		7
	Shatter (w/cortex)	Hozomeen Chert		11
	Shatter (w/o cortex)	Hozomeen Chert		10
	Core (w/cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		4
	Flake (w/o cortex)	Metasediment		3
	Shatter (w/cortex)	Metasediment		1
	Shatter (w/o cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			43

45WH260 (FS#80) Devil's Junction Creek No. 1

Elevation: 471 m Landform: Terrace Area: 5200 m^2
Year Recorded: 1988 Aspect/Slope: W-SW, 3-15%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		1
	Core (w/cortex)	Hozomeen Chert		1
	Core (w/o cortex)	Hozomeen Chert		3
	Flake (w/cortex)	Hozomeen Chert		4
	Flake (w/o cortex)	Hozomeen Chert		15
	Shatter (w/cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			26

45WH261 (FS#81) North Tenmile Island No. 6

Elevation: 464 m Landform: Alluvial Fan Area: 250 m^2

Year Recorded: 1988 Aspect/Slope: WSW, 0-3%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Jasper	7096	1
Recorded:	Shatter	Hozomeen Chert		2
	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		2
	Cobble tool	Metasediment		1
	TOTAL ARTIFACTS RECORDED			7

45WH265 (FS#85) South Lightning Creek No. 2

Elevation: 468 m Landform: Alluvial Fan Area: 200 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		4
	Shatter (w/cortex)	Hozomeen Chert		4
	Shatter (w/o cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			11

45WH266 (FS#86) South Cat Island No. 1

Elevation: 465 m Landform: Terrace Area: 1020 m^2
Year Recorded: 1988 Aspect/Slope: S, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		3
	Shatter (w/cortex)	Hozomeen Chert		3
	Flake (w/cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			8

45WH267 (FS#87) Dry Creek No. 2

Elevation: 482 m Landform: Terrace Area: 1400 m^2

Year Recorded: 1988 Aspect/Slope: W-SW, 10%

	Object	Material	NOCA#	Count
Recorded:	Debitage	Hozomeen Chert		28
	Debitage	Metasediment		1
	Core	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			30

Comment: "Debitage" probably includes flakes, shatter, and possibly cores, but the site record does not specify. Half the debitage had cortex.

45WH269 (FS#89) South Lightning Creek No. 3

Elevation: 480 m Landform: Steep Slope Area: 300 m^2
Year Recorded: 1988 Aspect/Slope: NW, 70-80%

	Object	Material	NOCA#	Count
Recorded:	Core (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		5
	Shatter (w/cortex)	Hozomeen Chert		>100
	Faunal	Bone		1
	TOTAL ARTIFACTS RECORDED			>107

45WH270 (FS#90) North Lightning Creek No. 5

Elevation: 479 m Landform: Alluvial Fan Area: 33,150 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-10%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	6357	1
	Projectile Point	Basalt	6367	1
Recorded:	Flake, Edge Modified (w/o cortex	Hozomeen Chert		3
	Biface (w/o cortex)	Hozomeen Chert		3
	Core (w/o cortex)	Hozomeen Chert		3
	Flake (w/o cortex)	Hozomeen Chert		70
	Shatter (w/cortex)	Hozomeen Chert		3
	Shatter (w/o cortex)	Hozomeen Chert		11
	Biface	Metasediment		1

Projectile Point	Metasediment	1
Projectile Point	Hozomeen Chert	1
Flake	Chalcedony	1
Flake	Basalt	1
TOTAL ARTIFACTS RECORDED		100

45WH271 (FS#91) Dry Creek No. 3

Elevation: 485 m Landform: Terrace Area: 2500 m^2
Year Recorded: 1988 Aspect/Slope: SE, 0-30%

	Object	Material	NOCA#	Count
Recorded:	Core (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		3
	Shatter (w/cortex)	Hozomeen Chert		>20
	TOTAL ARTIFACTS RECORDED			>24

45WH272 (FS#92) North Lightning Creek No. 6

Elevation: 477 m Landform: Alluvial Fan Area: 6 m^2
Year Recorded: 1988 Aspect/Slope: W, 2%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		37
	Shatter (w/o cortex)	Hozomeen Chert		2
	Flake, Edge Modified	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			40

45WH274 (FS#94) North Cat Island No. 2

Elevation: 470 m Landform: Bedrock Bench Area: 3375 m^2
Year Recorded: 1988, 1991, 1993 Aspect/Slope: N, 0-25%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Hozomeen Chalcedony	7097	1
	Projectile Point	Basalt	7098	1
	Projectile Point	Metasediment	10375	1

	Projectile Point	Metasediment	10376	1
	Biface	Basalt	10680	1
Recorded:	Core (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		46
	Shatter (w/cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		3
	Scraper	Hozomeen Chert		1
	Biface	Metasediment		1
	Core (w/o cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		1
	Flake (w/cortex)	Quartz Crystal		1
	Flake (w/o cortex)	Quartz Crystal		1
	TOTAL ARTIFACTS RECORDED			64

45WH276 (FS#96) North Cat Island No. 3

Elevation: 468 m Landform: Bedrock Bench Area: 11,050 m^2
Year Recorded: 1988 Aspect/Slope: W, 10-70%

	Object	Material	NOCA#	Count
Recorded:	Core (w/cortex)	Hozomeen Chert		2
	Core (w/o cortex)	Hozomeen Chert		4
	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		10
	Shatter (w/cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		2
	Flake, Edge Modified	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			22

