Extreme Archaeology: The Results of Investigations at High Elevation Regions in the Northwest.

by
Rudy Reimer
B.A., Simon Fraser University, Burnaby, B.C. 1997

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Abstract

Review of ethnographic and recent archaeological studies suggest that past human use of high elevation subalpine and alpine environments in northwestern North America was more intense than is currently believed. Archaeological survey high in coastal and interior mountain ranges resulted in locating 21 archaeological sites ranging in age between 7,500-1,500 BP. Lithic analysis of material from these sites indicates that technological strategies used at high elevations were affected by raw material availability, type and group mobility. The technological orientations of high elevation sites in coastal areas differed from those in the interior.

Site distribution patterns at subalpine elevations indicate a focus on ridgelines and cirque basins. These areas were ideal for use as resource procurement base camps between summer and fall. Data from other archaeological studies throughout the Northwest indicate similar technological orientations and settlement strategies for high elevation areas. Fluctuations in the use of high elevation resources are believed to have contributed to the development of Northwest cultures by 1) affecting regional settlement patterns, 2) controlling the availability of lithic, faunal and floral resources and 3) contributing to strong ideological ties to mountainous areas.

Dedication

This Thesis is Dedicated to the Ancestors of the Squamish and Similkameen Native Peoples.

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Chapter 1 Introduction

Go my sons, burn your books,
Buy yourseleves stout shoes.
Get away to the mountains, the deserts
And the deepest recesses of the earth.
In this way and no other will you gain
A true knowledge of things and
Of their properties.
-Peter Severinus, A.D. 1571.

This thesis explores the nature of past human use of high elevation areas of the Northwest Coast, the Interior Columbia and Fraser Plateaus and sections of the western Sub-Arctic of North America. Throughout this thesis, for ease of use, this area will be referred to as the "Northwest". Often archaeological sites found at high elevations in any area of the world are interpreted as being peripheral to past human cultures. Indeed, high elevation environments are peripheral to other areas, but human use of high altitudes goes far into antiquity. Acheulean hand axes have been found in East Africa at elevations greater than 2000 meters above sea level (Clark 1979: 93-109). Hunting of wild goats and sheep in the Zargos and Trans-Caspian Mousterian is well represented at sites at elevations as high as 2000 meters above sea level (Vishnyatsky 1999:69-122). Rock shelter sites have been excavated in New Guinea's subalpine zone and have been radiocarbon dated to nearly 40,000 years BP (Flood 1990: 39), while alpine areas in Australia have been used to harvest moths and other resources in antiquity (Flood 1990: 212-214). Evidence of Paleo-Indian occupation has been found in alpine areas of the southern Rocky Mountains (Benedict 1992a:1-16), the highland plateaus of Columbia at the Tibito site, and in the alpine regions of Peru at the Pachamachay and Asana River sites (Aldenderfer 1998:51-75; Dixon 1999). Clearly modern human beings (*Homo* *sapiens*) and our ancestors (*Homo?)* have used mountainous areas for a very long time and the modern preconceived notion of mountains as inhospitable places which people have avoided is wrong (Vivian 1997:1-11).

In British Columbia landforms are dominated by mountainous terrain. Even the interior plateau has a great deal of vertical relief. Since people have inhabited this region for over 10,000 years, a long lasting interaction with mountains and mountainous resources is very much a part of the human story of this area. Until quite recently archaeologists have not been interested in sites found in mountainous areas because early ethnographers and archaeologist did not investigate or actively seek detailed information about these areas (see Hill-Tout 1978a and b; Teit 1930). Recently, however, interest in the archaeology of mountainous areas has grown considerably (cf. Burtchard 1998; Frank 2000; Mierendorf 1999; Reimer 1998,1999a: 1-33; b 1-44; Reimer et al.1999:1-71). Discoveries of "ice mummies" in northern B.C. and other parts of the world clearly illustrate a recent human presence in mountainous areas (Burtchard 1998; Mierendorf 1998,1999; Reimer 1998, 1999a:1-33; b:1-44). Intriguing finds of aboriginal hunting gear melting out of glaciers at high altitudes also offer fascinating insights to the past use of mountainous terrain (Kuzyk et.al 1999). Several archaeological investigations also have illustrated a past human use of mountainous areas that goes beyond basic subsistence and settlement needs into ideological and spiritual realms (cf. Reeves 1996; Reimer 1998; Reimer et.al.1999:1-71; Vivian 1997). Modern scientific interest in mountains also goes beyond human history into natural history. Concern is growing over the ramifications of global warming and recreational use of these areas (Ryder 1998:1-38).

The main rational for this research is based on the current understanding of

Northwest Coast and Interior archaeology being focused on low elevation valley and ocean/lake side settings (cf. Ames and Maschner 1999; Matson and Coupland 1995). All the big village sites are found at valley bottoms, or at river and ocean side localities. These sites have been excavated and documented in length, so much of the current understanding of past human cultures and their use of natural resources pertains to low land areas (cf. Ames and Maschner 1999; Matson and Coupland 1995). As a result, we lack a complete understanding of past human use of all other environments, including subalpine and alpine areas. Far too often archaeologists in the Northwest dismiss high altitude areas as "areas people would have used only while passing through to get somewhere else." With the more extensive research presented in this thesis, and by other archaeologists in the Pacific Northwest, questions like "what were early people doing in the high mountains?" can begin to be addressed.

Secondly, it is hoped that this thesis will begin to clarify some of the methodological and theoretical issues surrounding archaeology at high altitudes. Many studies have only offered a basic description and limited interpretation of sites found in high elevations. Insights into the varying roles of past subsistence, settlement and ideology are usually not taken into account in interpreting sites in mountains. The type of archaeology conducted at high elevations is also different from that done at lower elevations, with the environment, the types of past activities and nature of the resulting archaeological record distinct from those of lowland areas. When one arrives in a high mountain setting after a long steep climb one can begin to appreciate the distinctive nature of past human use of such regions. When one reaches the world above the trees, the ideas, methodologies and theories of traditional archaeology developed in lowland settings are not always appropriate. The fauna and flora uniquely adapted to those environments are very different than their lowland neighbors, and must have held fundamentally different values to past people than those more accessible lowland species.

Chapter 2: Previous Archaeological Research In Mountainous Areas

ECCE SIGNUM- Latin for Behold the Proof.

2.0 Previous Archaeological Studies in Mountainous Areas

Below is a list of areas in western North America which have experienced notable mountain archaeology studies. A short summary of these studies is also presented along with an overview discussion of their main themes, intended to aid the reader through the following chapters. For reference purposes see author reference and numbers in tables 1 and 2, for figures 1 and 2 respectively.

Table 1. Northwest Coast and Sub-Arctic Mountain Range Studies.

Northwest Coast and Sub-Arctic	Mountain Range Studies
Area of Study	Reference
Oregon Cascades	1) Baxter et al. 1983; Baxter 1986; 2) Haynal 1999; 3) Snyder 1987,1991
Washington Cascades	4) Benson and Lewarch 1989; 5) Blukis Onat 1988; 6) Huelsbeck 1999; 7) Mack 1989; Mack and McClure 1998; 8) McClure 1989; 9) Mierendorf 1986; 1987, 1998, 1999; Mierendorf and Skinner 1997; 10) Zwiefil and Reid 1991
Mount Rainier	11) Burtchard 1998; Daugherty 1963; Rice 1965
Olympic Range	12) Bergland 1986,1988; Schalk 1988; Wessen 1992
Canadian Cascades	Frank 2000; Sto:lo Nation 1998
Squamish/Garibaldi	15) ARCAS 1999; Howe 1997; Joseph and Bikadi 1998; Reimer 1998, 1999a and b
Vancouver Island	16) Nagorson, Keddie and Luszcz 1996
Mount Edziza	17) Fladmark 1984,1985; Godfrey-

	Smith 1985
Spatzizi Plateau	18) Friesen 1983, 1985
Tatsenshini Park	19) Beatty 1999; Brooke 1999a and b; Champagne and Aishihik First Nations 1999; Joyce 1999; Kuehn 1999; Kuehn et al. 1999;
Yukon	20) Kuzyk et al. 1999
Northwest Territories	21) Pokotylo and Hank 1989

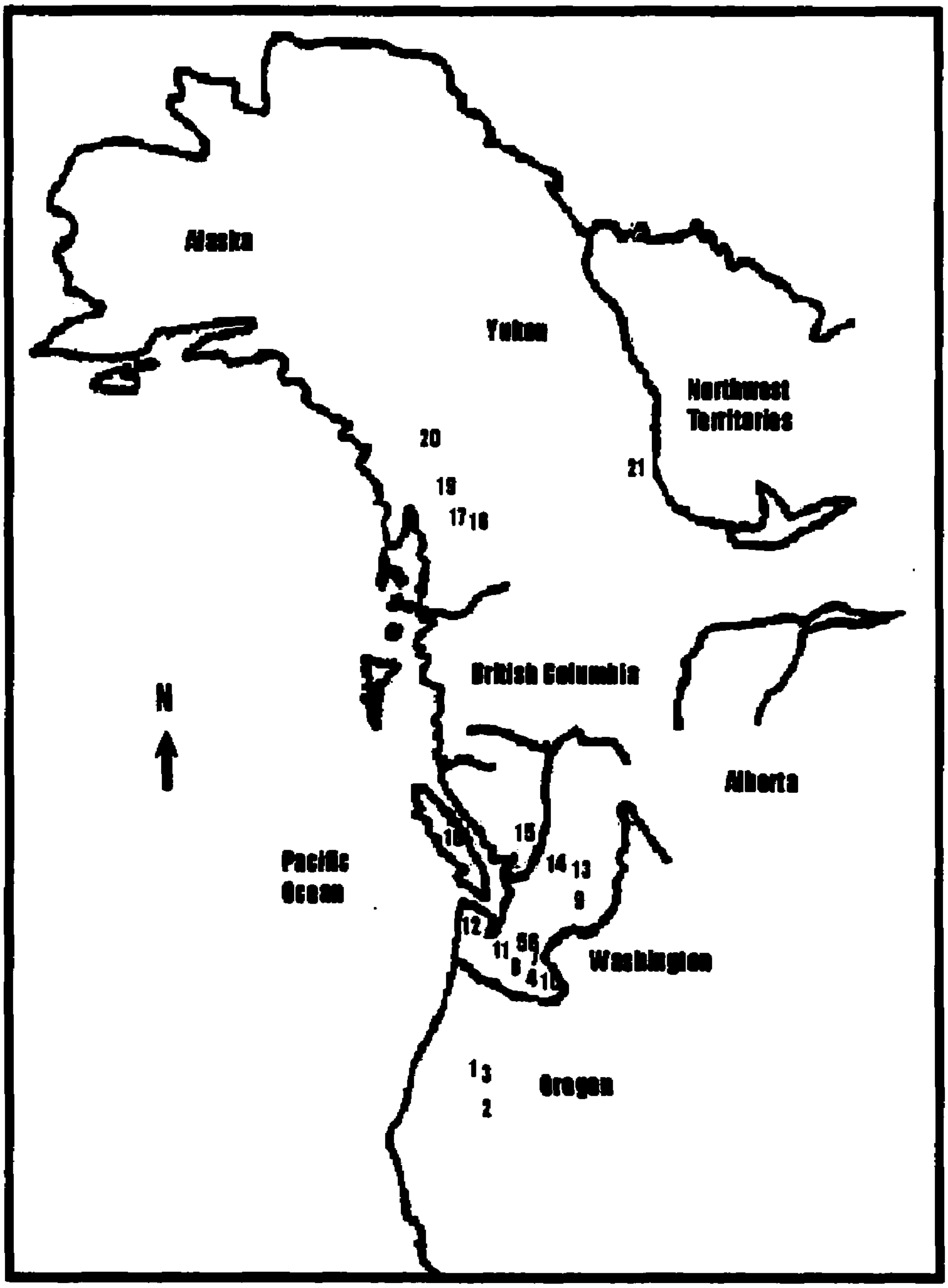

Figure 1. Location of Northwest Coast and Sub-Arctic Mountain Range Studies.

Table 2. Interior Mountain Range Studies.

[illegible]	
Area of Study	Reference
Great Basin/ California	22) Bettinger 1991 23) Canaday 1998
Southwest/ Colorado Front Range	24) Benedict 1969, 1970,1975 a and b; 1979 a and b, 1981, 1985 a and b, 1987, 1990, 1992 a and b,1993, 1996, 1999; Benedict and Olson 1978; 25) Black 1991; 26) Kornfield et al. 1999
Beartooth Mountains	27) Kunselman 1997
Waterton and Glacier Parks	28) Reeves 1975,1996
Cathedral Park	29) Reimer et al. 1999; Vivian 1989
Kootanys	30) Choquette 1981
Crowsnest Pass	31) Driver 1982, 1985, 1987, 1993; 32) Ronagan 1993; 33) Van Dyke 1987
Banff National Park	34) Christensen 1971;Greaves 1998; Hietzmann 2000, n.d. Langemann 1998; Magne 1998; Vivian 1993, 1997; Vivian and Hanna;1996
Lilloett Region	35) Alexander 1986, 1987, 1992; 36) Merchant 1998; 37) Pokotylo and Froese 1983; 38) Rousseau 1987 a and b; 1989, 1993, Rousseau et al. 1993
Potato Mountain	39) Alexander et al. 1985; Lowen 1998
Rainbow Mountains	40) Apland 1977

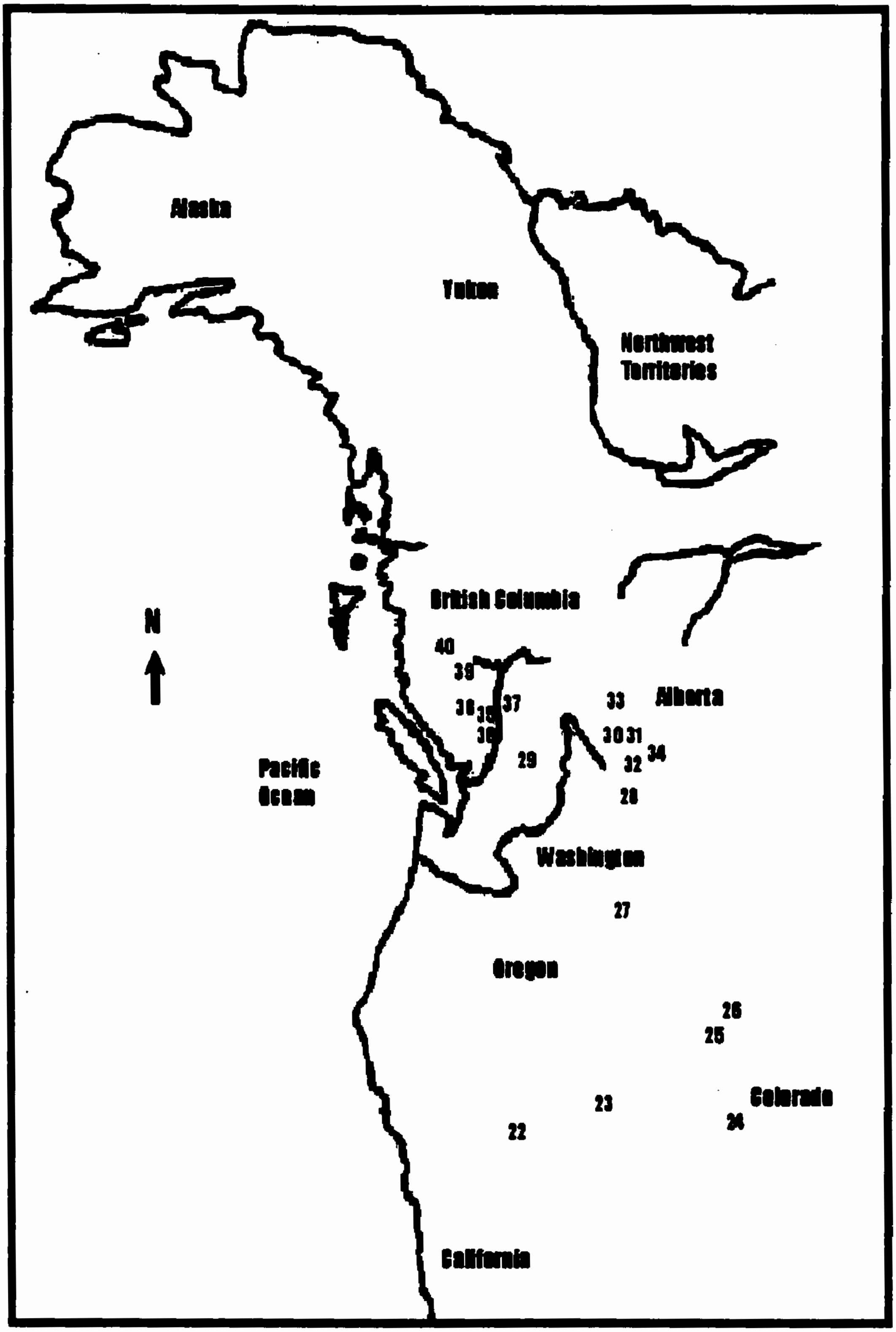

Figure 2. Location of Interior Mountain Range Studies.

2.1 The Northwest Coast

There have been four themes to high country archaeological research along the Northwest Coast.

1) Lithic raw material procurement: This activity has been documented by Fladmark (1984:139-156; 1985) and Godfrey-Smith (1985) for obsidian use in the Mount Edziza area. Apland (1977:1-21) conducted a similar but more limited study in the Rainbow Range on the Chilcotin Plateau. McClure surveyed the obsidian source in the Elk Pass area of Washington state (1989:49-70), while Mierendorf (1998:1-11;1999:1-24) has located a quarry with obsidian like material called vitophyre in Northern Cascades Park, of Washington state. Finally, I have located obsidian and other raw material sources in the Garibaldi volcanic belt (Reimer 1998,1999a:1-33, b:1-44).

2) Hunting strategies have been another research pursuit. They include those done in the alpine areas of Garibaldi and Squamish (Reimer 1998;1999 a and b), the slopes of Mount Rainier (Burtchard 1998), marmot hunting in alpine areas of Vancouver Island (Nagorsen, Keddie and Luszcz 1996), and up land rock shelters used for habitation and hunting in the Oregon Cascades (Baxter et al.1983).

3) Plant gathering activities have been investigated by Mack (1989:38-49), Mack and McClure (1998:1-7) in the Central Cascade Mountain Range. Frank (2000) conducted similar studies in the Northern Cascades, focusing on the mass production and processing of berries, most notably the *vaccinnium* variety.

4) Other studies have investigated landform associations with archaeological sites, such as those done by Snyder (1987, 1991:117-137), Benson and Lewarch (1989:31-48) and Zwiefel and Reid (1991:3-16) in the central Cascade Mountains. Many sites in these

studies are documented but only interpreted at a preliminary level. Very few archaeological sites at high elevations have been shovel tested, test excavated, or otherwise seriously examined.

Below are summaries of those mountain archaeology studies along the Northwest Coast. For ease of arrangement, locations will be listed from south to north.

2.1.1 Southern Cascades

Many sites located along the ridge crest of the Oregon and Washington Cascade Range were interpreted as seasonally inhabited camps for hunting and plant gathering activities. Located in the subalpine ecotone, they offer information reflecting prehistoric land use in highland areas (Baxter 1986:49-101; Mack and McClure 1998: 1-11; Mack 1989: 49-58; McClure 1989:59-70; Snyder 1991:117-137).

The span of occupation of these sites ranges from 6,700 BP (Cascade phase) to as recent as 200 BP (proto-historic). The sites are located on both the tops and bases of small ridges near the tree line on open meadows. Since meadow edges are areas of plant and animal diversity, inferred activities for these sites includes huckleberry processing, hunting, traveling and summer camping (Mack and McClure 1998:1-7; Mack 1989: 49-58; McClure 1989: 59-70; Snyder 1991:117-137).

The importance of harvesting blueberries in the highlands of Washington is well documented in the archaeological record of the Southern Cascades (Mack and McClure 1998:1-7; Mack 1989:49-58). Summer camp sites were made to facilitate mass gathering and processing of large berry patches. Once harvested, the berries were dried on mats and then placed over a log and frame rack to further dehydrate and preserve them. The result is the occurrence of an archaeological feature; known as a "berry drying trench." These sites are becoming more commonly recognized in suitable areas for upland camps. The trenches average 1 m wide, by 6 m long, and 20 cm in depth, with rows of fire altered rocks along their bases and a mound of overturned soil on one side. Charcoal and berry seeds may be found within the sediment matrix of these features. The largest number of these sites appears to be in the southern Cascades, although the known distribution of these and other upland sites is absolutely dependent on the amount of area surveyed. Often associated with these sites are the remains of residential camps, CMTs and midden deposits. Such sites occur at elevations of 940-1,550 m in the mountain hemlock zone (Mack and McClure 1998:1-7; Mack 1989:49-58).

In addition to the harvesting and processing of berries, archaeological survey in the alpine area of the Elk Pass region located a previously unknown obsidian source at 2,042 meters a.s.l. The main source area is located at the base of a talus slope while the main lithic reduction station is located along a ridge crest to the east. Preliminary debitage analysis found that procurement of material from this quarry was for biface manufacture. The temporal distribution of this material in archaeological sites ranges from 6,650 to 500 years BP. Less intensively used lithic workshop sites are located away from the main quarry area. These sites are interpreted as mountain goat or mountain sheep hunting sites (McClure 1989:59-70).

Procurement of this obsidian is inferred to have taken place during summer when plant gathering and hunting were the main activities and snow cover was reduced. Raw material procurement is thought to have been a secondary pursuit. This pattern holds with the low incidence of obsidian found in lowland sites and greater amounts found in highland areas. More suitable raw materials are found in easier to get to lowland localities. Further investigation into the temporal and spatial distribution of subalpine and alpine sites will tell archaeologists more about settlement and subsistence patterns in the Northwest (McClure 1989:59-70).

Based on data from the above mentioned studies Snyder (1987,1991:117-137) illustrated relationships between site locations and topographic features in the southern Cascades. Using a long transect located along the south-central Oregon Cascades as a sampling unit, Snyder (1987,1991:117-137) assumed that archaeological sites are not randomly spaced and would be located in relation to natural and cultural contexts. Those sites were tested statistically to measure the degree of relationship between natural landforms and assumed cultural variables. East of the Cascade crest archaeological sites are found to cluster around water sources more than any other environmental variable. Along the western flanks of the Cascades, sites tend to be more widely distributed, and focused on procurement of specific resources. Problems of modeling such distributions include a lack of chronological control, over all site visibility and biases inherent in surveying very different landscapes, i.e. meadows vs. forests. Overall site distributions are found to be patchy and concentrated in areas with enhanced resource availability (Snyder 1987,1991:117-137).

2.1.2 Mount Rainer

Greg Burtchard built on previous studies by Rice (1965:1-10) and Daugherty (1963) to conclude that prehistoric human use of Mt. Rainier in the North Cascades was controlled by the occurrence of a number of environmental events that affected human habitation. The terminal Wisconsinan glaciation limited the return of plant and animal life to the upper slopes of the mountain to the last 8,500 radiocarbon years. The eventual formation of present plant and animal distributions by that time made subalpine and alpine zones of the mountain conducive to human occupation. However, a dynamic history of later volcanic activity and mudflows on lower valley slopes decreased archaeological site visibility (Burtchard 1998:15-31).

A total of 33 archaeological sites were located on the upper slopes of Mt. Rainier, including, lithic scatters, rock shelters, isolated finds, quarries and seasonally occupied camps. Locally available cyrptocyrstalline silicates and dacite raw materials dominate the site assemblages. Those sites are thought to represent seasonal residential camps, plant and animal gathering locales and other short term occupation sites, based on the ratio of formed tools to debitage. Residential camps possess more diverse artifact assemblages while short term occupation sites have an inverse relationship (Burtchard 1998:77-149). Chronologically sensitive artifact types indicate a temporal range for these sites of 5,000 to 2,000 BP, which cluster in the sub alpine zone at elevations around 1,800 meters a.s.l. Sites are found on slopes of less than 10% grade, with orientations to the south and east. Site distance to water sources is not an important variable since water is always available nearby. Sites tend to be widely distributed and are found in cirque basins, benches and tarn fields, at the bases of cliffs and talus slopes and occasionally on ridges and saddles and table lands (Burtchard 1998:103-110).

Human use of the upper slopes of Mt. Rainier changed over the Holocene. Early occupations were by seasonal hunting and foraging groups. Later collector strategy, based more in the lowlands, focused on subalpine and alpine resources that could be harvested in mass, i.e. berries and small game (Burtchard 1998:111-178).

2.1.3 U.S.A Northern Cascades

Bob Mierendorf has surveyed areas of Northern Cascades National Park in Washington State and has found that ecology and glacial history are critical factors in locating sites. With the exception of the land/ sea ecotone, the land between lowland forest zones and subalpine areas is the most biotically rich in the Northwest. As a result, archaeological sites are commonly found at the tree line (subalpine ecotone), particularly on ridge crests and benches. Lithic scatters are the most common sites and are less than 1,000 square meters in size (Mierendorf 1986:29-82,1987:1-19,1998:1-10, 1999:1-24; Mierendorf and Skinner 1997: 49-50).

Very few excavations have been done in high land sites in the Northwest. However those sites which have been investigated indicate a use of high land areas stretching back to 6,600+90 years BP. Lithic artifacts dominate assemblages and organic preservation is poor (Blukis Onat 1988; Mierendorf 1986: 29-82,1987:1-19,1998:1-10,1999:1-24; Mierendorf and Skinner 1997: 49-50).

Mierendorf (1999:11-18) proposes that during the early Holocene there was more extensive use of highland areas in the North Cascades. Later, as staple resources in lowland areas became the economic focus, the use of upland sites decreased and became only a sporadic aid to long term subsistence needs. Hence, the use of highland areas became a matter of extending and proving ones ownership of territory. From that perspective past peoples would use high land areas only in times of high population density and food shortage.

2.1.4 Olympic Range

Randall Schalk (1988) proposes a cultural historic and cultural ecological model for the pre-contact native use of the Olympic Range mountains, based upon limited archaeological evidence provided by Bergland (1986:19-44,1988). Schalk states that "mountains played a pivotal role in early Holocene land use strategies" and that the development of lowland intensification or resources altered later use of mountainous areas. Schalk's general cultural historical model includes the following;

Paleo-Indian Foraging (greater that 10,000 BP),

Early Old Cordilleran Foraging (10,000-3,000 BP),

Late Old Cordilleran Foraging and Riverine Collecting (6,000-3,000 BP),

Riverine and Maritime Collecting (3,000-200 BP).

Actual evidence for Paleo-Indian occupation in the Olympics is lacking and is a category for potential early use and occupation of this region. Evidence for Early Old Cordilleran foragers is scattered throughout the Olympic peninsula region. Schalk states that Cascade and willow leaf shaped points are well suited to montane foraging in the Pacific Northwest. In addition, he proposes that low population densities and abundant ungulate game (due to the Hypsithermal Interval) made for a high mobility land use strategy during this time period. Late Cordilleran foraging saw a switch from high mobility and low population density to increased sedentism and higher population densities. As a result, land use of mountainous areas declined, but remained a part of overall cultural resource use. Eventually, cultural developments in low land settings saw a sharp decline in the use of montane landscapes, during the Riverine and Maritime collecting stage of Schalks' (1988) model. Also, see Bergland (1986,1988) and Wessen

(1992:1-60) for more details on site specific information in Olympic Park.

2.1.5 Canadian North Cascades

During an inventory survey members of the Sto:lo Nation examined two locations in the subalpine of the Chilliwak River drainage and two lithic scatter sites were found. At one site there is a possible roasting pit and at the other a hearth feature. No radiocarbon dates have yet been reported from either of these sites. (Sto:lo Nation 1998).

Ian Frank (2000:52-89) located nine sites in the Galene Lakes area of the northern Cascade Range. Many of those sites were isolated finds and are presumed to represent pre-contact hunting activities by local Salishian groups. Two of the sites were berry processing trench features, located close to berry patches in subalpine locations. All but two of the nine sites are located along ridgelines, with commanding views of the surrounding terrain. The two remaining sites are located at lake sides, in sheltered locations. Frank proposes a model that sees the majority of sites in high country settings located along high commanding view ridgelines (presumably for hunting purposes), but does not see the highest density of sites at lake side locations. Nevertheless, Frank's overall model meshes well with other findings in the North Cascades (cf. Mierendorf 1999:1-24).

2.1.6 Squamish/Garibaldi

Further North, in the South Coast Range, Howe (1997:1-6) recorded five sites along the Squamish/Cheakumus divide. All were lithic scatters apparently related to high country hunting of deer, elk and mountain goat. Joseph and Bikadi (1998:1-10) surveyed the shore line of Callaghan Lake and found numerous bark stripped culturally modified trees and a potential canoe run. Reimer (1998: 1-33,1999:1-41) surveyed selected areas of Garibaldi Provincial Park and recorded four lithic scatter sites. Three are related to high country ungulate hunting and lithic raw material procurement. The other lithic scatter is in association with a berry drying trench plant processing locality (cf. Mack 1989; Frank 2000:60-81). Details of site assemblages and locations will be discussed in later sections.

2.1.7 Vancouver Island

Further north, subalpine and alpine surveys in a karst cave setting in Strathcona Provincial Park, found four sites related to pre-contact Vancouver Island Marmot hunting (*Marmmota vancouveriensis*) (Nagorsen et al.1996:4-8). Marmot dominates faunal assemblages, with almost all bones showing indications of butchering and skinning (Nagorsen et al. 1996:13-21). The ages of the sites range from 2,630+50 to 830+60 years BP (Nagorsen et al. 1996: 12-13). The total lithic assemblage from the four sites is limited to four flaked stone artifacts, all found in association with marmot bones. The marmot bones from the four sites exhibit different butchery techniques, suggesting use of these areas by different hunters at different times (see radiocarbon dates above). The season in which marmot hunting took place is most likely summer to early fall. Marmot remains do not make their way down to coastal sites of Vancouver Island, and this suggests that at present we have a gap in knowledge concerning regional settlement and subsistence patterns (McMillan 1999:47-103; Nagorsen et al.1996:30-46).

2.2 Sub-Arctic

2.2.1 Edziza Range

Archaeological and Paleo-environmental studies of the Mt. Edziza region south of the lower Stikine river indicate intensive exploitation of subalpine and alpine obsidian sources (Fladmark 1984:139-156, 1985:54-70, 1986:49-52). One hundred and fifteen archaeological sites were located on surveys of Mt. Edziza and surrounding areas (Fladmark 1985:50-51). Delineation of sites was accomplished by finding concentrations of flakes and diagnostic tools. The most common site types recorded were quarry areas, seasonally occupied camps, flaking stations, multi-function sites and isolated finds (Fladmark 1984:139-156,1985, 52-105).

High altitude quarries in the Edziza area were preferred for quality of material and size of raw material nodules, possibly as far back as 10,000 BP. Paleo-environmental records suggest that the use of the high altitude (alpine) quarries may have been limited during Holocene Neoglacial conditions. Coastal and interior groups accessed the quarry areas for their own use, and gathered enough material for trade to other groups as far away as the central coast of B.C. and western Alberta (Carlson 1994:307-361; Godfrey-Smith 1985; Fladmark 1984:139-156, 1985: 195-208,1986: 49-52).

Analysis indicates that a least ten types of chemically distinct obsidian are present on Mt. Edziza, and most were widely utilized and traded throughout the Northwest. The obsidian occurring at higher elevations tends to be better for knapping and is available in larger quantities than the lower elevation lithic scatter sources. It is suggested that at the height of the Neoglacial favorable high elevation localities were cut off from human use

(Godfrey Smith 1985; Fladmark 1985:54-70).

2.2.2 Spatzizi Plateau

Systematic survey in the Upper Stikine River drainage found 67 sites. Seventeen are sites are located in subalpine contexts, on terraces, overlooking creeks, streams or lakes. Sites tend to have southern exposures and have easy access to a number of floral and faunal resources. All sites are small lithic scatters with low artifact densities. Artifact typology indicates the sites date from the last 3000 years. During this time period paleoenvironmental studies indicate that the local climate was stable and had a limited affect on human habitation of the region (Friesen 1983:25-72, 1985:99-166).

Lithic analysis concluded that sites included base camps, hunting camps/ kill sites, temporary camps and transitory camps. Limited faunal analysis suggested that higher elevation areas were utilized during the fall, and lower elevation areas during the fall and winter (Friesen 1983:56-72, 1985: 167-173).

2.2.3 Tatsenshini Park

Human remains were accidentally found by three hunters at the edge of a receding glacier of 2000m in Tatshenshini Park, northern B.C. (Brooke 1999a and b; Joyce 1999; Kuehn 1999: 78-91; Kuehn et al. 1999). The glacial ice in this area had expanded during the Little Ice Age ca. AD 1400, but began to retreat ca. AD 1850. The glaciers in northern B.C. have melted 6-30m in the last 100 years (Kuehn 1999: 78-91; Kuehn et al. 1999).

This is in the traditional territory of the Champagne and Aishihik Nations. Elders of the groups have stated that the area where the remains were found is near an old trail used for trade between coast and interior groups (Champagne and Aishihik First Nations

1999). In order to find out as much as possible about these remains and associated artifacts, native peoples and archaeologists are working together in mutual respect (Beatty 1999; Fong 1999). The human remains have been called Kwanday Dan Sinchi, or Long Ago Person .

The human remains include flesh, bones, hair, but no skull. They can be tested to find out about diet, nutrition and disease of native people before contact with Europeans. Initial osteological analysis suggest that the remains are of a male in his twenties. The young man probably fell into a crevasse while traveling across the glacier (Champagne and Aishihik First Nations 1999; Kuehn 1999: 78-91; Kuehn et al. 1999).

Additionally several artifacts were found in association with the human remains including wooden atlatl shafts, a woven cedar hat, an arctic ground squirrel fur cloak, an 2.5m long wooden pole (i.e. an alpenstock), several 1.2m long wooden sticks, cedar bark cordage, a sewn leather pouch with leaves and a fish, and a single piece of iron that may have been traded in from other areas. Surprisingly, no lithics were found at the site. Two AMS 14C dates on the associated artifacts resulted in an age estimate of 550 BP (Brooke 1999a and b; Joyce 1999; Kuehn 1999: 78-91; Kuehn et al. 1999).

2.2.4 Yukon

Receding alpine glaciers in the southern Yukon have recently revealed well preserved natural and cultural remains. Radiocarbon dates on the extremely well preserved organic remains of an arrow fragment and caribou fecal pellets offer evidence for alpine hunting in areas above Kusawa Lake for over 4,000 years. Caribou behavior is well known, with herds seeking wind-swept ridges with cool and insect free conditions in summer. Pre-contact peoples had this knowledge and used snow pack/glaciers along with stone blinds to hunt caribou during summer months. Intriguingly, present day caribou populations do not inhabit the area around this site. This and other unique contexts in the southern Yukon offer great potential for future research in high altitude paleoenvironmental conditions, pre-contact hunting strategies and technology (Kuzyk et al.1999:214-219).

2.2.5 Northwest Territories

Mountain Dene lithic procurement strategies in the Great Bear Lake region of the Northwest Territories was documented by Pokotylo and Hanks (1989:49-66). Chert outcrops at high elevations are believed to have great ideological connections to the earth. Before quarrying, offerings are made to the parent bedrock. The Dene believe the purpose of these offerings is to ensure continuous occurrence of suitable lithic materials. Pokotylo and Hank (1989:55) suggest that offerings of exhausted tools left by pre-contact hunters may be found at quarry sites. Extensive curation of tools at lower elevation sites and restricted access to the quarry during heavy winter snows indicate the special role of lithic raw material acquisition (Pokotylo and Hank 1989:49-66).

2.3 The Plateau

Archaeological research into high altitude resource use in the Plateau is widely scattered. Separate studies have taken place in the southwest Columbia plateau (Benson and Lewarch 1989: 31-48), the Kootenay region (Choquette 1981:21-36), Okanagan/Similkameen areas (Reimer et al.1999:1-71; Vivian 1989), Cornwall Hills and Cayoosh Creek (Rousseau 1987a:1-38, 1993; Merchant 1998) localities near Lillooet and

Potato Mountain in the Chilcotin (Alexander 1992:101-145, 1987; Alexander et al.1985). No clear theme to modeling high altitude sites is apparent in these reports, but similarities to Northwest Coast research is present. Procurement of lithic raw materials is common in the Okanagan-Similkameen area (Reimer et al.1999:1-71; Vivian 1989:17-38), the southwest Columbia plateau (Benson and Lewarch 1989: 31-48) the Rainbow Range (Apland 1977:1-22) and the Kooentays (Choquette 1981:21-36). High country hunting is also apparent in the Lillooet region (Alexander 1992; Rousseau 1987a:1-38; Rousseau et al.1993) and Okanagan- Similkameen studies (Reimer et al. 1999:1-71; Vivian 1989: 17-38), while plant processing is the major theme of the Chilcotin Potato Mountain study and Upper Hat Creek locality (Alexander 1986,1992:101-145; Pokotylo and Froese 1983). In the following sections, the various studies will be discussed from south to north.