45WH278 (FS#98) North Cat Island No. 4

Elevation: 471 m Landform: Terrace Area: 3400 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-80%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		1
	Core (w/cortex)	Hozomeen Chert		1
	Core (w/o cortex)	Hozomeen Chert		2

Flake (w/cortex)	Hozomeen Chert		1
Flake (w/o cortex)	Hozomeen Chert		12
Shatter (w/cortex)	Hozomeen Chert		1
Shatter (w/o cortex)	Hozomeen Chert		1
TOTAL ARTIFACTS RECORDED			19

45WH279 (FS#99) Boundary Bay No. 2

Elevation: 465 m Landform: Alluvial Fan Area: 440 m^2
Year Recorded: 1988 Aspect/Slope: W, 3-50%

	Object	Material	NOCA#	Count
Recorded:	Chopper	Metasediment		1
	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		34
	Shatter (w/cortex)	Hozomeen Chert		11
	Flake, Edge Modified	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			48

45WH280 (FS#100) North Cat Island No. 5

Elevation: 468 m Landform: Alluvial Fan Area: 300 m^2
Year Recorded: 1988 Aspect/Slope: W, 3%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		2
	Flake (w/cortex)	Hozomeen Chert		5
	Flake (w/o cortex)	Hozomeen Chert		31
	Shatter (w/cortex)	Hozomeen Chert		5
	Shatter (w/o cortex)	Hozomeen Chert		4
	Shatter	Hozomeen Chert		12
	Projectile Point Fragment	Hozomeen Chert		1
	Nodule	Hozomeen Chert		1
	Flake (w/cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		4
	Shatter (w/o cortex)	Metasediment		1
	Scraper	Metasediment		1
	TOTAL ARTIFACTS RECORDED			68

45WH284 (FS#104) North Lightning Creek No. 9

Elevation: 465 m Landform: Alluvial Fan Area: 80 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		3
	TOTAL ARTIFACTS RECORDED			4

45WH287 (FS#107) Boundary Bay No. 6

Elevation: 476 m Landform: Bedrock Bench Area: 4000 m^2
Year Recorded: 1988 Aspect/Slope: W, 10-100%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Metasediment		1
	Flake, Edge Modified	Jasper		1
	Flake, Edge Modified	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		2
	Flake (w/o cortex)	Hozomeen Chert		22
	Shatter (w/o cortex)	Hozomeen Chert		6
	TOTAL ARTIFACTS RECORDED			33

45WH288 (FS#108) North Lightning Creek No. 11

Elevation: 467 m Landform: Alluvial Fan Area: 300 m^2
Year Recorded: 1988 Aspect/Slope: S, 0%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		7
	Shatter (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			9

45WH289 (FS#109) North Lightning Creek No. 12

Elevation: 467 m Landform: Alluvial Fan Area: 50 m^2

Year Recorded: 1988 Aspect/Slope: NW, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		4
	TOTAL ARTIFACTS RECORDED			4

45WH290 (FS#110) North Lightning Creek No. 13

Elevation: 467 m Landform: Alluvial Fan Area: 3 m^2
Year Recorded: 1988 Aspect/Slope: NW, 2%

	Object	Material	NOCA#	Count
Recorded:	Core (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		179
	Shatter (w/cortex)	Hozomeen Chert		1
	Shatter (w/o cortex)	Hozomeen Chert		13
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			195

45WH291 (FS#111) North Lightning Creek No. 14

Elevation: 476 m Landform: Alluvial Fan Area: 250 m^2
Year Recorded: 1988 Aspect/Slope: NW, 3-10%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		2
	Microblade Core	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			3

45WH292 (FS#112) Desolation Trail

Elevation: 465 m Landform: Alluvial Fan Area: 1000 m^2
Year Recorded: 1988 Aspect/Slope: W-SW, 20-80%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Chalcedony		1
	Flake (w/o cortex)	Hozomeen Chert		1

	Shatter (w/o cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			4

45WH293 (FS#113) N. East Landing No. 1

Elevation: 485 m Landform: Bedrock Bench Area: 150 m^2
Year Recorded: 1988 Aspect/Slope: W, 10-50%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		90
	Shatter (w/cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		5
	TOTAL ARTIFACTS RECORDED			99

45WH294 (FS#114) East Landing No. 1

Elevation: 476 m Landform: Flood Plain Area: 25 m^2
Year Recorded: 1988 Aspect/Slope: S-SW, 0-5%

	Object	Material	NOCA#	Count
Collected:	Biface (knife)	Metasediment	6358	1
Recorded:	Flake, Edge Modified	Metasediment		1
	Flake (w/o cortex)	Chalcedony		1
	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			5

45WH295 (FS#115) N. East Landing No. 2

Elevation: 484 m Landform: Bedrock Bench Area: 4 m^2
Year Recorded: 1988 Aspect/Slope: W, 10-50%

	Object	Material	NOCA#	Count
Recorded:	Core (w/o cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		1

	Flake, Edge Modified	Hozomeen Chert	1
	TOTAL ARTIFACTS RECORDED		3

45WH297 (FS#117) Silver Creek No. 1

Elevation: 477 m Landform: Flood Plain Area: 3500 m^2
Year Recorded: 1988 Aspect/Slope: E, 5-25%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		1
	Core (w/cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		5
	TOTAL ARTIFACTS RECORDED			8

45WH298 (FS#118) Perry Point No. 1

Elevation: 476 m Landform: Alluvial Fan Area: 30 m^2
Year Recorded: 1988 Aspect/Slope: SE, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Shatter (w/o cortex)	Hozomeen Chert		>25
	Shatter (w/cortex)	Hozomeen Chert		>25
	Core/boulder	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			>51

45WH299 (FS#119) East Landing No. 3

Elevation: 475 m Landform: Flood Plain Area: 360 m^2
Year Recorded: 1988 Aspect/Slope: SE, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		4
	Shatter (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Exotic Chalcedony		1
	Projectile Point	Chalcedony, Red [sic]		1
	Scraper	Metasediment		1
	Flake (w/o cortex)	Metasediment		1

	TOTAL ARTIFACTS RECORDED	9

Comment: Projectile point was described as "corner notched".