2.3.1 South Columbia Plateau

Archaeological surveying in river and non-river settings in the Yakima Firing Range Center located 159 sites, 124 of these are prehistoric, 29 are historic, and 6 are both prehistoric and historic. The prehistoric sites indicate that land use began approximately ca. 7,000 BP. A lack of known sites 5,000-2,000 BP is believed due to increased volcanic activity in the Southern Cascades (Benson and Lewarch 1989:31-48, 1991:27-40).

Unlike Snyder's (1991:117-137) study along the Southern Cascades, the patterning of sites in relation to environmental variables is different in Benson and Lewarch's (1989:31-48) study. The relationship of site location to a number of environmental variables (slope, aspect, distance to water, elevation and the like) indicates the main factor in site selection is angle of slope, yet no preferable solar orientation aspect was found. Quarrying of lithic raw materials is found to be the most common activity in upland settings due to the overall higher quality of lithic raw materials in upland settings. Regional interaction between groups along the Cascades is evident in the different types of lithic raw materials found in assemblages (Benson and Lewarch 1989:31-48, 1991:27-40).

2.3.2 Cathedral Provincial Park

The park is bounded by the Ashnola and Similkameen Rivers to the north and east respectively, the USA border to the south and the height of the Coast Range to the west. This area was inhabited by the Similkameen people. The details of an Athapaskan migration into this area will not be discussed here, but see Baker (1990) for more information on that topic. Five ecological zones were utilized prehistorically: 1) the low elevation river side terraces with bunch grass, 2) spruce, 3) lodge pole pine, and 4) the upper elevation Douglas and sub alpine fir and 5) the alpine tundra zones. Higher elevation sites will be discussed here, for information on lower elevation sites see Copp (1974,1979,1996) and Vivian (1989:17-38).

Vivian's (1989: 17-38) survey of Cathedral Provincial Park involved the discovery of 24 new archaeological sites and reassessment of 14 previously recorded sites. Most included lithic scatters, cultural depressions (roasting pits, house pits?), isolated finds, a quarry and lithic workshops.

Numerous sites are located along the Ashnola River, while others reside in more mountainous areas near lakes. Four sites were found in the alpine areas of the park. They included two lithic scatters representing short term resource procurement events, one lithic quarry of basalt/dacite material and one lithic workshop positioned close to the source quarry (Vivian 1989:33).

An archaeological survey in 1999 of additional high elevation areas in Cathedral Provincial Park located 10 more archaeological sites bringing the total number of known sites in the subalpine and alpine areas of Cathedral Park to 17 (Reimer et al. 1999:1-71). Further information on these sites will be presented in following chapters.

2.3.3 Kootenays

High altitude lithic resources are known to have experienced varying degrees of human exploitation in the southern Canadian Rockies/Kootenays (Choquette 1981:21-36). A total of 10 lithic types are known for the region, with their use reflecting variable location, cultural preference, technological demands, or territorial ownership. Quarry areas and associated lithic scatters tend to be located on high promontories and outlook areas. Hunting activities were secondary to quarrying activities, with hunting areas tending to be located in basins below game drive areas (Vivian and Hanna 1996). The location of these different lithic types may be useful in determining the seasonal use of certain areas and resources. Considering their location and variable seasonal availability, these high country quarries also may be connected to certain ethnic/ tribal/band groups (Choquette 1981:21-36).

2.3.4 Lillooet Region

Alexander (1992:99-145) studied ethno-archaeological analogues of high country use in the Lillooet region. She states that the subalpine and alpine areas were used primarily for the hunting of deer and the collection of food plants in the early summer and fall. Early summer in this region is mid-May and small parties would have begun to use high elevation areas. Those trips into the mountains could last from two to three days, to as long as two weeks, depending on resource needs. Using ethnographic information a model of high land resource use was constructed by Alexander (1992: 99-145) which will be summarized below.

Sites found in alpine elevations in the Lillooet region include burials, short term transient camps, plant gathering areas, ungulate hunting and butchering sites (blinds, cairns, drives, lithic scatters), and lookouts. Alexander suggests that archaeological residues of such activities will be difficult to find due to the lack of features, bone preservation, and the generally small size of these types of sites (Alexander 1992:99-145). At lower elevation subalpine/montane parkland elevations a different variety of archaeological sites will be found. They would include base camps, transient camps and resource procurement locations, such as look outs, hunting drives, hunting blinds, hunting fences, kill and butchering sites and plant gathering sites. Sites in the montane parkland will be more easily located since the occurrence of additional artifacts and features will make these sites more visible than alpine sites.

2.3.5 Cayoosh Range

Mike Rousseau and Peter Merchant conducted two archaeological impact assessment surveys in which shovel testing yielded five lithic scatter sites in the Cayoosh Range (near Lillooet, B.C). The sites were relatively dated by surface finds of diagnostic artifacts. Projectile points are similar to ones attributed elsewhere on the Fraser Plateau to the Shuswap and Plateau horizons (ca 3,500-1,200 BP) (Richards and Rousseau 1987:21-48; Rousseau 1993:1-24; Merchant 1998). All artifacts are of basalt/dacite, and site functions suggest hunting camps/stations. Historical features include a cabin, a trap line, an aboriginal trail, culturally modified trees, a talus slope pit feature and two stone hunting blinds. These localities are attributed to continued traditional uses of that high land area by local native peoples (Rousseau 1993:1-24; Merchant 1998).

2.3.6 Cornwall Hills

A complete survey and partial test excavations of an alpine meadow in the area of Cornwall Hills (near Lillooet) located nine lithic scatter sites, thought to range in age from 7,000 to 1,000 BP (Rousseau 1987a:1-38). All are interpreted as remnants of hunting camps. The area was free of glacial ice by 11,500 BP and by 11,000-10,000 was forested with pine trees. Artifacts of note include a single Nesikep Tradition like projectile point base and evidence of a microblade industry (Rousseau 1987a:1-38; Stryd and Rousseau 1996:177-204).

Slope wash and aeolian deposition made the visibility of early sites difficult in this area and sites later than 4,500 BP are more common. Activities include deer hunting, and the collecting of nodding onion and mountain potato. All such the sites are located on the tops of knolls with a good view of the surrounding landscape (Rousseau 1987a:1-38).

2.3.7 Upper Hat Creek

Extensive root gathering and processing took place at mid to high elevations in the Upper Hat Creek valley (south-central B.C. interior), on the Fraser Plateau, for the last 3,000 years. Surface surveying located a total of 223 sites, 173 were lithic scatters with the remaining 50 consisted of clusters of cultural depressions. Three site types were defined: 1) sites with small cultural depressions 2) sites with small cultural depressions and associated lithic scatter and 3) sites with large cultural depressions (a result of reuse) associated with lithic scatters. Those cultural depressions are the result of pit roasting of large quantities of root foods. Excavation and radiocarbon dating of 11 of these cultural depressions resulted in age estimates ranging from 700+100 BP (SFU 365) to 2245+50 BP (S-1642). The cultural depressions were filled with large quantities of fire altered rock, charcoal, ash, burnt soil and sediment and root maco/micro-botanical remains (Pokotylo and Froese 1983:133-151). However, the size of these features is too variable to infer site function (i.e. they could be cache pits or house pits), simply on the basis of their surface appearance.

2.3.8 Potato Mountain

Systematic surveying of the slopes of Potato Mountain by Alexander (1985, 1987) in the western Chilcotin region resulted in the finding of numerous lithic scatters, roasting pits and cache pits in subalpine parkland setting. A small number of survey quadrats located in alpine areas revealed no archaeological sites. The results of the survey indicate a preference for subalpine parkland settings for root and tuber harvesting.

2.3.9 Rainbow Range

Further north, at the western edge of the Chilcotin plateau, Brain Apland conducted an archaeological survey of the Rainbow Range and Anahim Peak. He located 23 lithic scatter sites related to procurement of obsidian. Survey coverage focused on the northeastern part of the mountain range, which includes Anahim Peak, the north slope of the Rainbow Mountains and Mackenzie Pass. Obsidian deposits on these mountains have been eroded and reworked through glacial action. As a result, quarrying of obsidian material is not restricted to any particular area of the mountain range. The locality around "Obsidian Creek" is the only likely focal point of heavy obsidian utilization since nodules at this locality are somewhat larger than other areas (Apland 1977:19-21).

2.4 The Southwest

2.4.1 Colorado Front Range (of the Rockies)

Based on over 20 years of field work in the Front Range of the Rocky Mountains of Colorado, James Benedict has recorded and investigated numerous sites, representing the most comprehensive archaeological investigations of high elevations in North America. Many of these sites are game drive systems, butchering sites, hunting camps, and vision quest locations, ranging in age from Paleoindian (Kornfield et al.1999; Benedict 1992a:1-16, 1992b) to proto-historic (Benedict 1985 a and b; 1999:1-15). Based on this work a settlement model based on culture ecological principles was formulated (Benedict 1992:1-16). Environmental factors affecting human use of subalpine and alpine areas in the Front Range includes 1) a location at the headwaters of four major river systems on the Great Continental Divide; 2) Long lasting snow banks that make an overall arid region resistant to drought; 3) a paleo-environmental record that shows human use was restricted to this region during harsh climatic time periods; 4) the fact that humans could have easily accessed the areas from lowland settings; 5) a lack of good quality stone material at high elevations; 6) an overall scarcity of edible plants in alpine areas and; 7) high elevation habitats do attract large ungulate populations that are suitable for hunting by humans.

People in the past could have accessed the alpine region in two ways. The first involved people moving in a simple up and down seasonal migration. The second involved a long distance counter clock wise movement through the Front Range that involved people gathering from both sides of the Front Range to communally hunt ungulate herds concentrated in the high alpine areas to avoid other predators and insect pests. During periods of cold and moist conditions subalpine and alpine regions would have been uninhabitable by plants, animals and people. For more details see (Benedict 1975a:161-174 and b: 267-278, 1978:1-181,1979 a:7-17, 1979 b:1-12, 1981:62-120, 1985 a:1-34, and b:84-168, 1987:1-27, 1990:1-70, 1992 a:1-16 and b:334-359, 1993:1-39, 1996:1-77, 1999:1-15; Black 1991:1-29; Kornfield et al. 1999).

2.5 Great Basin

2.5.1 Great Basin

Bettinger's (1991:654-679) documentation of alpine villages in the White Mountains of Nevada represents the only occurrence of probable year round occupations of alpine areas in North America, possibly due to warmer and drier conditions in this mountain range. The alpine village sites are thought to be the result of people intensifying plant and animal exploitation, Bettinger rules out technological innovation and environmental variables to state that the alpine villages were made by Numic speaking peoples expanding out of the southern Great Basin ca. 1,300-1,000 BP (Bettinger 1991: 654-679). Early and less intensive use of the mountain areas is also suggested, but not as part of the Numic spread. He also suggests that technological innovation, climatic change and population pressure were the possible reasons for a sudden intensive use of these alpine areas. Examination of the types of sites and associated artifacts indicates that population pressure was the major factor in the formation of the village sites.

Five interior mountain ranges of the Great Basin also were surveyed by Canaday (1998:1-12), although sites were rare. In the 7,500 acres investigated, only 31 sites were found, the majority being rock cairns related to game drive hunting activities. Most such game drive sites favor ridge line, knoll top and cirque edge locations. The low density of game made hunting a more intercept activity than a game drive activity (Canaday 1998:1-12).

2.6 Canadian Rocky Mountains

Archaeological information and ecological management practices are only beginning to be used in land management decisions in the Canadian National Parks of the southern Rockies. Archaeological and ecological theory and data have to be used to determine the extent of human presence on the landscape in the past. By recognizing the possible contributions and limitations of both fields of knowledge appropriate decisions can be made. An example of such is the ecological view of humans as "stressors" of the natural landscape. The traditional archaeology views humans as "conditioners" of the natural landscape (Magne 1998:1-15).

High land (subalpine and alpine) areas are often seen as harsh inaccessible parts of the landscape in western North America. However, ethnographic and archaeological accounts prove that this was not the case for native populations of the Rocky Mountains. The breadth of activities and traditional knowledge that still exists confirms that use of mountains was and still is an important part of native life. They were important areas for procurement of food, lithic raw materials and religion in the form of vision quests. Unfortunately, that long held view of the mountains as an untamable wilderness is slow to change (Vivian 1997:1-11).

2.6.1 Crowsnest Pass

Evidence from several paleo-environmental and archaeological sites in Crowsnest Pass in the southern Canadian Rockies show that the Hypsithermal interval of the early Holocene did not alter settlement patterns of Plains peoples (Driver 1987:345-360). Altitude shifts of ecological zones (grasslands and timberlines) did not restructure the environment. The timberline moved both up and down slope and hence expanded and constricted the montane forest zone. People(s) inhabiting Crowsnest Pass during the Hypsithermal moved seasonally from the foothills out to the Plains. While in the foothills and high mountain passes Plains people(s) lived beside Interior Salish people with a mountain adaptation.

An example of such a pattern was found at the early Holocene site of DjPo 47, where remains of big horn sheep (*Ovis canadensis)* were radiocarbon dated to 7,200+230 and 8,550+270 BP. Mazama Ash (ca. 6,700 BP) and stratigraphic relationships indicate an occupation time span at this site was from approximately 9,000 to 6700 BP (Driver 1982:265-272). Four closely associated sheep skeletons were found in association with projectile points common to this time period. The butchery techniques used on these animals indicate the site was not a kill site and that the bones were transported by cultural means (Driver 1982:265-272).

On a broader regional scale Driver examined 72 faunal assemblages from 22 sites, to find differences between seasonal kill/processing sites and seasonal base camp/habitation sites (Driver 1985:109-129). Seasonality studies of the faunal remains from different time periods indicate that there was no significant shift in hunting strategies through the Holocene. In the eastern end of the pass, winter sites are found with a high incidence of bison remains. In the west end a wider range of species are found in summer sites. Knowledge of game movements and abundance allowed past people to alter there subsistence activities accordingly (Driver 1985:109-129).

Expanding on earlier work, Driver (1982,1985,1987) examined the long occupation (8,500-500 BP) at DjPp8 in Crowsnest Pass, Alberta. The combination of information from DjPp8 and other sites indicated that a wider range of fauna and use of exotic lithic sources (Driver 1993:43-58) increased over time. Formation of long distance trade networks indicates that there may have been ritual importance to obtaining exotic raw materials. They also have superior flaking properties and are more useful than more abundant and local lithic raw materials. The formation of trade net works linked people by kinship and resources. Sites with faunal remains have diverse assemblages and are believed to represent seasonal movement of animals and people. Winter sites took advantage of large bison herds in the foot hills while summer sites focused on other ungulates (Driver 1993:43-58).

2.6.2 Southern Canadian Rocky Mountains

Investigation of 280 sites in the Waterton Lakes area of Southern Alberta are synthesized by Reeves (1975:237-248). The age of these sites ranges from 10,000 years

BP to proto-historic times. The climate of the Waterton Lakes area has been favorable to human occupation over this entire time span. Warm winters and abundant game is the main factor promoting human habitation in this area. Sites are located on flat, well drained areas, with favorable aspects and available water. Ungulate behavior and seasonal movements from lowland winter to upland summer habitats controls the seasonal focus of sites. Contrary to Driver (1987:345-360) Reeves suggests that the early Holocene warming caused grasslands in lowland localities and alpine areas to expanded at the expense of mid-altitude forests. Cultural response to these factors included a movement of Plains cultures to the foot hills areas and the continued use of a broad based mountain culture in other areas (Reeves 1975:237-248).

Later survey work by Reeves (1996:1-6) focused on finding and documenting vision quest sites. This pioneering study found a total of 56 such sites in the southern Canadian Rockies (Reeves 1996:8-55). Oval stone alignments (averaging in size of 1x2 meters in size) and cairns of the "right type of stone" are the most commonly documented site. The "right type of stone" is usually a white/red quartzite, argillites or basalt/diorites. Alignments tend to be oriented toward sacred mountain tops, with Ninastakis the most common target. These sites have to be located on high alpine ridge tops (usually over 2,200 meters a.s.l.) with clear site lines in order to serve their function. Reeves suggests the age of these sites in the range of 10-2,000 years (Reeves 1996:57-69).

Archaeological survey further north in the southern Canadian Rockies located a number of sites in James Pass. The environment in this high valley system is suitable for human use. This is due to the Chinook winds and snow free conditions throughout much of the year. Shovel tests conducted during survey recovered artifacts in 28 of the 38 tests.

Sites tend to be in sheltered locales and close to water sources (i.e. creeks, tarns). Test excavations at EkPu8 resulted in the discovery of a cultural sequence dating from 10,140+80 BP to 1,150 BP. This occupation span is based on radiocarbon dates and temporally sensitive artifacts (projectile points). The occurrence of this material and material from other sites in nearby passes suggest that there is potential for more early period sites along the high Alberta foothills and mountain margins. Ronaghan suggests this is due to relatively early de-glaciation followed by formation of a stable and productive environment (Ronaghan 1993:85-91).

2.6.3 Banff National Park

The first systematic archaeological survey of Banff National Park was done by Ole Christensen in 1969-1971, concentrated in a limited number of high elevation locations and passes. A total of 18 sites were recorded in alpine areas (above 2000 m a.s.l.) while 13 sites were recorded (above 1800 m a.s.l.) in the subalpine. The majority of sites occurred near passes, while a few were by lake side settings. Christensen noted that this site distribution was likely due to passes being easy travel routes but also allowed access to a wide range resources at both high and low elevations (Christensen 1971:117-155).

Most of the sites found by Christensen were small surface, or shallow depth lithic scatters, with small artifact densities. Lithic material at these sites was in late stages of reduction. Based on lithic analysis and site location it was concluded that these sites represent summer ungulate hunting camps. Sites in subalpine locations had artifacts that supported the presence of multi-functional base camp activities. Sites at higher alpine areas were the result of daily or overnight hunting forays (Christensen 1971: 117-155).