45WH301 (FS#121) Hozomeen Creek No. 3

Elevation: 475 m Landform: Terrace Area: 1 m^2
Year Recorded: 1989 Aspect/Slope: W, 15%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7103	1
	TOTAL ARTIFACTS RECORDED			1

45WH305 (FS#125) Hozomeen Creek No. 7

Elevation: 483 m Landform: Alluvial Fan Area: 3000 m^2
Year Recorded: 1988 Aspect/Slope: E, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		>260
	Shatter (w/o cortex)	Hozomeen Chert		>45
	Flake (w/o cortex)	Hozomeen Chalcedony		3
	Flake (w/o cortex)	Metasediment		2
	TOTAL ARTIFACTS RECORDED			>311

45WH306 (FS#126) Silver Creek No. 2

Elevation: 480 m Landform: Alluvial Fan Area: 1000 m^2
Year Recorded: 1988 Aspect/Slope: SE, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Core (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Metasediment		2
	TOTAL ARTIFACTS RECORDED			4

45WH307 (FS#127) Hozomeen Creek No. 8

Elevation: 483 m Landform: Alluvial Fan Area: 4 m^2
Year Recorded: 1988 Aspect/Slope: N, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Core (w/cortex)	Metasediment		2
	TOTAL ARTIFACTS RECORDED			2

45WH308 (FS#128) South Lightning Creek No. 4

Elevation: 486 m Landform: Alluvial Fan Area: 45 m^2
Year Recorded: 1988 Aspect/Slope: W, 0-3%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/o cortex)	Hozomeen Chert		2
	Chopper	Metasediment		1
	TOTAL ARTIFACTS RECORDED			4

45WH406 (FS#131) South Lightning Horse Camp

Elevation: 487 m Landform: Alluvial Fan Area: 120 m^2
Year Recorded: 1989 Aspect/Slope: SW, 10%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		>10
	Shatter (w/o cortex)	Hozomeen Chert		>40
	TOTAL ARTIFACTS RECORDED			>51

45WH448 (FS#132) South Cat Island Campground

Elevation: 500 m Landform: Bedrock Bench Area: 600 m^2
Year Recorded: 1989 Aspect/Slope: S, 10-60%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		6

TOTAL ARTIFACT RECORDED 6

45WH407 (FS#137) Cougar Island Mid Knob

Elevation: 460 m Landform: Bedrock Bench Area: 140 m^2
Year Recorded: 1989 Aspect/Slope: N, 20-60%

	Object	Material	NOCA#	Count
Recorded:	Shatter (w/cortex)	Hozomeen Chert		>10
	TOTAL ARTIFACTS RECORDED			>10

45WH408 (FS#138) South Boundary Point

Elevation: 455 m Landform: Steep Slope Area: 1500 m^2
Year Recorded: 1989 Aspect/Slope: W, 10-100%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		12
	Shatter (w/cortex)	Hozomeen Chert		>10
	Uniface	Metasediment		1
	Core (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			>24

45WH409 (FS#139) South Tenmile Island No. 3

Elevation: 486 m Landform: Steep Slope Area: 50 m^2
Year Recorded: 1989 Aspect/Slope: SE, 80%

	Object	Material	NOCA#	Count
Recorded:	Flake, Edge Modified	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			3

45WH410 (FS#140) Devil's Creek

Elevation: 458 m Landform: Alluvial Fan Area: 30 m^2
Year Recorded: 1989 Aspect/Slope: E, 10%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		2
	Biface (w/cortex)	Hozomeen Chert		1
	Core (w/cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		1
	Flake, Edge Modified	Metasediment		1
	TOTAL ARTIFACTS RECORDED			6

45WH411 (FS#141) Devil's Junction Creek No. 4

Elevation: 461 m Landform: Terrace Area: 3 m^2
Year Recorded: 1989 Aspect/Slope: W, 20%

	Object	Material	NOCA#	Count
Recorded:	Flakes (w/o cortex)	Hozomeen Chert		4
	TOTAL ARTIFACTS RECORDED			4

45WH412 (FS#142) South Tenmile Island No. 4

Elevation: 473 m Landform: Terrace Area: 105 m^2
Year Recorded: 1989 Aspect/Slope: E-SE, 0-30%

	Object	Material	NOCA#	Count
Recorded:	Flake, Edge Modified	Hozomeen Chert		2
	Flake (w/o cortex)	Hozomeen Chert		4
	Flake (w/o cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			7

45WH413 (FS#143) North Tenmile Island No. 7

Elevation: 464 m Landform: Alluvial Fan Area: 30 m^2
Year Recorded: 1989 Aspect/Slope: SW, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1

	TOTAL ARTIFACTS RECORDED			2

45WH414 (FS#144) Ponderosa Point No. 1

Elevation: 456 m Landform: Terrace Area: 30 m^2
Year Recorded: 1989 Aspect/Slope: W-SW, 0-10%