A total of 71 alpine archaeological sites were found during the survey seasons of 1992-1993 (Vivian 1993:25-73). The most common site types found were lithic scatters and isolated finds. Most archaeological site assemblages were small, lacking in formed tools and stratigraphic depth. Some of the sites recorded were interpreted as "base camps," located at or just below the modern tree line. Additionally, they are in easy to access locations, near major passes, transportation corridors, game habitats and trails. Isolated hard-to- access areas have a notable lack of sites. Vivian suggests the main activities that took place at these high elevation sites were hunting and lithic quarrying. The age of these sites ranges from Clovis (an isolated Clovis point was found at Clearwater Pass) to Late Period times. A high number of Middle Period projectile points have been found in alpine settings, suggesting a mid-Holocene rise in use of mountainous areas. Vivian believes the location of these sites near or at modern tree lines supports a rise in occupation during the mid Holocene since tree lines in the study area have not shifted a great deal in the last 5,000 years.

Chapter 3: Ethnography

Our people have always used the earth, from the oceans to the top of the highest mountains- An Old Saying from a Squamish Elder

3.0 Ethnography

A general overview of the native cultures of southwestern B.C. will be discussed here with focus on the Squamish and Similkameen and their interactions with alpine terrain. A further focus will be on resources gathered from high altitudes (see Bouchard and Kennedy 1976; Bouchard and Turner 1976; Hill-Tout 1978a: 27-56; Matthews 1955:23-26; Suttles 1987, 1990:453-475; Teit 1930, Spier 1938).

3.1 The Squamish

The Squamish are a division of the Coast Salish, who speak their own unique language "Skomish" (Suttles 1990:453-475). The Squamish border the Musqueam to the south, the Sechelt and Mt. Currie to the north and the Burrard and Katzie to the east. Squamish traditional territory lies in the "lower mainland region" of southwestern British Columbia. Specifically the Squamish define the boundaries of their traditional territory as follows. From Point Grey to Roberts Creek on the west, then north along the height of land to the Elaho river headwaters, including all of the islands in Howe Sound and the entire Squamish valley and Howe Sound drainage. Then the boundary extends south-east to the confluence of the Soo and Green rivers north from Whistler, then south along the height of land to the Port Moody area, including the entire Mamquam river and Indian Arm drainage; then west along the height of land on the south side of Burrard Inlet to Point Grey.

The Squamish can be characterized as a semi-sedentary fishing-hunting and gathering group with a complex social and political structure. During winter months they lived in large family owned long houses. These houses formed villages usually found along rivers and the ocean sides where inter-tidal and ocean resources could easily be obtained (Barnett 1955; Bouchard and Kennedy 1976; Bouchard and Turner 1976; Matthews 1955; Suttles 1990:453-475).

In summer the large family groups living in those long house villages spread out across the landscape for hunting and gathering in all surrounding biogeoclimatic zones. The location of their temporary settlements was determined by the availability of important food resources or the resources desired for a specific need. In these temporary camps the Squamish built and lived in small tent-mat lodge like structures (Barnett 1955; Bouchard and Kennedy 1976; Bouchard and Turner 1976; Matthews 1955 and Suttles 1990:453-475).

More detailed accounts of Squamish traditional life are found in (Barnett 1955; Bouchard and Kennedy 1976; and Bouchard and Turner 1976; Hill-Tout 1978a: 27-56; Matthews 1955; Suttles 1990:453-475).

3.1.1 Ethnohistoric Accounts of High Altitude Resource Use

3.1.2 Fauna

The most commonly hunted animals by Coast Salish peoples at high altitudes were mountain goats (Bouchard and Kennedy 1976; Drucker 1953:7-50; 1955:51-52; Duff 1952:71-73; Kennedy and Bouchard 1983:25-40; Suttles 1955:23-26, 1990:453-475). Several areas in the Squamish river drainage are ethnographically known for high altitude floral and faunal resource pursuits, especially Mountain Goats (see Bouchard and Kennedy 1976; Bouchard and Turner 1976; Hill-Tout 1978a:27-56; Kennedy and Bouchard 1983:25-40; Matthews 1955; Suttles 1990:453-475).

Thirty kilometers north of the Squamish delta in the upper river valley is a place traditionally known as "Pu'yam", which roughly translates as "a good place to hunt mountain goats." Inhabitants of the Pu'yam village were well know for their skills in hunting mountain goats.

Other areas in Squamish territory, also known to be good places for hunting mountain goats, are the mountains above the north-west of the confluence of the Squamish and Cheakamus rivers and the mountains above Deeks Creek which drains into Howe Sound. The Tantalus Range is called "Tswilix" by the Squamish, after a legendary Mt. Goat hunter who used that region (Bouchard and Turner 1976; Bouchard and Kennedy 1976; Hill-Tout 1978a:27-56; Mathews 1955; Suttles 1990:453-475).

"Xwuxwelken", or gray haired head, is the Squamish name for a mountain goat. A young mountain goat is called "i7imkiya", while an old one is referred to as "sinakw". Mountain goats were hunted mostly after the rutting season in late November, when they are at their fattest and their fur is at it's best. When hunted in the spring mountain goat meat was said to have tasted like cedar, due to goats eating the tips of cedar boughs in times of deep snow (Bouchard and Turner 1976; Bouchard and Kennedy 1976; Duff 1952:71-73; Hill-Tout 1978a:27-56; Mathews 1955; Suttles 1990:453-475).

The actual hunting of mountain goats was considered dangerous, thus reserved for those with "the power of the mountain goat." Even with the aid of specially trained hunting dogs and after receiving the gift for hunting mountain goats, a young man must still apprentice under a older hunter. Eventually training would pay off in the reception of "the power" through a spirit quest. Spirits came to young men in dreams and while fasting in the wilderness (Bouchard and Kennedy 1976; Drucker 1955:51-52; Duff 1952:71-73; Hill-Tout 1978a:27-56; Kennedy and Bouchard 1983:25-40; Mathews 1955; Suttles 1955:23-26). Going on a prolonged mountain goat hunting trip was called "tl'elhnayem" and areas where mountain goats were hunted were owned by people with status (Bouchard and Kennedy 1976).

In following the goats into the mountains the young man must "keep their smell from the goats" (Bouchard and Kennedy 197645-46). If this could not be done, the goats could detect the hunter and success in the hunt would not be achieved. Masking their human smell, hunters would have to bath often, rub cedar boughs over their bodies and cover themselves with a mountain goat wool blanket, by obtaining enough mountain goat wool off the trees in highland areas. In addition to special powers, hunters who traveled into high country areas also carried a long pole used for aid in mountaineering (Bouchard and Kennedy 1976; Drucker 1955:51-52; Duff 1952:71-73; Hill-Tout 1978a:27-56; Kennedy and Bouchard 1983:25-40; Mathews 1955; Suttles 1955:23-26).

Once killed, a mountain goat could be used several ways. The meat could be cooked and eaten by boiling or roasting over a fire. A freshly killed mountain goat could also be cooked by igniting a fire with wood kindling within the rib cage of the goat. This would provide both heat and cooked meal for the hunter. The meat also could be preserved by smoke drying in the mountains. The fat could be rendered into cakes to be used later. Mountain goat fat was used to cover the skin in cold weather, or boiled down to be used as butter. The horns of a mountain goat were soaked in water to be made pliable, then split and shaped into spoons called "xa7lew" (Bouchard and Kennedy 1976; Bouchard and Turner 1976; Drucker 1955:51-52; Duff 1952:71-73; Hill-Tout 1978a: 27-56; Kennedy and Bouchard 1976; Kennedy and Bouchard 1983:25-40; Mathews 1955; Suttles 1955:23-26; 1990:453-475).

The skins of the mountain goat were highly valued and figure in some of the legends of the Squamish people. Skins could also be used by a young man to pursue the woman he desired to marry. Used as a tribute payment to the woman's family, mountain goat wool blankets were made by combining the wool with dog fur and the fluffy seeds of the fireweed plant (Bouchard and Kennedy 1976; Bouchard and Turner 1976; Hill-Tout 1978a:27-56; Kennedy and Bouchard 1983:25-40; Gustafson 1980:37-64; Mathews 1955:23-26).

In ceremonial contexts, mountain goat wool blankets were highly valued, and were distributed at potlatches as a sign of wealth. If not enough mountain goat wool blankets were acquired, the family holding the potlatch would tear up the existing blankets in order to give something to everyone. These blanket scrambles were common at larger feasts and potlatches (Barnett 1955; Bouchard and Kennedy 1976; Bouchard and Turner 1976; Gustafson 1980:37-64; Hill- tout 1978a:27-56; Mathews 1955:23-26; Suttles 1990:453-475).

Other animals hunted in the high mountains included deer and elk, which were hunted in much the same way as mountain goats. The meat and skins of these animals were used, but not viewed as high status items since the hunting grounds where these animals were obtained were not owned (Barnett 1955; Bouchard and Kennedy 1976; Drucker 1955:51-52; Duff 1952:71-73; Kennedy and Bouchard 1983:25-40; Mathews

1955; Suttles 1955:23-26; 1990:453-475). Table 3 are the uses of animals hunted at high elevations, along with a prediction of their possible manifestation in archaeological contexts. It is possible that mountain goats and other animals being viewed as high status has some antiquity, since they are represented in art found in archaeological contexts dated ca. 3,500 BP (Carlson 1983b:199-206, 1996:215-226, 1999:39-48; Carlson and Hobler 1993: 25-52).

Table 3. Fauna Species Utilized at High Elevations by The Squamish People.

Animal Species	Uses	Archaeological Visibility and Manifestation
Mountain Goat (*Oreamnos americanus*)	food, wool and or fur, horns, bone raw material	Medium; Bones in high altitude sites, bones and horns in low land shell middens, fibers in wet site contexts
Deer (*Odocoileus sp.)*	food, bone raw material	High; bones in sites in various settings
Elk (Cervus elaphus)	food, antler, bone raw material	Medium; bones in sites in various settings
Marmot (*Marmota monax, Marmota caligata*)	food	Medium; bones in high altitude sites
Grouse/Ptarmigan (*Dendragapus obscurus, Lagopus lagopus*)	food	Medium; bones in sites in various settings
Skunk (*Mephitis mamphitis*)	medicine	Low; ?
Black Bear (*Ursus americanus*)	food, bone raw materials	High; bones in sites in various contexts
Grizzly Bear (*Ursus actos horribilis*)	food, bone raw materials	Medium; bones in sites in various contexts
Rodents, Moles (*rodenta sp.*), Porcupine (*Erethizon dorsatum nigrescens*), Snowshoe Hare (*Lepus americanus macfarlani*), Beaver (*Castor canadensis*), Muskrat*(Mustelidae sp.)*, Racoon (*Procyon lotor*)	food	Medium; cones in sites in various contexts
Bald Eagle (*Haliaeetus leucocephalus*)	feathers	Low; feathers in shell middens or wet site contexts
Golden Eagle (*Aquila chrysaetos*)	feathers	Low; feathers in shell middens or wet site contexts
Snow Goose (*Chen caerulescens)*	food	Medium; bones in sites in various contexts
Canadian Goose (*Branta canadensis)*	food, bone raw materials	Medium; bones in sites in various contexts

3.1.3 Flora

The most important plant resource to coastal groups is cedar, which was used in making everything from houses, canoes, rope, to clothing, although many other trees also were used for construction materials and fuel. Many plants were used as medicine and such knowledge was owned and usually kept secret. Many of the medicines were part of a tea-like drink, while others were applied directly to the skin. Major plant foods that contributed variety to the diet were the many berries found throughout the coastal environment, particularly those harvested in large quantities at high elevation picking grounds. Similar methods as described by Mack (1989:49-58), Mack and McClure (1998:1-7), and Frank (2000:21-40) were employed to process berries into dry cakes that could later be hydrated at lower elevations. Chief August Jack Khahtsahlano gives a description of this process;

> *Then berries. Indian woman know how to dry berries, dry lots berries; just like raisins. Dry them first, then press into pancakes, make them up in blocks just like pancakes, about three pounds to block. Stack cakes in high pile in house; when want to cook, break piece off* (Matthews 1955:10).

Plant preparation in Squamish society was exclusively a woman's job. Many Squamish women aspired to be "good berry" pickers. The first harvest of berries was distributed to all in the village since berry picking grounds were not owned and were accessible to all. Other plant foods were roasted in pits, or needed no preparation and were eaten raw (for more detailed accounts of plant uses see Turner 1975 and 1998). Below is a table listing useful plants found at high elevations, although some also occur at lower elevations. Many of the important food plants listed below are ripest in late summer and fall. People gathering terrestrial resources knew that at this time plants and animals were at their best (Barnett 1955; Bouchard and Turner 1976; Drucker 1955: 53-55 ; Duff 1952:73-74; Hill-Tout 1978a:27-56; Kennedy and Bouchard 1983:25-40; Matthews 1955; Suttles 1955:26-27; 1990; Turner 1975,1998). The timing of harvesting for many of these plant foods followed the mass harvesting, processing and storage of marine foods. The harvest of these plant foods also coincided with other high altitude resource procurement pursuits (see above). Below is table 4 listing the uses of plants and a prediction of their archaeological visibility.

Table 4. Plant Species Utilized at High Elevations by the Squamish People.

Plant	Material	Food	Medicine	Other	Archaeological Visibility
yellow cedar (*Chamaecyparis nootkaensis*)	*			*	high; CMT's, charred
silver fir (*Abeis amabilis*)	*		*	*	high; CMT's, charred
grand fir (*Abies grandis*)	*		*		high; CMT's, charred
trembling aspen (*Populus tremuloides*)			*		medium; CMT's, charred
white pine (*Pinus monticola*)	*		*		high; CMT's, charred
sitka spruce (*Picea sitchensis*)	*		*		high; CMT's, charred
mountain alder (*Alnus sinuata*)			*		medium; CMT's, charred
mountain hemlock (*Tsuga mertensiana*)	*		*		high; CMT's, charred
old mans beard (*Alectoria sarmentosa*)			*		low; ?
swamp goose berry (*Ribis lacuture*)		*			medium; charred
Alaska blueberry (*Vaccinium alaskense*)		*			high; Cultural Depressions, charred seed
bog cranberry (*Vaccinium oxycoccus*)		*			medium; charred

Plant	Material	Food	Medicine	Other	Archaeological Visibility
bunchberry (*Cornus canadensis*)		*			medium; charred
devils club (*Oplopanax horridum*)			•		medium; charred
Canada blueberry (*Vaccinum mytillordes*)		*			high; Cultural Depressions, charred seed
bog blueberry (*Vacinnium uliginosum*)		•			medium; charred
stink currant (*Ribes bracteosum*)		*			medium; charred
red huckleberry (*Vaccinum parvifolium*)		*			high; Cultural Depressions, charred seed
black twinberry (*Lonicera chilensis*)			*		medium; charred
thimbleberry (*Rubus parviflorus*)		•			medium; charred
wild gooseberry (*Ribes divaricatum*)		•			medium; charred seed
red elderberry (*Sambucus racemosa*)		•			high; Cultural Depressions, charred seed
salmon berry (*Rubus spectabilis*)		•			medium; charred seed
blue elderberry (*Rubus cerulea*)		•			high; Cultural Depressions, charred seed
mountain bilberry (*Vaccinum membranaceum*)		•			medium; Cultural Depressions, charred seed
oval leafed blueberry (*Vaccinum ovalifolium*)		•			high; Cultural Depressions, charred seed
blueberries (*Vaccinum sp.*)		*			high; Cultural Depressions, charred seeds
Indian hellebore (*Veratum viride*)			•		low; ?
Indian thistle (*Cirsium brevistylum*)				•	medium; charred
Continued on	Next Page				

Plant	**Material**	**Food**	**Medicine**	**Other**	**Archaeological Visibility**
deer fern (*Blechnum spicant*)			*		medium; charred
bracken fern (*Pteridium aqulinum*)		*		*	medium; charred
lady fern (*Athyrium filix femina*)	*				medium; charred
cow parsnip (*Heraclem lanatum*)		*			low; ?
grasses (*Carx sp.*)	*				medium; charred
Indian hemp (*Apocynum cannabinum*)	*				medium; charred or water logged
yarrow (*Achillea millefolium*)			*		low; ?
fireweed (*Epilobium angustifolium*)	*				high; fibers in blankets
puffball (*Lycoperdon sp.*)				*	low; ?
horsetail (*Equsetum arvense*)		*			low; ?
stinging nettle (*Uritca dioica*)		*		*	low; ?
kinnikinnick (*Arctostaphylos uva-ursi*)		*	*	*	medium; charred
Indian plant fungus (*Echinodontium tinctorium*)				*	high; rock art
bluejoint reedgrass (*Calamagrostis canadensis*)	*				medium; charred

3.2 The Similkameen

Major ethnographic works on the Salish Okanagan/ Athapaskan Similkameen groups can be found in Hill-Tout (1978b:131-159), Hudson (1990:53-89); Hunn, Turner and French (1999:525-545); Bouchard and Kennedy (1999:238-252), Spier (1938); Teit (1930), and Turner, Bouchard and Kennedy (1980). The Similkameen peoples live in the valley system of the Similkameen River and it tributaries. There is some debate as to the original inhabitants of this region, with a belief that Athabaskan-speaking peoples previously lived in the area, commonly referred to as "Stuwix" or the Nicola-Similkameen (Baker 1990:10-49; Wyatt 1999:220-222). The question of this population being replaced/displaced or absorbed will not be pursued here.

Four sub-groups of Salishian Okanagan/Similkameen people were recognized by Teit (1930). These are the Keremyeus (Keremeeos), Acnu'lox (Ashnola), Snazai'st or Tcutcuwi'xa (Upper Similkameen) and Zu'tsamen (Tulameen). These groups annually moved widely across the landscape to hunt, fish, and gather plants and roots when they were at their best.

3.2.1 Ethnohistoric Accounts of High Altitude Resource Use

3.3.2 Fauna

Animals listed in Table 5 were hunted by bows and arrows, knives, clubs and spears. The Similkameen were known for the use of a double curved bow, made from juniper wood and mountain sheep horn and for the use of hunting dogs. If many people were available, a game drive could be undertaken using nets and favorable topography. Dead falls were used for hunting bears, and snares for smaller game.

Since there is no salmon available in the Similkameen River system, these people had to rely on hunting terrestrial game. Teit (1930:242-247) records that the Similkameen had four great hunts per year. A spring hunt focused on deer and sheep, took place close to the home village and was short in duration. A late fall hunt focused on deer, mountain sheep, elk and bears. It took place far from home villages and could last as long as two months. A midwinter hunt focused on deer and a late winter hunt focused on sheep. These winter hunts most likely took place near villages and did not last as long as the great late fall hunt. During the winter, mountain sheep ewes were taken and rams let go. Men acted alone in the shorter hunts, but were helped by the women during the late fall great hunt. Women were known to drive and shoot game as much as the men, while on the great fall hunt.