	Object	Material	NOCA#	Count
Recorded:	Flake, Edge Modified	Hozomeen Chert		6
	Projectile Point	Hozomeen Chert		1
	Biface	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		8
	TOTAL ARTIFACTS RECORDED			16

45WH415 (FS#145) Ponderosa Point No. 2

Elevation: 461 m Landform: Terrace Area: 450 m^2
Year Recorded: 1989 Aspect/Slope: S, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		3
	Core	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			4

45WH416 (FS#146) Ponderosa Point No. 3

Elevation: 458 m Landform: Terrace Area: 1600 m^2
Year Recorded: 1989 Aspect/Slope: SW-S-SE, 0-20%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		4
	Shatter (w/o cortex)	Hozomeen Chert		1
	Core (w/o cortex)	Hozomeen Chert		2
	Flake (w/o cortex)	Metasediment		2
	TOTAL ARTIFACTS RECORDED			9

45WH417 (FS#147) South Lightning Creek No. 5

Elevation: 459 m Landform: Flood Plain Area: 120 m^2
Year Recorded: 1989 Aspect/Slope: S, 5%

	Object	Material	NOCA#	Count
Collected:	Flake, Edge Modified	Basalt	7093	1
Recorded:	Flake	Hozomeen Chert		4
	Biface Fragment	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			6

45WH418 (FS#148) Ponderosa Point No. 4

Elevation: 458 m Landform: Terrace Area: 7050 m^2
Year Recorded: 1989 Aspect/Slope: S, 5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7099	1
	Biface	Metasediment	7100	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		115
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		9
	Flake (w/o cortex)	Metasediment		2
	Flake, Edge Modified (w/o cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		1
	Projectile Point (w/o cortex)	Hozomeen Chert		3
	Projectile Point (w/o cortex)	Metasediment		1
	Core (w/cortex)	Metasediment		1
	Core (w/cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		4
	Core (w/o cortex)	Hozomeen Chert		5
	TOTAL ARTIFACTS RECORDED			146

45WH419 (FS#149) W. Bank Fan 31-E No. 1

Elevation: 465 m Landform: Alluvial Fan Area: 2 m^2
Year Recorded: 1989 Aspect/Slope: E, 10-20%

	Object	Material	NOCA#	Count

Recorded:	Flake (w/o cortex)	Hozomeen Chert	6
	Flake (w/cortex)	Hozomeen Chert	2
	TOTAL ARTIFACTS RECORDED		8

45WH420 (FS#150) North Cat Island No. 7

Elevation: 465 m Landform: Terrace Area: 375 m^2
Year Recorded: 1989 Aspect/Slope: NW, 0-20%

	Object	Material	NOCA#	Count
Collected:	Flake, Edge Modified	Hozomeen Chalcedony	7120	1
	Microblade Core	Hozomeen Chert	7119	1
Recorded:	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		1
	Core (w/o cortex)	Hozomeen Chert		2
	Scraper (w/o cortex)	Hozomeen Chert		1
	Shatter	Hozomeen Chert		3
	TOTAL ARTIFACTS RECORDED			10

45WH421 (FS#151) North Lightning Creek No. 15

Elevation: 465 m Landform: Alluvial Fan Area: 25,000 m^2
Year Recorded: 1989 Aspect/Slope: SW, 3%

	Object	Material	NOCA#	Count
Collected:	Preform	Metasediment	7116	1
	Projectile Point	Hozomeen Chert	7117	1
	Projectile Point	Hozomeen Chert	7118	1
Recorded:	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		129
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		11
	Biface (w/o cortex)	Hozomeen Chert		11
	Core (w/o cortex)	Hozomeen Chert		4
	Core (w/cortex)	Metasediment		1
	Core (w/o cortex)	Metasediment		2
	Flake (w/cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		8
	Shatter (w/o cortex)	Hozomeen Chert		6

	Scraper (w/o cortex)	Hozomeen Chert	1
	Quarry Blank (w/o cortex)	Hozomeen Chert	1
	Faunal	Bone	>50
	TOTAL ARTIFACTS RECORDED		>229

Comment: Faunal remains were fragmented, calcined.

45WH422 (FS#152) No Name Creek Fan No. 1

Elevation: 461 m Landform: Alluvial Fan Area: 4 m^2
Year Recorded: 1989 Aspect/Slope: E, 5-10%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		2
	Scraper (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			3

45WH423 (FS#153) South Cat Island No. 2

Elevation: 467 m Landform: Bedrock Bench Area: 105 m^2
Year Recorded: 1989 Aspect/Slope: SE, 30%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		47
	Flake (w/cortex)	Hozomeen Chert		1
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			50

45WH424 (FS#154) Boundary Bay No. 7

Elevation: 464 m Landform: Earth Movement Area: 225 m^2
Year Recorded: 1989 Aspect/Slope: W-NW, 0-20%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		8

Projectile Point (w/cortex)	Hozomeen Chert		1
TOTAL ARTIFACTS RECORDED			9

45WH425 (FS#155) North Lightning Creek No. 16

Elevation: 458 m Landform: Alluvial Fan Area: 1500 m^2
Year Recorded: 1989 Aspect/Slope: NW, 0-30%

	Object	Material	NOCA#	Count
Collected:	Biface (knife)	Hozomeen Chert	7091	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		52
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		3
	Shatter (w/cortex)	Hozomeen Chert		1
	Biface (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			60

45WH426 (FS#156) Boundary Bay No. 8

Elevation: 467 m Landform: Alluvial Fan Area: 500 m^2
Year Recorded: 1989 Aspect/Slope: W, 0-10%

	Object	Material	NOCA#	Count
Recorded:	Projectile Point (w/o cortex)	Metasediment		1
	Flake (w/o cortex)	Exotic Chalcedony		2
	Shatter (w/o cortex)	Hozomeen Chert		5
	Shatter (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Jasper		1
	Flake (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Metasediment		1
	Faunal	Bone		1
	TOTAL ARTIFACTS RECORDED			13

45WH427 (FS#157) Boundary Bay No. 9

Elevation: 461 m Landform: Flood Plain Area: 1 m^2

Year Recorded: 1989 Aspect/Slope: W, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			2

45WH428 (FS#158) North Cat Island No. 8

Elevation: 462 m Landform: Alluvial Fan Area: 3575 m^2
Year Recorded: 1989 Aspect/Slope: S, 8%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7101	1
	Biface	Allenby Chert	7102	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		79
	Biface (w/o cortex)	Hozomeen Chert		3
	Core (w/o cortex)	Hozomeen Chert		1
	Shatter (w/o cortex)	Hozomeen Chert		22
	Microblade (w/o cortex)	Hozomeen Chert		1
	Projectile Point	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			109

45WH429 (FS#159) North Lightning Creek No. 17

Elevation: 465 m Landform: Alluvial Fan Area: 10 m^2
Year Recorded: 1989 Aspect/Slope: NW, 5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Metasediment		2
	Core (w/o cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			4

45WH430 (FS#160) North Cat Island No. 9

Elevation: 459 m Landform: Alluvial Fan Area: 2500 m^2
Year Recorded: 1989 Aspect/Slope: W, 5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Allenby Chert	7128	1
	Projectile Point	Metasediment	7129	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		27
	Shatter (w/o cortex)	Hozomeen Chert		12
	Core (w/cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		2
	Flake, Edge Modified	Hozomeen Chert		2
	Core (w/cortex)	Metasediment		1
	Shatter (w/cortex)	Hozomeen Chert		3
	Scraper (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chalcedony		1
	TOTAL ARTIFACTS RECORDED			52

45WH431 (FS#161) Spencer Bay No. 5

Elevation: 468 m Landform: Bedrock Bench Area: 16 m^2
Year Recorded: 1989 Aspect/Slope: NW, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		5
	Flake (w/cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		1
	Core	Metasediment		1
	TOTAL ARTIFACTS RECORDED			10

45WH432 (FS#162) South Lightning Creek No. 6

Elevation: 470 m Landform: Terrace Area: 10 m^2
Year Recorded: 1989 Aspect/Slope: SW, 5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			2

45WH433 (FS#163) Perry Point No. 3

Elevation: 467 m Landform: Bedrock Bench Area: 90 m^2
Year Recorded: 1989 Aspect/Slope: E, 0-10%

	Object	Material	NOCA#	Count
Collected:	Biface	Hozomeen Chert	7115	1
	Flake	Exotic Chert	7130	1
	Flake	Exotic Chert	7131	1
	Flake	Exotic Chert	7132	1
	Flake	Unknown	7133	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		75
	Shatter (w/o cortex)	Hozomeen Chert		6
	Core (w/o cortex)	Hozomeen Chert		2
	Shatter (w/cortex)	Hozomeen Chert		7
	Flake (w/cortex)	Hozomeen Chert		4
	Flake (w/o cortex)	Metasediment		6
	Flake (w/cortex)	Metasediment		1
	Core (w/o cortex)	Metasediment		1
	Core (w/cortex)	Metasediment		3
	Flake (w/o cortex)	Hozomeen Chalcedony		2
	Flake (w/o cortex)	Unknown		15
	Flake (w/cortex)	Unknown		2
	Faunal	Bone		1
	TOTAL ARTIFACTS RECORDED			129

Comment: Faunal remain was mentioned in features section of site inventory form but was not tallied with rest of artifacts. "Exotic Chert" is light gray in color; NOCA# 7132 appears to have been heat treated. NOCA# 7133, listed as an "unknown" material, is described as fine-grained, black colored material, possibly basalt or Allenby chert.

45WH434 (FS#164) Boundary Bay No. 10

Elevation: 465 m Landform: Alluvial Fan Area: 3750 m^2
Year Recorded: 1989 Aspect/Slope: NW-W-SW, 0-15%

	Object	Material	NOCA#	Count
Collected:	Biface	Hozomeen Chert	7107	1
	Projectile Point	Metasediment	7108	1

	Projectile Point	Metasediment	7109	1
	Projectile Point	Metasediment	7110	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		11
	Flake (w/cortex)	Hozomeen Chert		48
	Shatter (w/o cortex)	Hozomeen Chert		8
	Shatter (w/cortex)	Hozomeen Chert		7
	Biface (w/o cortex)	Hozomeen Chert		2
	Scraper (w/o cortex)	Hozomeen Chert		1
	Core (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		2
	Hammerstone	Andesite		1
	Core (w/o cortex)	Unknown		1
	TOTAL ARTIFACTS RECORDED			87

45WH435 (FS#165) Boundary Bay No. 11

Elevation: 461 m Landform: Alluvial Fan Area: 600 m^2
Year Recorded: 1989 Aspect/Slope: W, 5-20%