Knowledgeable and skilled hunters directed the collective game driving activities. Success in hunting was seen as the outcome of knowledge and adherence to proper rituals. Hunts would be preceded by a "sweat" in which the hunter would purify himself by spending time in a sweat hut. An example of a great Similkameen hunter is chief Quinisco, also known as "bear hunter." In the 1860s he was described by Susan Allison in the following terms:

> *The tribe living at Chuchu-awa were under Quinisco, as the Bear Hunter, and numbered bearly [sic] two hundred....Quinisco gained his name as hunter from the courageous way he hunted and attacked grizzly bears. He would go out quite alone armed with only his knife and follow them up until they stood at bay. Then, without waiting for them to charge, he would rush on them and plunge his knife into them while they were hugging him. That is how his brother, Shiawha-lak-an described his method.* (Allison 1976:27).

The Ashnola area of the Similkameen region is recognized as important mountain sheep habitat. Teit (1930:243-245) recorded a hunting expedition one winter in which the

Ashnola people invited neighboring Similkameen bands, and others from the Thompson, Nicola and Columbia Rivers and Okanagan Lake to participate. An account of a Similkameen hunt, given by Teit (1930:243-245) is cited below:

> *Sheep were formerly very plentiful in the (Ashnola) district, and the people of the band there decided to have a great sheep hunt one winter, partly so that they might have an abundance of meat for a festival they were going to hold, and partly to show their guests what a fine sheep-hunting ground they had, and give them a chance of some exciting sport. This was in our grandmothers days. The people invited the neighboring Similkameen bands, and they invited their friends from the neighboring tribes so a great many came from Thompson and Nicola Rivers, Okanagan Lake and Columbia River. Among them were some Shuswap. All gathered at Keremeos, and from there they proceeded to the hunting ground. Many women joined the party to aid as drivers, and all were provided with snowshoes. When they neared the place where they were going to drive, the hunting Chief took off his cap, made of the skin of a ewe's head, and, waving it toward the cliffs where the sheep were, prayed to them as follows: "Please, sheep, go your usual way, and follow each other, so that we may eat your flesh and thus increase or lengthen our breath (life). Pity us, and be driven easily to the place where we shall shoot you!" He then sent many men around to sit at the heads of two gulches on top of the mountain and shoot the sheep with arrows as they came up. The men picked were the best shots, and included most of the strangers. He then directed the drivers, a great many men and all the women, mostly Similkameen people, how to proceed and where to go. Most of them, in driving and following the sheep, had to pass a place where they had to jump over a cliff about 3 or 4 meters in height alighting on a bank of snow. All the men jumped, but some of the women were afraid, turned back and went around by a longer route. The drivers saw and started great numbers of sheep, but they failed to get them to take the top of the mountain. Instead the sheep congregated on a steep, inaccessible cliff below the top, out of range from above or below, and stayed there. The people shouted at them lustily, but they remained there, knowing that it was a secure place. The great drive came to a standstill, and the hunting Chief could see no way to get the sheep out.*
>
> *Among the drivers was an Upper Thompson woman, the grandmother of the narrator of the story, who was married to a Similkameen man. She lived in Similkameen and was known to be resourceful and to have shamanistic powers. The mountain sheep was one of her guardian spirits, and on this occasion she was wearing a cap made of the head skin of an old ewe with horns attached, similar to that worn by the hunting Chief. The leading Similkameen people held a consultation. They said, "All our friends will laugh at us if we can not get sheep for them." The Thompson woman said, "Yes, they certainly will." The Chief then said to her, "Well, you may know something. I will give the leadership of this hunt to you; you shall be hunting Chief." She answered, "Very well, but one thing you*

must promise." Then, pointing to the dog close to her side (a rather small and vicious-looking animal, that all the people hated), she said, "You must promise never again to abuse my dog. I will drive the sheep alone with my dog, and you may sit down and watch me." She approached the sheep, pointing first at them, then at the four points of the compass, but no one could hear what she said. Presently she gave a sharp call, and the sheep ran into a bunch, which she now pointed out to the dog. She said to it, "Friend, go and drive your friends so that they will all go up where the people want them." The dog rushed off and drove the sheep fiercely. When any of them scattered, he rounded them up again. He was very intelligent, courageous, fleet of foot and long-winded. The woman followed as fast as she could, encouraging him. The dog drove all the sheep up and the men in waiting killed a great number.

The importance of hunting is reflected in several pictographs in the Okanagan/Similkameen area. For example, one shows deer being driven into a surround, or corral, and another portrays a hunting scene with a variety of animals (Corner 1968:59-69).

Fur trapping was another important mountain pursuit. Susan Allison (1976:33) described a Similkameen Okanagan trapper who arrived at her place in March 1870:

About the middle of the month Cosotasket came from the mountains with a quantity of furs-my husband said he had at least five hundred dollars worth. Some he traded with him, the rest he hung in a tree till he felt like going to the Hudson's Bay Company post at Keremeos. Cosotasket said that that year he only had a few martens as his favorite trapping ground at the Skagit was spoiled by the fire...Cosotasket at that time lived mostly in the mountains and was known among the tribesmen as the Mountain Chief).

Below, Table 5 lists the animal species used by the Similkameen peoples, along with an expected measure of their visibility in the archaeological record.

Table 5. Fauna Species Utilized at High Altitude by the Similkameen.

Animal Species	Uses	Archaeological Visibility and Manifestation
Mountain Sheep (*Ovis dalli sp.*)	food, bone raw material, horns, fur/skins	High; Bones in high altitude sites, bones and horns in low land sites
Mountain Goat (*Oreamnos americanus*)	food, bone raw material, horns, fur/skins	Medium; Bones in high altitude sites, bones and horns in low land sites

Deer (*Odocoileus sp.)*	food, bone raw material, fur/skins	High; Bones in high altitude sites, bones and horns in low land sites
Elk (*Cervus elaphus*)	food, bone raw material, fur/skins	Medium; Bones in high altitude sites, bones and horns in low land sites
Black Bear (*Ursus americanus*)	food, fur/skins, claws	Medium; Bones in high altitude sites, bones and teeth/claws in low land sites
Grizzly Bear (*Ursus actos horribilis*)	food, fur/skins, claws	Medium; Bones in high altitude sites, bones and teeth/claws in low land sites
Rabbits (*Lepus sp.*)	food, fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Marmot (*Marmota monax, Marmota caligata*)	food, fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Beaver (*Castor canadensis*)	food, fur/skin	Medium; Bones in high altitude sites, bones and teeth in low land sites
Squirrel (*Tamiascirus douglas mollipilosus*)	food/fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Cougar (*Felix concolor oregonenis*)/Lynx (*Lynx canadensis candaensis*)	fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Wolf (*Canis lupus fuscus*), Coyote *(Canis lantrans lestes)*	fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Otter (*Lutra canadensis pacifica*), Marten (*Martes americana caurina*), Fisher (*Mustela sp.*), Weasel (*Mustela frenata altifrontalis*)	fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Wolverine (*Gulo gulo*)	fur/skin	Medium; Bones in high altitude sites, bones in low land sites
Canadian Goose (*Branta canadensis)*	food, feathers	Medium; Bones in high altitude sites, bones in low land sites
Grouse/Ptarmigan (*Dendragapus obscurus, Lagopus lagopus*)	food, feathers	Medium; Bones in high altitude sites, bones in low land sites
Ducks (*Anas sp.*)	food, feathers	Medium; Bones in high altitude sites, bones in low land sites

3.3.3 Flora

Plant use for the Similkameen/Okanagan has been documented by Bouchard and Kennedy (1999:238- 252), Hill-Tout (1978b:131-159), Hudson (1990:53-89), Hunn, Turner and French (1999:525-545), Reimer et al. (1999:1-71), Spier (1938), Turner (1992,1997,1998), and Turner, Bouchard and Kennedy (1980). Floral resources were very important to Similkameen peoples and many of those plants were located in high elevation areas (subalpine and alpine) and collected from late spring to fall. Major food types, such as avalanche lily, glacier lily and tiger lily, thrive in mountainous areas, provide a much needed source of carbohydrates and serve as both storable and tradable commodities. Cooking of these and other plant foods in pits also made them more palatable, digestible and storable (Bouchard and Kennedy 1999:238-252; Lowen 1998:129-166; Hunn, Turner and French 1999:525-545; Turner, Bouchard and Kennedy 1980).

Berries were another important plant food. They were gathered by woman who went year after year to the same large patches found in the same places in the mountains (Spier 1938:25-30; Teit 1930:237-242). After harvesting, the berries would be dried on large racks placed over a trench like pit, with a slow burning fire (see Mack 1989: 49-58; Mack and McClure 1998:1-7 ; Frank 2000:21-40). Plant use often is not readily visible in the archaeological record, although roasting pits should be detectable. Below, Table 6 lists plant uses and their predicted archaeological visibility. It must be noted that many of those plants do occur at lower elevations as well, but since they are present at high elevation habitats they were included in this study.

Table 6. Flora Species Utilized at High Elevations by the Similkameen People.

Plant Species	Material	Food	Medicine	Other	Archaeological Visibility and Manifestation
Black Cottonwood (*Populus balsaminifera*)	•	•	•		medium; CMT's charcoal
Trembling Aspen (*Populus tremuloides*)	•				medium; CMT's charcoal
Alpine Larch (*Larix occidentalis*)			•		medium; charcoal
Lodgepole Pine (*Pinus contorta*)	•	•	•		high; CMT's charcoal
Whitebark Pine (*Pinus albicaulis*)		•			high; CMT's
Western White Pine (*Pinus monticola*)	•	•			medium; CMT's charcoal
Sub Alpine Fir (*Abies lasiocarpa*)			•		low; CMT's charcoal
Pacific Silver Fir (*Abies grandis*)	•				low; charcoal
Englemann Spruce (*Picea englemannii*)			•		low; CMT's
Douglas Fir (*Pseudotsuga menziesii*)	•	•		•	high; CMT's charcoal
Black Gooseberry (*Ribes sp.*)		•	•		medium; charred seeds
Sticky Current (*Ribes viscosissium*)			•		low; charred seeds
Western Mountain Ash (*Sorbus scoulina*)		•	•		low; charcoal
Sitka Mountain Ash (*Sorbus sitchensis*)		•	•		low; charcoal
Saskatoon (*Amelanchier alnifolia*)		•			high; charred seeds
Birch Leaved Spirea (*Spiraea betulifolia*)			•		low; ?
Dwarf Nagoonberry (*Rubus articus*)		•			medium; charred seed
Trailing Raspberrry (*Rubus pubescens*)		•			low; charred seeds
Red Raspberry (*Rubus idaeus*)		•	•		medium; charred seeds
Thimbleberry (*Rubus parviflorus*)		•			low; charred seeds
Snowbrush (*Ceanothus velutinus*)			•	•	low;
Shrubby Penstemon (*Penstemon fruticous*)	•		•		low; ?
Soapberry (*Sheperdia canadensis*)		•	•		high; charred seeds
Douglas Maple (*Acer glabrum*)	•				high; charcoal
Continued on next page					

Plant Species	Material	Food	Medicine	Other	Archaeological Visibility and Manifestation
Devils Club (*Oplopanax horridum*)			*		low; ?
Sitka Willow (*Salix sitchensis*)			*		low; charcoal
Sitka Alder (*Alnus crispa spp.*)	*				low; charcoal
Red Elderberry (*Sambucus racemosa*)		*	*		low; charred seeds
Black Twinberry (*Longicera involucrata*)			*		low; ?
Kinnikinnick (*Arctostaphylos uva-arsi*)		*	*	*	high; charred seed, charcoal
Labrador Tea (*Ledum groenlandicum*)		*	*		low; ?
Vaccinium berries (8) (*Vaccinium spp.*)		*			high; charred seeds
Crowberry (*Empetrum nigrum*)		*			medium; charred seeds
Princes Pine (*Chimaphila umbellata*)		*	*		low; charcoal
Common Juniper (*Juniperus communis*)		*	*		low; charcoal
Orange Agoseris (*Agoseris sp.*)			*		low; ?
Short Beaked Agoseris (*Agoseris sp.*)			*		low; ?
Yarrow (*Achillea millefolium*)			*		low; ?
Subalpine Daisy (*Erigeron peregrinus ssp. callianthemus*)	*				low; ?
Leafy Aster (*Aster foliaceus*)			*		low; ?
Heart Leaved Arnica (*Arnica sp.*)				*	low; ?
Mountain Arnica (*Arnica sp.*)				*	low; ?
Spikelike Goldenrod (*Solidago spathulata*)			*		low; ?
Rosy Pusseytoes (*Antennaria rosea*)			*	*	low; ?
Pearly Everlasting (*Anaphalis margaritacea*)			*		low; ?
Common Red Paintbrush (*Castilleja miniata*)				*	medium; rock art
Sickletop Lousewort (*Pedicularis racemosa*)		*			low; ?
Common *Harebell (Campanula rotundifolia*)			*	*	low; ?
Scarlet Gilia (*Ipomoopsis aggregata*)			*		low; ?
Sitka Vaerian (*Valeriana sitchensis*)			*		low; ?
Sweat Scented Bedstraw (*Galium trifolium*)				*	low; ?
Continued on next page					

Plant Species	Material	Food	Medicine	Other	Archaeological Visibility and Manifestation
Tall Larkspur (*Delphinium glaucum*)				*	low; ?
Red Columbine (*Aquilegia formosa*)				*	low; ?
Cut Leaf Anemone (*Anemone multifida*)			*		low; ?
Western Pasqueflower (*Anemone occidentalis*)			*		low; ?
Goat's Beard (*Aruncus dioicus*)			*		low; ?
Wild Strawberry (*Fragaria virginiana*)		*	*		medium; charred seeds
Yellow Mountain Avens (*Dryas drummondii*)			•		low; ?
Old Man's Wiskers (*Geum trifolium*)			*		low; ?
Large Leaf Avens (*Geum macrophyllum*)			*		low; ?
Holboell's Rockress (*Arabis holboellii*)			*		low; ?
Alpine Willowherb (*Eploobium anagallidifolium*)				•	low; ?
Fireweed (*Epilobium angustifolium*)	•	*	•	*	high; charred, fibers in blankets
Cow Parsnip (*Heracleum lanatum*)		*			low; ?
Western Spring Beauty (*Claytonia lanceolata*)		*			high; Cultural Depressions, charred bulbs
Roseroot (*Sedum integrifolium*)			*		low; ?
Lance-Leaved Stonecrop (*Sedum lanceolatum*)			*		low; ?
Mountain Ladyslipper (*Calypso bulbosa*)			*		low; ?
White Bog Orchid (*Habeenaria dilatata*)				•	low; ?
Rattlesnake Plantain (*Goodyera oblongifolia*)			*		low; ?
Nooding Onion (*Allium cemum*)	*		*		high; Cultural Depressions, charred bulbs
Chocolate Lily (*Fritillaria lancelata*)			*		medium; Cultural Depressions, charred bulbs
Tiger Lily (*Lilium columbianum*)	•		•		high; Cultural Depressions, charred bulbs
Continued on next page					

Plant Species	**Material**	**Food**	**Medicine**	**Other**	**Archaeological Visibility and Manifestation**
Star Flower False Soloman's Seal (*Smilacina racemosa*)			*		low; ?
False Soloman's Seal (*Smilacina sp.*)			*		low; ?
Clasping Twisted Stalk (*Streptopus amplexifolius*)			•		low; ?
Rosy Twisted Stalk (*Sreptopus roseus*)			*		low; ?
Queens Cup (*Clintonia uniflora*)			•		low; ?
Yellow Glacier Lily (*Eryhronium grandiflorum*)	•		•		high; Cultural Depressions, charred bulbs
Indian Hellebore (*Veratum viride*)			•		low; ?
Bear Grass (*Xerophyllum tenax*)	*				low; ?
Meadow Death Camas (*Zigadenus venenosus*)				*	medium; charred bulbs
Ross's Sedge (*Carex rossii*)				*	low; ?
Grasses (*Cares sp.)*	*				low; ?
Oak Fern (*Gymnocarpium dryopteris*)	•		•		medium; charred
Lady Fern (*Athyrium filix femina*)		*	•		medium; charred
Spiny Wood Fern (*Dryopteris expansa*)		*			low; charred
Oergon Woodsia (*Woodseia oregonia*)	•			*	low; ?
Parsely Fern (*Cryptogramma crispa*)			*		low;charred
Maiden Hair Fern (*Adiantum pedatum*)				•	low; charred
Common Horsetail (*Equesetum arvense*)				*	low; ?
Step Moss (*Hylocomium splendens*)			•		low; ?

Chapter 4: Modern and Paleo-environments

There is an ancient world above us. Above the tree line lies a rarefied, bitterly cold realm, scoured by winds and dominated by winter. Amazingly, this is a world of life
-John Winnie Jr.

4.1 Modern Environmental Conditions for the Squamish/Garibaldi Area

The main water drainage in the study area is the Squamish River, with the Cheakamus, Mamquam, Elaho and Ashlu being its major tributaries. Physiographically the area is highly mountainous, (Figure 3), with summits reaching 2000-3000 meters. Glacial ice still covers 10-40% of the mountain ranges (Ryder 1998:1-39). Notable peaks include Mount Garibaldi, the Black Tusk, Mount Fee, Mount Cayley, the Tricuni Peaks and Tantalus Range. On these mountains the topography can range from steep and rugged, to gentle sloping meadow tablelands, creating habitats suitable for a diversity of plants and animals. In rocky areas little in the way of plant or animal life exists, yet on the alpine meadows several species of plants and animals reside. Plants that grow at high elevations often ripen later than their low land equivalents. Animals and people are aware of this seasonal "up slope ripening" and hence follow the fresh food up slope in the late summer to early fall seasons. (Arno and Hammerly 1984; Pojar and McKinninon 1994).

In total, the modern environment of the Squamish region includes three biogeoclimatic zones (Meidinger and Pojar 1991:52). First the Coastal Western Hemlock zone lies at low elevations near the ocean and along river valleys, and is dominated by western hemlock (*Tsuga heterophylla*), amabilis fir (*Abies ambillis*), and yellow cedar (*Chameaecypraris nootkatensis*) (Meidinger and Pojar 1991:95-112; Pojar and McKinnon 1994:15-20). Abundant rainfall and mild temperatures create an ideal place for such trees (Arno and Hammerly 1984:103-104). In slightly drier areas in this zone, Douglas fir (*Pseudotsuga menziesii spp. menziesii*) are more common while in wetter areas cedar is more dominant (Arno and Hammerly 1984:103-104; Woodward et al. 1995:217-225).