	Object	Material	NOCA#	Count
Collected:	Tool, Unspecified	Basalt	7089	1
Recorded:	Flake (w/o cortex)	Metasediment		7
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		4
	Shatter (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Quartz Crystal		1
	Flake, Edge Modified (w/cortex)	Quartz Crystal		1
	Core	Hozomeen Chert		1
	Faunal	Bone		18
	TOTAL ARTIFACTS RECORDED			35

45WH436 (FS#166) Boundary Bay No. 12

Elevation: 464 m Landform: Alluvial Fan Area: 1500 m^2
Year Recorded: 1989 Aspect/Slope: NW-W, 30%

Object	Material	NOCA#	Count

Collected:	Projectile Point	Metasediment	7126	1
	Projectile Point	Metasediment	7127	1
	Hammerstone	Granitic	7134	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		5
	Flake (w/cortex)	Hozomeen Chert		2
	Biface (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		2
	TOTAL ARTIFACTS RECORDED			13

45WH437 (FS#167) Boundary Bay No. 13

Elevation: 463 m Landform: Earth Movement Area: 250 m^2
Year Recorded: 1989 Aspect/Slope: S, 0-5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7086	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		12
	Shatter (w/o cortex)	Hozomeen Chert		2
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		1
	Flake (w/cortex)	Hozomeen Chert		2
	Shatter (w/cortex)	Hozomeen Chert		2
	Flake (w/o cortex)	Metasediment		3
	Flake (w/cortex)	Metasediment		1
	Faunal	Bone		3
	FMR Concentration	N/A		1
	TOTAL ARTIFACTS RECORDED			63

45WH438 (FS#168) Boundary Bay No. 14

Elevation: 467 m Landform: Earth Movement Area: 60 m^2
Year Recorded: 1989 Aspect/Slope: W, 5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7095	1
	Pestle	Metasediment	10738	1
	Pestle	Metasediment	10739	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		20

Flake (w/cortex)	Hozomeen Chert	3
Shatter (w/cortex)	Hozomeen Chert	2
Shatter (w/o cortex)	Hozomeen Chert	2
Biface (w/o cortex)	Hozomeen Chert	2
Flake (w/o cortex)	Metasediment	24
Flake (w/cortex)	Metasediment	2
Flake (w/o cortex)	Quartz Crystal	1
Flake (w/o cortex)	Basalt	1
Faunal	Bone	3
TOTAL ARTIFACTS RECORDED		63

45WH439 (FS#169) North Jack Point

Elevation: 467 m Landform: Flood Plain Area: 300 m^2
Year Recorded: 1989 Aspect/Slope: S, 0-5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	7087	1
Recorded:	Flake (w/cortex)	Metasediment		1
	Flake (w/o cortex)	Metasediment		3
	Faunal	Bone		13
	TOTAL ARTIFACTS RECORDED			18

45WH440 (FS#170) Boundary Bay No. 15

Elevation: 464 m Landform: Alluvial Fan Area: 400 m^2
Year Recorded: 1989 Aspect/Slope: S, 5-10%

	Object	Material	NOCA#	Count
Collected:	Knife, Groundstone	Slate	7106	1
Recorded:	Flake (w/o cortex)	Metasediment		9
	Core (w/cortex)	Metasediment		1
	Shatter (w/cortex)	Metasediment		1
	Biface (w/cortex)	Metasediment		1
	Flake (w/cortex)	Hozomeen Chert		4
	Flake (w/o cortex)	Hozomeen Chert		8
	Biface (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1

Shatter (w/o cortex)	Hozomeen Chert	3
Scraper (w/o cortex)	Hozomeen Chert	1
TOTAL ARTIFACTS RECORDED		31

45WH441 (FS#171) S. East Landing No. 2

Elevation: 470 m Landform: Flood Plain Area: 220 m^2
Year Recorded: 1989 Aspect/Slope: N/A, 0%

	Object	Material	NOCA#	Count
Recorded:	Biface (w/o cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Hozomeen Chert		9
	Flake, Edge Modified (w/o cortex)	Hozomeen Chert		1
	Core (w/cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		3
	Flake (w/o cortex)	Metasediment		60
	Flake, Edge Modified (w/o cortex)	Metasediment		2
	Projectile Point (w/cortex)	Metasediment		1
	Shatter (w/cortex)	Metasediment		3
	Flake (w/o cortex)	Hozomeen Chalcedony		1
	Faunal	Bone		5
	TOTAL ARTIFACTS RECORDED			87

45WH442 (FS#172) Boundary Bay No. 16

Elevation: 463 m Landform: Alluvial Fan Area: 6 m^2
Year Recorded: 1989 Aspect/Slope: W-SW, 5%

	Object	Material	NOCA#	Count
Recorded:	Shatter (w/cortex)	Hozomeen Chert		1
	Flake, Edge Modified (w/o cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			2