Figure 3. Coast Mountain Vegetation.

The Mountain Hemlock zone lies above the Coastal Western Hemlock, up to elevations of approximately 1200 meters (Meidinger and Pojar 1991:113-124; Pojar and McKinnon 1994:15-20). Its growing season is short due to the heavy snow packs common along the Coast Mountains (Arno and Hammerly 1984; Ryder 1998: 1-38). At higher elevations the Mountain Hemlock zone becomes patchy and eventually becomes subalpine parkland (Figure 1). Trees such as subalpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*) found at high elevations are separated by inter-fingering heath and meadow alpine plant communities. Subalpine fir trees prefer northerly aspects while mountain hemlock prefers more southerly aspects (Arno and Hammerly 1984:95-97; Woodward et al. 1995:217-225).

The Alpine Tundra Zone is above the Mountain Hemlock Zone (Meidinger and Pojar 1991:263-274; Bennet 1976; Douglas 1972:147-166). Essentially treeless, it has a very short growing season and all plant growth is stunted in size (Lettmerding 1976). Alpine plant communities can be divided into three main types, Subalpine Parkland, Heath, and Mountain Meadow (Arno and Hammerly 1984:102-107; Douglas 1972:147-166; Pojar and McKinnon 1994:15-20).

The Subalpine Parkland is made up of a mosaic of cedar, hemlock, subalpine fir and other less numerous tree species. Heaths are dominated by dwarfed, shrubby, evergreen members of the heather family (Arno and Hammerly 1984:102-107; Douglas 1972:147-166; Pojar and McKinnon 1994:15-20). Common plants growing in this zone include; black crowberry (*Empertium nigrium*), partridge foot (*Luetka pectinata*), and birds' beak lousewort (*Pedicularis orinthorhyncha*). This plant community forms a thick, spongy mat under foot mat that obscures the true ground surface (even holes and rocks). The Coastal Mountain Meadows are less extensive than the Heaths. They are dominated by numerous flowering herbs, such as arrow-leafed groundsel (*Seneciro triangualris*), subalpine daisy (*Erigeron peregrinus*), sitka *valerian (Valeriana sitchensis*), arctic lupine (*Lupinus arcticus*), Indian hellbore (*Veratrum viride*), genitains (*Gentinana spp.*), sedges (*Carex spp.*), and numerous grasses such as purple mountain hairgrass (*Vahlodea atropurpurea*). These plants offer a spectacular floral display in the late summer.

Alpine and subalpine plant communities are controlled by several environmental variables, including topography, parent rock material, temperature, snow pack and elevation. Greatly hindering soil development and the decomposition of organic materials is the freezing and thawing of sediments and soils. More mature soil horizons will form in areas where there is a combination of level ground, and suitable parent material (i.e. volcanic ash) and in protected subalpine areas that receive less annual snow fall. (Meidinger and Pojar 1991:263-274; Ryder 1998:1-38; Valentine 1976; Van Ryswyk and Okazaki 1979).

True alpine rock land is steep sided and includes features such as rock outcrops, cliffs, boulder fields, fell fields, talus and scree slopes, wet runnels and gullies and avalanche cones (Arno and Hammerly 1994:102-107; Pojar and McKinnon 1994:15-20).

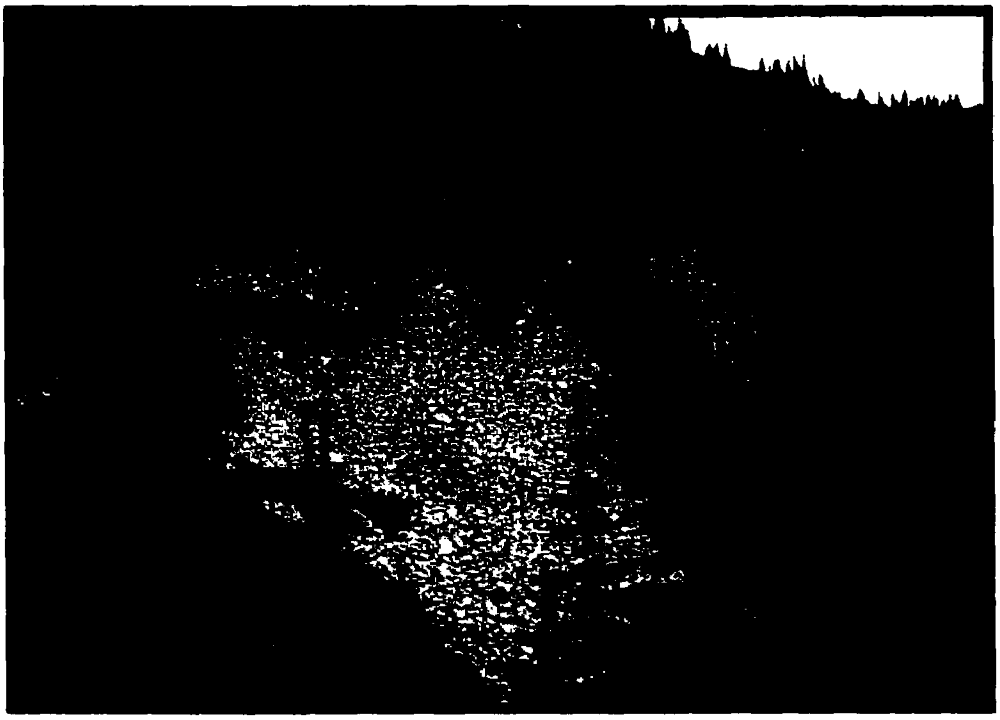

Figure 4. Avalanche Cone.

Soil and plant cover is very sparse and discontinuous with only saxifrages (*Saxifraga spp*), ferns, buttercups (*Ranunculus spp.*), grasses, sedges (*Carex spp.*), lichens and bryophytes growing over a very short season (Pojar and McKinnon 1994:15-20;

Douglas 1972:147-166; Bennet 1976; Lettmerding 1976; Valentine 1976; Van Ryswyk and Okazaki 1979). Although appearing barren and sparse these areas offer areas for some of the rarest plant and animal species to live (Figures 3-5).

Figure 5. True Alpine in Garibaldi Park.

Notable mammal species that seasonally inhabit alpine areas are black bears (*Ursus americanus*), grizzly bears (*Ursus artos horriblus*), mountain goats (*Oremanus americanus*), elk (*Cervus canadiaesis leucodontus*), deer (*Odocoilus hemionus hemionus*), snowshoe hare (*Lepus americanus pallidus*), and yellow-bellied marmots (*Marmmota flaviventis avara*) (Chadwick 1983; Lee and Fundenberg 1982 a and b ; Reichel 1986:111-119). While no single plant community is preferred by all those mammals (Chadwick 1983; Lee and Fundenberg 1982a and b; Winnie 1996), many smaller animal species prefer the subalpine parkland and mountain meadows over heath communities (Reichel 1986:111-119; Winnie 1996).

Bird species which seasonally inhabit the alpine region include Canada goose (*Branta canadiaensis*), grouse (*Dendragrapus abscurus*) and ptarmigan (*Lagopus lecurus*) (Meidinger and Pojar 1991:272; Winnie 1996).

4.2 Geology

Subalpine and alpine regions in the Squamish-Whistler British Columbia have been affected by a complex volcanic history. Knowledge of this history yields important information about the potential presence of suitable lithic raw materials in the study area.

The age of lava flows in the Garibaldi volcanic belt has been studied by Green (1991:171-174), Green et al. (1988:563-579) and Brooks and Friele (1992:2425-2428). More detailed chronological work is being planned by Cathy Hickson of the Geological Survey of Canada (Cathy Hickson personnel communication 1999). The oldest lava flow in the Garibaldi volcanic belt is 2.2 million K/Ar years old, while the most recent is 10,000 14C years old (Green et al. 1988: 565). In this time range there have been four periods of significant eruptive activity and inactivity. Intervals of active volcanic eruption occurred 2.3 to 1.7 millions years ago, 1.4 to 1.0 million years ago, 700,000 years ago, and 12,000-10,000 years ago. Two of those time periods of activity may have coincided with glacial advances and retreats at 1.4-1.0 million and 12,000-10,000 BP intervals (Green et al. 1988: 563).

An eruption which occurred at the northern sections of Mt. Garibaldi was influential in the formation of Garibaldi Lake around 1.3 million years ago (Green 1988:567-571). The terminal sections of this flow came into contact with glacial ice and melt water, quickly cooling, and forming a solid rock dam across a small creek draining the adjacent valley, creating Garibaldi Lake. Water does drain through an underground channel beneath the lava barrier (Figure 7), in the form of Rubble Creek (Mathews 1975:14-16).

The history of Mount Garibaldi is unique. Classified as a strato-volcano, it was built on top of both solid rock and Wisconsinan glacial ice. Early eruptions around 260,000 years ago formed a solid dacite core which later eruptions built upon. A long period of dormancy commenced after 260,000 years BP. It was not until 12,000-10,000 years ago that the volcano again became active (Mathews 1951,1952, 1975). During the later eruptions large amounts of ash and cinder formed tall cones on top of the dacite core. Almost the entire western half of the volcano cone was deposited on the surface of the nearby Cordilleran glacial ice sheet (Figure 6). Deglaciation ca 10,200 C14 BP (Friele and Clague nd.) caused the western flank of the volcano to collapse (Mathews 1952). That is why Garibaldi does not appear today as a typical volcanic cone.

Figure 6. Mt. Garibaldi as seen from southeast on top of Paul Ridge.

Lava from later eruptions flowed down the steep and freshly de-glaciated valleys. The most notable is the Ring Creek lava flow (Brooks and Friele 1992:2425-2428). Following the valley downward this lava flow created channels on its flanks that are now Mashiter and Ring Creeks. Tree and plant debris found at the head of the flow have produced radiocarbon age estimates of 10,650±160 BP (Beta 43865) and 9360±160 B.P (Beta 38914) (Brooks and Friele 1992:2425-2428).

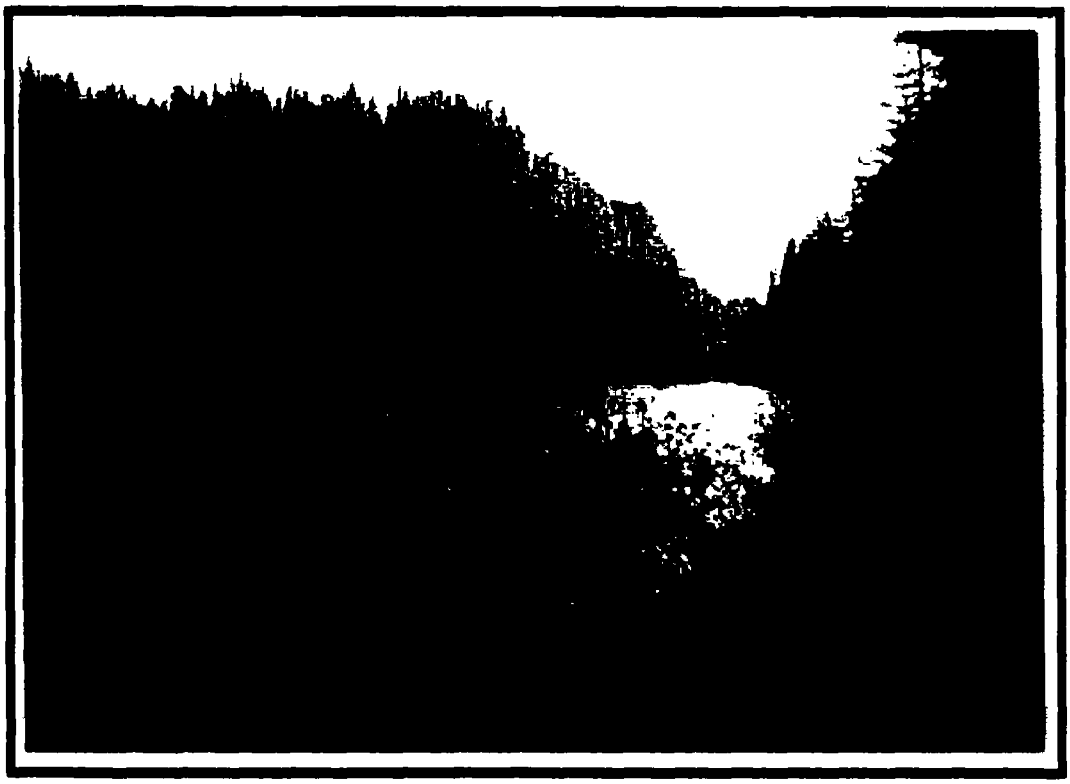

Figure 7. Barrier Lake, Garibaldi Park.

Most rock types resulting from these flows are basalt, basaltic andesite, andesite, dacite, rhyodacite and glassy rhyodacite. The dacite, rhyodacite and glassy rhyodacite materials would be useful as lithic raw materials (Green et al. 1988:563-579; Green 1991:171-175; Mathews 1952).

4.3 Glacial History

A synthesis of the history of deglaciation of the Upper Howe Sound and the Mamquam/Squamish River valley has been outlined by Friele and Clague (n.d.). On the basis of several radiocarbon dates from wood debris found in glacio-lacustrine profiles, the upper Mamquam River valley was free of ice as early as 11,900 BP. By 11,550 BP a re-advance of glacial ice went as far south as Porteau Cove in Howe Sound, but 10,700 BP the ice began its final retreat north. It is believed that the re-advance and later retreat were a response to climatic factors and not due to changes in glacial mass balance, or floating and advances of ice margins in response to rising lake levels. By 10,200 BP the Mamquam and Squamish River valleys were finally free of glacial ice. At this time the mouth of the Squamish River was as far north as the Ashlu River and the Cheekye River flowed westward, forming the Cheekye fan deposits (Freile and Clague n.d.; Freile and Hickon n.d.). The headwater valley areas were not ice free until after 10,000 BP. Due to the more extensive alpine areas in the Squamish River drainage, glacial ice lingered there longer than other areas in the lower mainland. More recent neoglacial episodes also occurred in the region, to be summarized later.

4.4 Sea Level Fluctuations

Late glacial marine limits were also affected by ice present in the Squamish River drainage. The 200m a.s.l. limit proposed for the Fraser Lowland is high for the head of Howe Sound and the Squamish River Valley (Friele and Clague nd.; Friele and Hickon nd.). Glacial ice persisted while isostatic rebound was complete. Sea levels were 45 meter a.s.l. by 10,200 BP, fell to 30 meters a.s.l. by 9800 BP and soon after 9800 BP were below present sea level datum. In contrast, Fraser Lowland sea levels fell below present datum between 11,000 and 10,500 BP. Hence, isostatic rebound in the Squamish River drainage and Howe Sound area was delayed by as much as 700 years (Friele and Clague n.d.; Friele and Hickon n.d.).

4.5 Tree Line Fluctuations

Later Holocene environmental changes also may have had an impact on the settlement systems of pre-contact populations in the study area. Fluctuations of the timberline can be described much like sea levels. If one views the subalpine and alpine zone as an island, then the implications of fluctuations of timberlines elevations may be great. The distribution of resources in separate biogeoclimatic zones of the region is discussed in the modern environment and ecosystems section.

Palynological evidence for early Holocene warming and later cooling periods are evident throughout Northwest North America. Case studies from British Columbia and Alberta are included in this review, but see (Beaudoin 1986:145-152; Clague and Mathews 1989:277-280; Clague et al. 1992:153-167; Evans 1997:81-92; Hebda 1995:55-79;) for more detailed data and summaries. For simplicity, the time period of warming spans 10,000 to 6,000 years BP and will be referred to as the "early Holocene warm interval." The direct applicability of these studies to the study area is useful in determining a general pattern of paleo-environmental fluctuation. No detailed synthesis of the regional Holocene environment yet exists, hence separate local studies will be reviewed(Figure8).

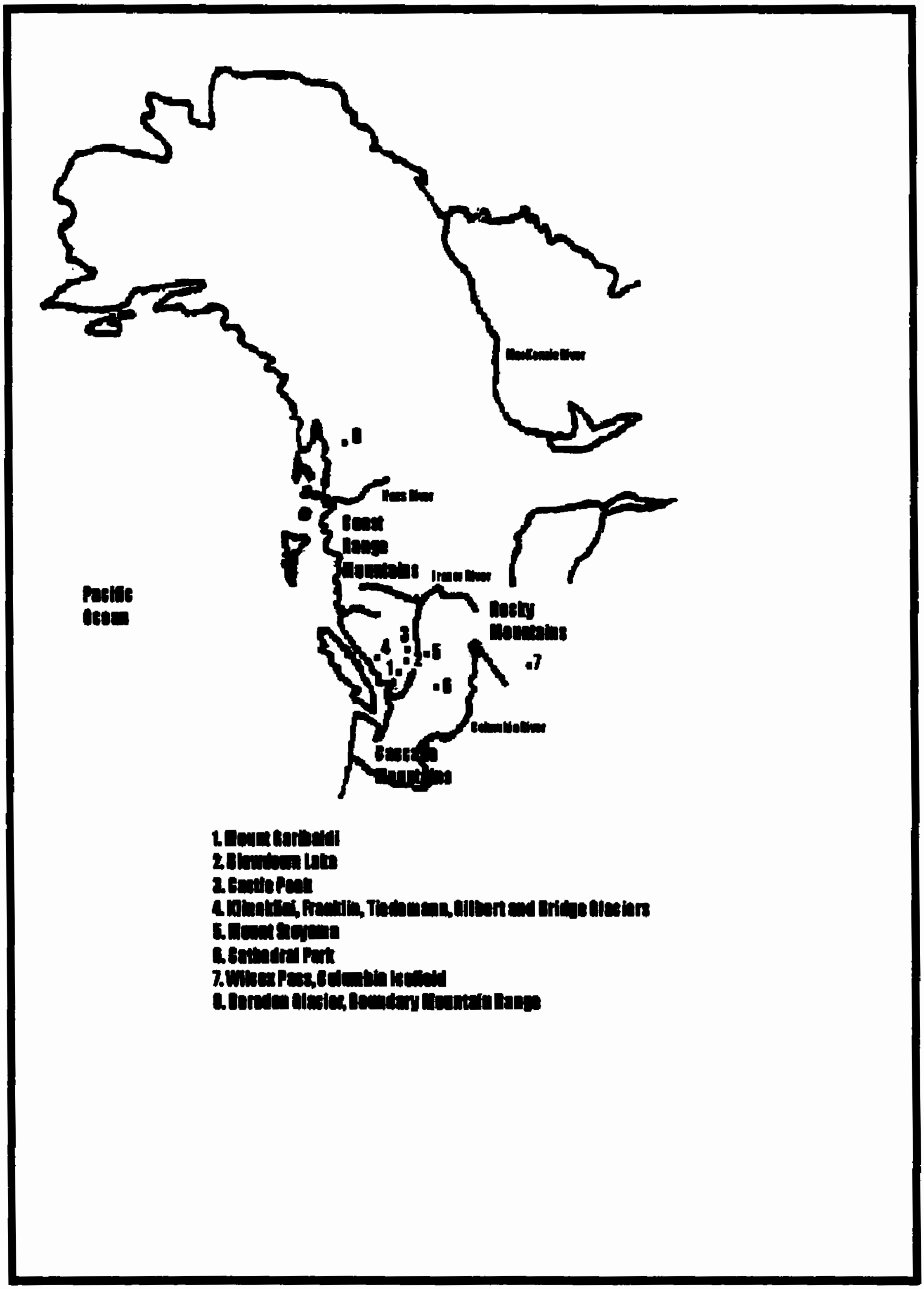

Figure 8. Location of Paleoenvironmental Studies.

4.5.1 South Coast

Castle Peak in the south Coast Mountains (Figure 8) was a study location for Clague and Mathews (1989:277-280) and Clague et al. (1992:153-167). Research involved sampling wood from fallen trees found 60-130 meters above modern tree line for radiocarbon dating, which indicated an early Holocene age (ca. 9,100-8,200 BP). These results fit with other studies in the Pacific Northwest (see Pielou 1991) in indicating that a warm period occurred in the early Holocene (Clague et al. 1992:157) and, persisted to approximately 6,000 year BP (Clague and Mathews 1989:279-280).

Similar results have been obtained in pollen cores obtained from Blowdown Lake (Figure 8) in the alpine zone near Mount Currie British Columbia (Evans 1997:82-83). Radiocarbon dates from the sampled core were 4140±100 BP (Beta 57762), 4000±90 BP (TO-3877) and 1460±50 BP (TO 3876). Basal deposits indicate the presence of cooler and wetter conditions around 6,600 BP. Ratios of *Picea* to *Pinus* pollen indicate tree lines may have remained as much as 60 meters higher than present until 3,400 BP. Low pollen counts are interpreted by Evans to be the result of a lower than present tree line from 3,400 to 2,400 years BP marking the occurrence of the Neoglacial period in the coast mountains (Ryder and Thompson 1986:273-287). It was not until ca. 2,400 BP that tree lines reached near present levels, although they fell again 300-200 years BP, marking the Little Ice Age (Evans 1997: 90-91).

4.5.2 Rocky Mountains

At Wilcox Pass, in the southern Rocky Mountains of Alberta (Figure 8) a series of samples were studied for differences in *Picea* to *Pinus* ratios (Beaudoin 1986:145-152), which can be used to infer periods of warmer or cooler than present conditions. A lower

Picea to *Pinus* ratio indicates warmer conditions, while a higher *Picea* to *Pinus* ratio indicates cooler than present conditions (Beaudoin 1986:148-149). A low *Picea* to *Pinus* ratio is indicated in the section of core dated to 9600±305 BP (GX-8785). This ratio holds to approximately 6000 BP. Post 6,000 BP an increasingly high *Picea* to *Pinus* ratio is indicated and a cool period is evident from 4,500-4,000 BP. Although not complete, the results from Wilcox Pass support other regional warming and cooling trends in the southern Rocky Mountains (Beaudoin 1986:150-151).

4.6 Neoglaciation

Porter and Denton (1967:177-210) outlined the first synthesis of Neoglaciation in Northwest North America. A number of radiocarbon dates from sampled logs found eroding from underneath present day glaciers across western North America mark the ages of Neoglacial advances. Lateral and terminal moraine deposits also mark the presence of three neoglacial advances, believed to be roughly synchronous and common across the entire Pacific Northwest.

Figure 9. Overlord Glacier and the extent of glaciation, Garibaldi Park.

The affect of these glacial advances should not be underestimated (Figure 9). The above picture illustrates the extent of a recent Little Ice Age advance (trim lines mark the mountain side) in the Fitzimmons Creek valley east of Whistler, B.C. Additionally, one has to remember the huge snow packs that formed from the long harsh winter of 1998-1999. Figures 10 and11 were taken during the month of August, are one year apart and illustrate the extreme differences of a regular snow fall year (1998) and a high snow pack year (1999). During Neoglacial times high elevations not only experienced advancing glacial ice but a persistent snow pack over summer months for many years. These conditions made subalpine and alpine environments a harsh place for life.

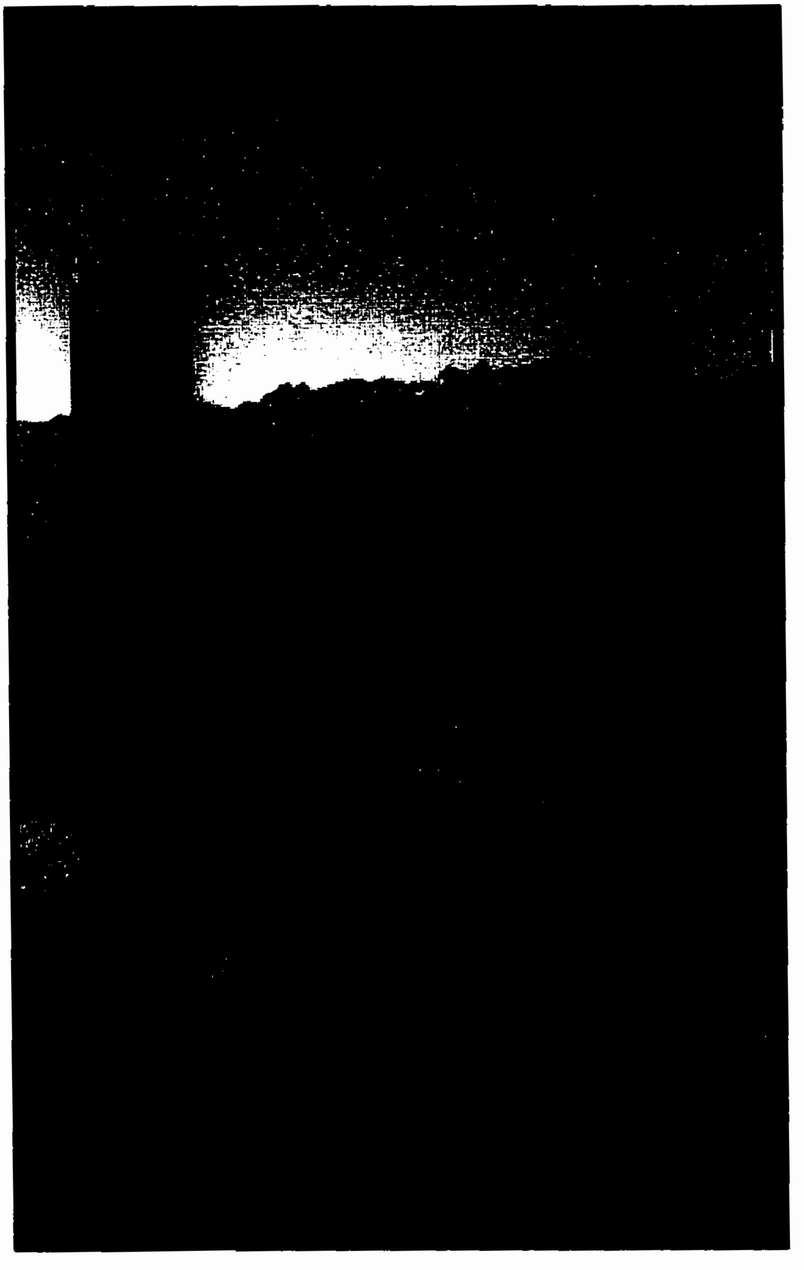

Figure 10. Trail to Elfin Lakes, Garibaldi Provincial Park, summer 1998.

Figure 11. The same trial to Elfin Lakes, Garibaldi Provincial Park, summer 1999.

4.6.1 South Coast

An initial synthesis of Neoglacial conditions along the south coast was attempted by Porter and Denton (1967). Collecting 14C dates from the small number of alpine contexts then known, they could not readily define the length and extent of glacial advances and retreats, but their work did focus the future direction of research. They also radiocarbon dated Neoglacial advances on the slopes of Mount Garibaldi (Figure 8) at 5260±200 BP (Y-140 bis) and 4700±300 BP (W-1030).

Radiocarbon dates from an older moraine which lies beyond a younger Little Ice Age moraine deposit on Mt. Rainer are 3500±250 (W-1115) and 2040±200 BP (W-1393). Temporally sensitive volcanic ash deposits found on the Little Ice Age moraine deposit are believed to be 500-400 years old (Porter and Danton 1967: 185). An overridden stump near Sphinx glacier in the Mount Garibaldi area gave a radiocarbon date of 460±40 BP (Y-347) (Porter and Danton 1967:186).

Other research in the south Coast Mountain Range indicates a series of three Neoglacial advances (Mathews 1951:357-380; Ryder and Thomson 1986: 273-287; Ryder 1989:74-76). The Garibaldi phase of Neoglaciation occurred from 6,000-5,000 BP based on a set of radiocarbon dates from Bridge glacier, Mount Garibaldi, Sentinel glacier, Mount Brankenridge and Ruddock creek in the Monashee mountains (Figure 8). The Tiedemann advance happened from 3,300-1,900 BP based on radiocarbon dates from Tiedemann glacier, Gilbert glacier, Tide Lake, and Downie Creek in the Monashee mountains (Ryder and Thomson 1986:276-277:284-286). Little Ice Age advances dating 900 BP and later were also marked at Klinaklini glacier, Franklin glacier, Tiedemann glacier, Bridge glacier, Sphinx glacier, and Big Eddy creek in the Monashee mountains (Mathews 1951:357-380; Ryder and Thomson 1986:276-277:284-286). On the bases of these studies a sequence of Neoglacial advances was formulated for the region. Climaxing at 4700, 2800 and 300 years BP (Mathews 1951; Porter and Danton 1967:177; Ryder and Thompson 1986; Ryder 1989:74-76).

4.6.2 North Coast

Clague and Mathews (1996:10-24) summarize Neoglacial expansions on the British Columbia north coast (Figure 8). Geomorphic, stratigraphic, paleoecological and geo-chronological data from along the edges of Frank Mackie, Berendon and Salmon glaciers in the north Coast Range indicate a series of Neoglacial advances. Three radiocarbon dates indicate the occurrence of an early Holocene advance dated at 7060±90 BP (GSC-5524), 6690±90 BP (GSC-5753), 6600±90 BP (GSC-5406). It was followed by a later Neoglacial advance dated 2870±80 BP (TO-3539), and 2220±80 BP (TO-3528). Radiocarbon dates indicate an increase in melt water during the late Holocene and a possible minor Neoglacial advance 1600 years ago (Clague and Mathews 1996:15, 22). Little Ice Age events are believed to have occurred earlier in the northern Northwest Coast than other regions. Radiocarbon dates on this include 1090±60 BP (TO-3638), 1070±90 BP (TO-3527), 900±50 BP (GSC-5730), 470±90 BP (GSC-5726), 210±80 BP (TO-4155), 720±50 BP (TO-4091), 600±70 BP (TO-4152), 520±60 BP (TO-4092), 400±50 BP (TO-4090).

4.6.3 Rockies

Reconstruction of Neoglacial events in the Canadian Rockies (Figure 8) has been done by Luckman (1986:17-28, 1993:144-153). The Peyto Advance is delineated by numerous radiocarbon dates (numbers in brackets) on log detritus eroding from the edges of the Peyto (14), Saskatchewan (3), Robson (3), and Yoho (1) glaciers. There also are 12 in- situ stumps which were overridden by advancing glacial ice. The presence of dead trees above modern tree lines supports the occurrence of higher early Holocene tree lines, followed by a Neoglacial advance. Radiocarbon dates from the wood samples are 3100-2500 years BP. In fact a total of 50 radiocarbon dates define the Peyto advance 3100-2500 years BP and a Little Ice Age advance beginning 800-600 years BP (Luckman et al.1993:149).

Luckman has outlined potential problems with reconstructing Neoglacial advances from such evidence. They include assumptions that the oldest surviving tree was sampled in dendrochronological work and variability in lichenometry and radiocarbon dating in the last 1000 years. Only by combining evidence from several sources can regional Neoglacial advances be reconstructed confidentially (Luckman 1986:21-27).

4.7 Modern Environmental Conditions for the Cathedral/Cascade Mountain Region

The present climate in the Cathedral Park alpine study area (Figures 8 and 34) can be considered a function of its altitude and exposure (Melcon 1975; Parish et al. 1996:11-18). Although it lies in the rain-shadow of the Cascade Mountains and Coast Mountains, moderate precipitation does fall at higher elevations (Parish et al. 1996:11-18). Melcon's (1975) study in the McKeen Ridge area show sharp increases in precipitation and decreases in temperature in relation to rising elevation. The precipitation maximum occurs in June to December, with no single month averaging less than 3 cm of rainfall. Despite this precipitation pattern, moisture stress may be a significant limiting factor for vegetation on parts of the ridge. With high winds on exposed alpine areas, much of the snowfall is blown off the ridge, leaving few permanent snow-packs and limited spring/summer runoff. The shallow snow accumulation also suggests that frost penetration is substantial, as it is inversely related to the depth and duration of the insulating effect of snow cover. Less than 14 frost free days per year occur on McKeen and Lakeview Ridge (Melcon 1975), suggesting that surface soils and sediments could be affected by the formation of ice wedges. They occur with the expansion and contraction of water as it freezes and thaws and cause a physical disturbance of soil materials termed "*cryoturbation*" (Benedict 1970:165-226; Ryder 1998:1-38). This frost churning action also can move rock fragments to form net like patterns on the ground surface, such as hummocks and surface rings (sometimes several meters across).

A poorly developed soil is present on Lakeview and McKeen Ridges (Figure 34). Its parent material is a partially weathered, course grained quartz monzonite, in which individual crystals have been separated by chemical weathering, forming a course, sandy material which lacks a fine silt or clay fraction. These individual grains are often covered by an iron oxide stain (Melcon 1975).

Four biogeoclimatic zones are found at the higher elevations of Cathedral Park (Figure 12), including 1) the Interior Douglas Fir, 2) Montane Spruce and 3) Subalpine Fir and 4) Alpine Tundra zones (Meidinger and Pojar 1991; Parish et al.1996:11-18; Vivian 1989; Reimer et al.1999). The area is the Interior Douglas-fir Biogeoclimatic zone, with lodgepole pine (*Pinus contorta*) an important post-fire succession species. Characteristic shrubs include soapberry (*Shepherdia canadensis*) and bearberry (*Arctostaphylos uva-ursi*), as well as pinegrass (*Calamagrostis rubescens*) and other grasses. Mid to high elevations of interior mountains are Montane Spruce and Englemann Spruce-Subalpine fir biogeoclimatic zones (Meidinger and Pojar 1991: 153-166; Parish et al. 1996:11-18). Englemann spruce (*Picea engelmannii*), with white spruce (*Picea glauca*) and subalpine fir (*Abies lasiocarpa*) are dominant. Post-fire succession patches of lodgepole pine and trembling aspen (*Populus tremuloides)* occur widely, while Douglas Fir enters the lower and southern sections of this zone. Upper sections of this zone include open patches of meadow, heath and grasslands (Hebda 1995; Meidinger and Pojar 1991:183-194 and 223-236; Parish et al.1996).

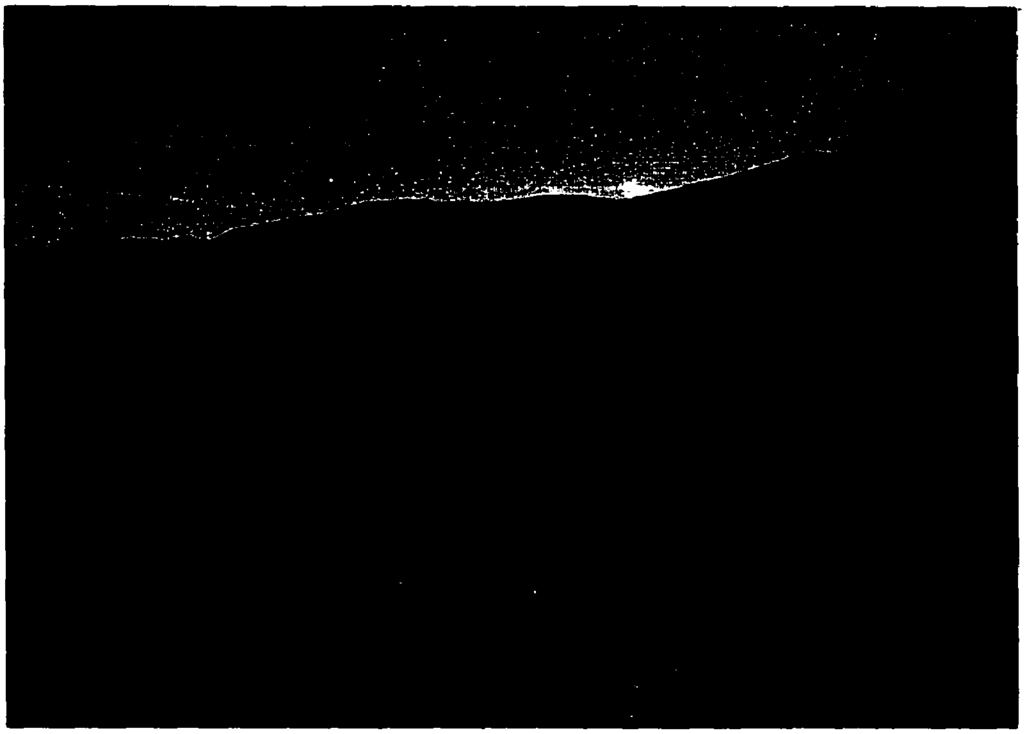

Figure 12. Interior Mountain Vegetation.