45WH443 (FS#174) Boundary Bay No. 17

Elevation: 463 m Landform: Terrace Area: 5400 m^2

Year Recorded: 1989 Aspect/Slope: SW, 5%

	Object	Material	NOCA#	Count
Collected:	Knife (w/cortex)	Exotic Chalcedony	7013	1
	Flake (w/cortex)	Exotic Chalcedony	7014	1
	Drill	Exotic Chalcedony	7015	1
	Projectile Point	Basalt	7016	1
	Drill	Hozomeen Chert	7017	1
	Projectile Point	Hozomeen Chert	7018	1
	Projectile Point	Metasediment	7019	1
	Tool, Unspecified	Exotic Chalcedony	7020	1
	Flake, Edge Modified	Basalt	7021	1
	Projectile Point	Allenby Chert	7022	1
	Projectile Point	Basalt	7023	1
	Flake (w/cortex)	Chalcedony	7024	1
	Graver	Exotic Chalcedony	7025	1
	Projectile Point	Allenby Chert	7026	1
	Scraper	Exotic Chalcedony	7027	1
	Projectile Point	Metasediment	7028	1
	Flake, Edge Modified	Exotic Chalcedony	7029	1
Recorded:	Flake (w/o cortex)	Basalt		1
	Biface (w/o cortex)	Hozomeen Chert		4
	Flake (w/cortex)	Hozomeen Chert		11
	Flake (w/o cortex)	Hozomeen Chert		277
	Flake, Edge Modified (w/cortex)	Hozomeen Chert		4
	Projectile Point (w/o cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		34
	Shatter (w/cortex)	Hozomeen Chert		10
	Scraper	Hozomeen Chert		2
	Core (w/o cortex)	Hozomeen Chert		3
	Core (w/cortex)	Hozomeen Chert		1
	Flake, Edge Modified (w/o cortex)	Metasediment		1
	Flake (w/cortex)	Metasediment		10
	Flake (w/o cortex)	Metasediment		38
	Scraper (w/o cortex)	Metasediment		1
	Core (w/cortex)	Metasediment		3
	Shatter (w/o cortex)	Metasediment		4
	Flake (w/o cortex)	Hozomeen Jasper		1
	Scraper (w/o cortex)	Exotic Chalcedony		1
	Flake (w/o cortex)	Exotic Chalcedony		3
	Shatter (w/o cortex)	Hozomeen Chalcedony		1
	Flake (w/o cortex)	Hozomeen Chalcedony		1
	Shatter (w/cortex)	Vitrophyre		1

	Faunal	Bone	8
	TOTAL ARTIFACTS RECORDED		436

45WH458 (FS#178) North Lightning Creek No. 18

Elevation: 463 m Landform: Steep Slope Area: 5 m^2
Year Recorded: 1990 Aspect/Slope: SW, 80%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		>10
	TOTAL ARTIFACTS RECORDED			>10

45WH457 (FS#182) Ruby Creek Rockshelter

Elevation: 528 m Landform: Steep Slope Area: 100 m^2
Year Recorded: 1990 Aspect/Slope: S, 50%

	Object	Material	NOCA#	Count
Collected:	Flake	Metasediment	7967	1
	Flake (w/o cortex)	Metasediment	7967	11
	Faunal	Bone	7974	7
	TOTAL ARTIFACTS RECORDED			19

Comment: Also some metal cans and jar lids, indications of recent use as temporary camp by visitors.

45WH496 (FS#184) Green Point Rockshelter

Elevation: 525 m Landform: Bedrock Bench Area: 60 m^2
Year Recorded: 1990 Aspect/Slope: S, 6%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Exotic Chalcedony		1
	Cobble Chopper	Granitic		1
	TOTAL ARTIFACTS RECORDED			2

45WH456 (FS#185) Panther Creek Fan

Elevation: 503 m Landform: Alluvial Fan Area: 30 m^2
Year Recorded: 1990 Aspect/Slope: NE, 22%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		5
	Shatter (w/o cortex)	Hozomeen Chert		3
	Shatter (w/cortex)	Hozomeen Chert		3
	TOTAL ARTIFACTS RECORDED			11

45WH467 (FS#186) Casino Bay No. 5

Elevation: 491 m Landform: Terrace Area: 4000 m^2
Year Recorded: 1990 Aspect/Slope: SE, 22%

	Object	Material	NOCA#	Count
Collected:	Quarry Blank	Hozomeen Chert	7964	1
	Tool, Unspecified	Hozomeen Chert	7965	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1
	Shatter (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			5

45WH466 (FS#187) Roland Point Campground (East Bank Trail)

Elevation: 546 m Landform: Alluvial Fan Area: 1800 m^2
Year Recorded: 1990 Aspect/Slope: W, 16%

	Object	Material	NOCA#	Count
Collected:	Flake	Hozomeen Chert	7966	1
Recorded:	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1
	Core (w/cortex)	Hozomeen Chert		1
	Core (w/cortex)	Metasediment		1
	TOTAL ARTIFACTS RECORDED			5

45WH465 (FS#188) Devil's Campground

Elevation: 543 m Landform: Bedrock Bench Area: 25 m^2
Year Recorded: 1990 Aspect/Slope: W, 22%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/cortex)	Hozomeen Chert		2
	Flake (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			4

45WH459 (FS#189) Desolation Trailhead

Elevation: 489 m Landform: Steep Slope Area: 1200 m^2
Year Recorded: 1990 Aspect/Slope: W, 50%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		14
	Shatter (w/cortex)	Hozomeen Chert		>50
	TOTAL ARTIFACTS RECORDED			>64

45WH461 (FS#192) North Lightning Creek No. 19

Elevation: 491 m Landform: Bedrock Bench Area: 4 m^2
Year Recorded: 1990 Aspect/Slope: SW, 22%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		2
	Shatter (w/o cortex)	Hozomeen Chert		1
	TOTAL ARTIFACTS RECORDED			3

45WH464 (FS#195) Big Beaver No. 2

Elevation: 503 m Landform: Terrace Area: 1 m^2
Year Recorded: 1990 Aspect/Slope: N, 11%

	Object	Material	NOCA#	Count

Recorded:	Flake (w/o cortex)	Hozomeen Chert	3
	TOTAL ARTIFACTS RECORDED		3

45WH472 (FS#196) Big Beaver Falls

Elevation: 490 m Landform: Terrace Area: 4 m^2
Year Recorded: 1990 Aspect/Slope: S, 0-22%

	Object	Material	NOCA#	Count
Collected:	Flake (w/o cortex)	Allenby Chert	10200	1
Recorded:	Flake (w/o cortex)	Allenby Chert		2
	Flake (w/o cortex)	Hozomeen Chert		2
	FMR Concentrations	N/A		?
	TOTAL ARTIFACTS RECORDED			>6

Comment: Evidence of recent camping at site.

45WH474 (FS#198) Dry Creek/Ponderosa Point

Elevation: 488 m Landform: Terrace Area: 400 m^2
Year Recorded: 1991 Aspect/Slope: N/A, 0-5%

	Object	Material	NOCA#	Count
Recorded:	Flake (w/o cortex)	Hozomeen Chert		>20
	TOTAL ARTIFACTS RECORDED			>20

45WH483 (FS#199) Spencer Bay No. 6

Elevation: 470 m Landform: Bedrock Bench Area: 400 m^2
Year Recorded: 1991 Aspect/Slope: N/A, 0-5%

	Object	Material	NOCA#	Count
Collected:	Projectile Point	Metasediment	10381	1
	Microblade Core	Hozomeen Chert	10382	1
	Microblade Core	Hozomeen Chert	10383	1
	Groundstone	Metasediment	10384	*1
	Groundstone	Metasediment	10385	*1

	Debitage	Hozomeen Chert	10386	1
Recorded:	Flake (w/o cortex)	Metasediment		>15
	Flake (w/cortex)	Metasediment		2
	Biface (w/o cortex)	Metasediment		1
	Core (w/o cortex)	Metasediment		3
	Flake, Edge Modified (w/o cortex)	Metasediment		2
	Flake (w/o cortex)	Hozomeen Chert		>20
	Flake (w/cortex)	Hozomeen Chert		1
	Biface (w/o cortex)	Hozomeen Chert		1
	Shatter (w/cortex)	Hozomeen Chert		1
	Flake (w/o cortex)	Quartz Crystal		11
	Faunal	Bone		3
	TOTAL ARTIFACTS RECORDED			>65

Comment: *NOCA 10384 and 10385 are two fragments of the same object.

APPENDIX J: GLOSSARY OF ARCHEOLOGICAL TERMS

GLOSSARY OF ARCHEOLOGICAL TERMS USED TO DESCRIBE PROJECT RESULTS

archeological remains
Any materials or substances that were manufactured, altered, modified, conditioned, or transported by human activity or under human influence.

artifact
Any object that was manufactured, altered, modified, or transported by human activity or under human influence.

assemblage
A collection or grouping of selected archeological remains or artifacts; criteria for assemblage definition may be based on a common origin, location, manufacturing style, age, material type, or other criteria.

B.P.
Before Present; in radiocarbon dating, refers to the number of radiocarbon years before the year A.D. 1950.

calcined
Bone material that has been altered by exposure to high temperatures.

core
A mass of stone from which flakes have been intentionally removed.

cortex
The weathered, outside surface of a stone object.

ethnographic
Refers to the description or described characteristics of groups of people with distinctive ways of life or cultural systems.

expedient tools
Tools that were made rapidly, often casually, with little if any attention to detail, and that were usually discarded, or just left in place, after use.

faunal remains
Any parts of any animal taxa; in archeological sites, most often these are bone parts.

feature

A recognizable, physical association of artifacts or archeological materials; examples include cooking hearths, house floors, mounds, rock piles, pits, etc.

fire-modified rock (FMR)
Rocks or rock fragments that were intentionally heated by humans.

flake
A fragment of stone removed from a larger stone mass, and that has recognizable attributes of a conchoidal fracture.

formed tools
Tools of any material that were manufactured to a particular shape or style.

historic
A general time period distinguished by the presence of written documents, beginning about A.D. 1800 in the project area.

Holocene
The last ca. 10,000 years of time; the non-glacial epoch since the last great ice age; the present is considered part of the Holocene.

krotovina
A soil term describing a rodent burrow that has filled in with soil or other materials.

land use
A culture, or society's, or group's characteristic pattern of settlement, subsistence, or ecological niche.

lithic
Made of stone, rock, or mineral.

lithic scatter
A broad category of archeological site characterized predominately by the presence of chipped stone artifacts.

microblade
A flake that is long relative to its width, with parallel sides, and thin cross-section.

microblade core
A mass of stone from which microblades were intentionally removed.

obsidian
A naturally-occurring, volcanic glass.

Pleistocene
The geological epoch characterized by the advance and retreat of large continental and alpine glaciers; the Pleistocene ended ca. 10,000 years ago.

prehistoric; prehistory
The entire time period before written records or documents were created, beginning approximately 10,000 year ago and lasting until about 200 years ago in the project area.

projectile point
An object used as the penetrating tip on a projectile.

radiocarbon dating
A method of dating based on the natural radioactivity of carbon; only organic materials are dated.

site
A location identifiable as a place of human activity.

stratigraphy
Natural geologic layering or stratification in a sedimentary deposit, soil, or bedrock; and cultural stratigraphy created by anthropogenic activities.

tephra
The material ejected from a volcano and transported by air, often forming a distinct layer or deposit where it lands.

vitrophyre
A variety of obsidian characterized by the presence of easily-visible, light-colored crystals embedded in the glass matrix.