The vegetation succession encountered in Cathedral Park from the Ashnola River to alpine areas, is similar to that found in other parts of the Similkameen Valley, and has been examined in detail by (Hebda 1995:55-79; Meidingrer and Pojar 1991:263-274; Melcon 1975; Parish et al. 1996:11-18; Van Ryswyk 1969:53-67). On dry, windswept, stable areas the most common species are sedges (*Carex scirpoidea), (Carex hepburnii), (Carex pyrencia), (Carex albonigra)*, *(Kobresia mysuroides),* grasses *(Festuca ovina var brachyphylla), (Trisetum spicatum),* rushes *(Luzula spicata), (Juncus drummondii), (Juncus parryii),* figworts *(Penstemon procerus),* sunflowers *(Antennaria alpina),* pink flowers *(Silene acaulis),* roses *(Potentilla nivea), (Sibbaldia procumbens),* and several others. A rather dense cover of small mosses, as well as foliose and crustose lichens are represented. Of these, the most common, occurring on most exposed rock in the upper alpine, is the lichen (*Ephebe lanta)* (Parish et al. 1996:11-18). This lichen is dull black and occurs in flat thin mats and tufts on rock surfaces. Melcon (1975) found this lichen to be less common on soil material. On courser-textured soils and disturbed areas, *Dryas octopctala, Salix nivalis, Salix canadensis and Lupinus lepidus var lobbii* increased (Melcon 1975). He also points out a distinct contrast between areas of basalt bedrock and areas of quartz monzonite bedrock. Plants cover all soils over volcanic material, however, the quartz monzonite/grus areas are almost devoid of vegetation. Melcon (1975) further suggests that factors limiting vegetation include moisture and nutrient deficiencies in the grus, and the fact that the course grains provide little support for shallow rooted alpine plants.

4.8 Geology

Rice (1947) did the major work on the geology of the Cathedral Park area. He indicates that the Park's geologic history varied greatly, from that of the predominantly sedimentary and metamorphic Cascades to the widespread volcanics of British Columbia's Plateau. The Park area is in the inter-montane zone of the British Columbia Interior, a broad zone of relatively immobile crust extending the length of British Columbia and into northern Washington State.

4.9 Pleistocene/Holocene Glaciation

Sequences of Fraser and pre-Fraser Glaciations have been established for the interior Plateau. The ice cap associated with the pre-Fraser advance seems to have covered the entire Plateau while the upper surface of the Fraser ice was lower (Melcon 1975). During his early fieldwork, Rice (1947) spent some time determining the upper extent of glacial erosion (pre-Fraser) in Lakeview Valley, since this is of considerable importance in assessing the origin and morphology of landforms present on the ridges

(Figure 13). He states that the principle flow within the sheet split into two lobes near the modern town of Princeton. One lobe moved southeast to parallel the lower Similkameen Valley while the other moved south and southwest into Washington state between the Tulameen and Upper Similkameen Rivers. Cathedral Park is located midway between these two active channels of ice lobe movement, and was an area of slow moving and inactive ice (Rice 1947). The jagged appearance of the Sawtooth Range at the head of Lakeview Valley suggests that the area was never completely submerged beneath glacial ice.

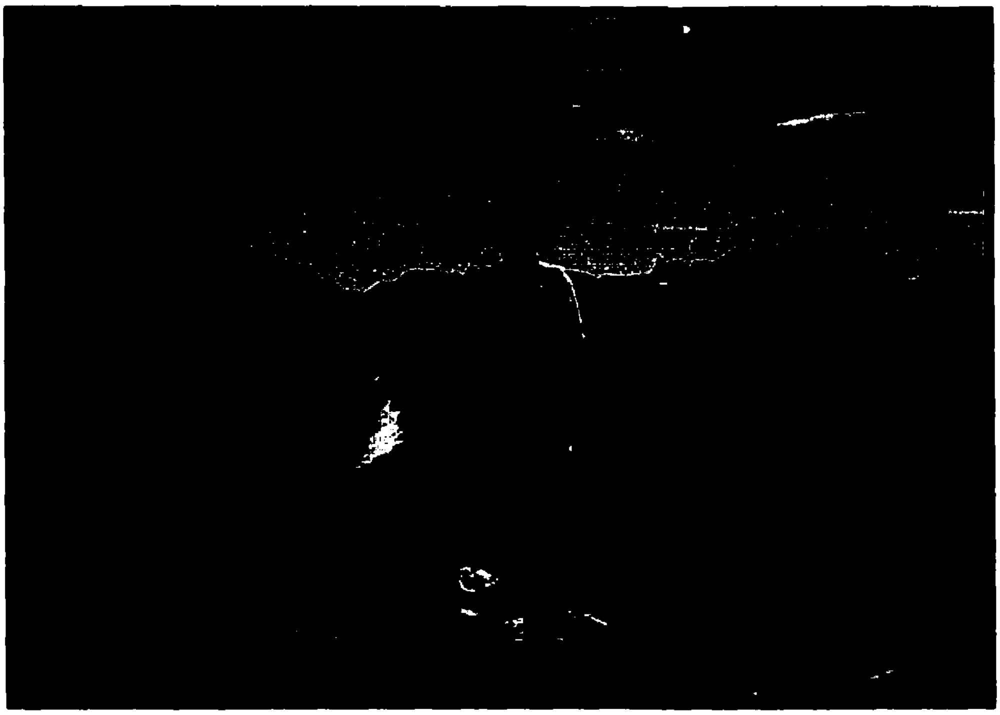

Figure 13. Alpine Areas of Cathedral Park.

The rounded form of Lakeview and Boxcar Mountains (Figure 34) are likely to have been the result of glacial sculpting. Trim lines associated with scouring of valley glaciers in Lakeview, Ewart and Wall Creek Basins occur at 2,280-2,400 meters a.s.l. The upper third of the west side of the valley is notable for a series of seven cirques cut into granitic bedrock. Tarn lakes occupy the first four of these cirques, and the southern three are filled with debris. Two smaller shallow lakes located on the valley floor to the east of Glacier Lakes formed behind the irregular moraine material that covers the valley floor. Lesser landforms in the study area include granitic tors, cryoturbated and patterned ground, talus cones, as well as boulder fields and alpine lakes. These boulder fields give way to stone stripes as the slope angle increases. This patterned ground occurs approximately 30 meters above the tree line on ridges. Boulder free areas carry alpine vegetation and rocks commonly have lichen cover. These features are thought to have formed under periglacial conditions accompanying the Fraser glaciation (Melcon 1975).

4.10 Holocene Paleoenvironments

The post-glacial vegetation and climate history of the northern Cascades have been examined at a few locations. Melcon (1975) suggests that fossil podzols and charcoal fragments on Lakeview Mountain indicate that the tree-line (presently below 2,250 meters a.s.l) climbed to 2,400 a.s.l during a early Holocene warming (approx. 6,600yrs BP). Based on studies conducted at Mount Styoama (Figure 8), by Pellatt (1996; Pellatt et al. 1998; 2000) proposes the following four periods of climatic change since the end of Pleistocene glaciation (approx. 10,000 BP).

1) a late glacial cold period (>10,000 BP),

2) an early Holocene warm, dry period (~ 10,000-7,000 B.P) (a xerothermic),

3) a mid-Holocene period of climatic transition beginning with a warm, moist phase (mesothermic) (7,000 to 4,000 BP) and then cooling (Neoglacial) between 4,800 and 2,400 B.P also known as the Burroughs Mountain Stade (Porter and Denton 1967: 177-210) and,

4) a modern Neoglacial cool, moist conditions (2,400 BP to the present) also known as the Garda Stade and the Little Ice Age.

Hebda's (1995:55-79) model of British Columbia's Holocene vegetation supports these periods, with the southern interior plateau having a more open vegetation than today at mid to low elevations ca. 6,000 BP. Hebda also suggests modern forest conditions were established by ca. 4,500-4,000 BP, while lower and upper tree lines declined. Evans (1997:81-92) also documented this pattern in the Coast Range (Figure 8). Under non-forested conditions (early Holocene 10,000-6,000 BP), the microclimate of Cathedral Park would not have differed greatly from that which prevails today. Current vegetation could be broadly representative of the entire post-Pleistocene period, but with fluctuations in elevation. Those fluctuations may have affected the distribution of archaeological sites in areas altered by these changes.

4.11 Geomorphology of Mountainous Areas of the Pacific Northwest

A landscape reflects the environmental history of an area, including on going changes. Such processes have direct impacts on archaeological sites and can be referred to as "landscape taphonomy." In order to understand how these processes relate to other environmental variables and archaeology, a summary of the geomorphological processes at work in high altitude settings will be given (for similar perspectives, again see Benedict 1970:165-226,1981,1985a and b, 1990,1993, 1996, Benedict and Olson 1978; Ryder 1998:1-38).

Incised by glaciation, the Coast Range Mountains rise sharply out of the ocean inlets and river valleys, while the Interior Mountain Ranges roll more gently (Ryder 1981). In addition, the climate of high altitude areas has always been cooler and wetter than that of lowland settings. Hence a major factor altering soils, sediments and archaeological sites in the subalpine and alpine zones is "cryoturbation", or the effects of freezing and thawing (Ryder 1998:17-27).

The types of cryoturbation in subalpine and alpine areas can be classified as either "periglacial," or "nivation," reflecting local climate, vegetation cover, topography and geology. Periglacial phenomena include frost shattering, frost heaving, frost sorting, and solifluction (Ryder 1998:18-27).

Frost shattering is where rock is fragmented by expansion and contraction, freezing and thawing. The intensity of frost shattering is dependent on the amount of moisture, the types of rock and the degree and rate of temperature change. Extreme results of this process include the formation of block fields, talus slopes and rock glaciers, which may drastically alter archaeological sites (Ryder 1998: 1-38).

Frost heaving is the process of upward movement of rock material in unconsolidated sediments through freezing effects. Its extent is dependent on the amount of moisture, rate of temperature fluctuation and types of soils and sediments being frozen (Ryder 1998:23-25).

Frost sorting is a process in which soils and sediments are moved into patterned alignments or arrangements. Heaving and thrusting displaces materials into areas that have less moisture, producing so called patterned ground. Sorted polygons, nets and stripes are the most common forms. Factors controlling the development and shapes of these features include the texture, size, and shape of the materials being displaced, angle of slope, vegetation cover, amount of moisture, the presence or absence of permafrost and the variability of the freezing process (Ryder 1998:23-25).

Solifluction is a process in which soils and sediments are moved down slope when saturated with water. The degree of solifluction is controlled by the amount of moisture, the degree of slope, the impermeability of the soil/sediment substrate, the size of particles and the type of surface vegetation. Solifluction can be divided into different types depending on these variables. Thus, "sheets" are present on flatter ground surfaces, "lobes" are present on steeper slopes, "benches" parallel contours, and "streams" are linear down slope features (Ryder 1998:24-25).

Niavation features include hollows, terraces, and avalanches. Niavation hollows form in areas that have ledge like topography (i.e. terraces) along steep gradients, such as drainage channels, and natural ground depressions. Niavation terraces form along hillsides and mountain summits. Avalanches cause quick down slope movement of plant, soil, sediment and rock material as a result of a combination of freezing and thawing processes (Ryder 1998:25-26).

Wind is a common erosion factor in areas of low vegetation cover, and abundant precipitation and exposure. Wind abrades rock and contributes to periglacial and nivation processes (Ryder 1998:27).

Chapter 5 Survey Methodology and Theoretical Expectations

He ought to give himself up to a particular landscape in his experiences, to look at it from as many angles as he can, to wonder about it, to dwell upon it.
-N.S. Momaday, The Way to Rainy Mountain.

5.1 Survey Methodology

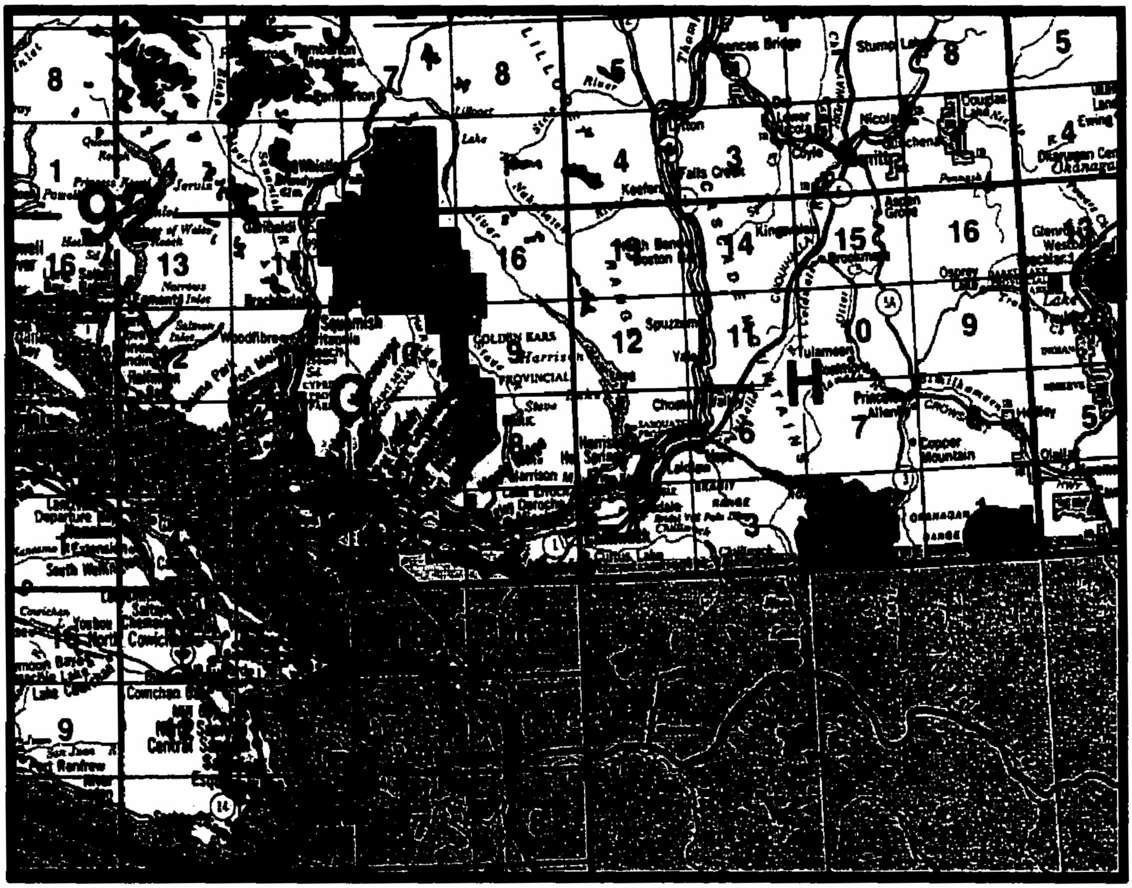

Figure 14. The Southern Coast and Interior of British Columbia, scale 1: 2,000,000 or 1 cm = 20 km.

Archaeological survey in selected alpine areas of Garibaldi Provincial Park, the Squamish/Cheakumus River divide and Cathedral Park was done between the summer of 1998 to the fall of 1999. Figure 14 shows the location of these areas in relation to Vancouver, British Columbia.

Initial plans were to use a quadrant sampling strategy (cf. Nance 1994: 221-248) to discover archaeological sites. They were subsequently adjusted to suit field conditions, including very steep slopes, time constraints, lack of a suitable sized survey crew, poor site visibility, and the desire of field personnel for self preservation (i.e. not falling off a cliff face or being eaten by bears). Upon arriving in a location the surrounding area was assessed for site visibility and suitable landforms conducive to retaining archaeological sites. Survey then proceeded to cover all those areas on foot. Extra attention was given to erosion blowouts and cut banks, which were examined for sub-surface deposits. No shovel tests were done for several reasons; First, Provincial Parks had a concern with the fragile subalpine flora, secondly shovels and screens are difficult to carry and use in high mountainous terrain, and third, there is a general lack of soil and sediment deposition in the survey areas. Survey was aided by the use of 1:50,000 scale NTS maps, a portable Garmin II Plus Global Positioning System and backcountry gear (backpacks, tents, sleeping bags, etc.).

Based on existing ethnographic, archaeological and environmental information a series of variables was used to build a model predicting the types of sites that may occur at high elevations, including their functions, assemblage characteristics and locations. Important environmental variables include;

- **1) Flora and Faunal Distributions**: Different plant and animal communities will be used by people to varying degrees in the pursuit of specific resources (cf. Burtchard 1998; Mack 1989: 49-58; Mack and McClure1998:1-7; Mierendorf 1998:1-10; 1999: 1-24; Millennia 1997; Reimer 1998; 1999b:1-44). Three types of plant communities exist at subalpine elevations, 1) Heath, 2) True Meadow, and 3) Subalpine Parkland. Of course, true alpine environments occur at higher elevations (Pojar and Mckinnon 1994: 11-18).

Heath plant communities are dominated by thick growth of dwarf heather (*Cassiope mertinsiana* and *Phylolodoce empetriformis*) and *vaccinium* berry patches. The heath plant community was therefore probably a focal point for pre-contact native harvesting of *vaccinium* berry plants (cf. Mack 1989: 49-58; Mack and McClure 1998: 1-11).

The true meadow is characterized by flowering herbs, sedges and grasses. Meadows are considered prime grazing habitat for ungulate populations in mountainous areas and hence a focus of hunting activity (cf. Burtchard 1998: 11-178; Mierendorf 1998: 1-7; 1999: 1-27; Millennia 1997; Reichel 1986: 111-119).

Subalpine Parkland communities are characterized by small clumps of stunted Mountain Hemlock (*Tsuga mertensinia*), Yellow Cedar (*Chaecyparis nootkaensis*), and Subalpine Fir (*Abies lasiocarpa*) (Pojar and Mickinnon 1994: 11-18). As those trees increase in size and density with diminishing altitude the ecotone parkland community offers an advantageous location, where people could access both lower elevation montane habitats for firewood and shelter, and higher elevation subalpine and alpine environments which were ideal for ungulate hunting (cf. Burtchard 1998: 111-179; Mierendorf 1998: 1-7; 1999: 1-24; Reimer 1998).

True alpine areas are treeless, with only small and scattered micro-niches of lichens, mosses and sedges (Pojar and McKinnon 1994). The distribution of the different plants is dependant on the amount of precipitation, slope and aspect (see below) (cf. Douglas 1972: 147-166; Lee and Funderberg 1982 a and b; Pojar and McKinnon 1994; Riechel 1986: 111-119).

- **2) Elevation**: This parameter refers to linear distance above sea level, which controls the position of the ecotonal flora and faunal distributions mentioned above. The "timberline" is defined as the uppermost area of substantial tree growth. The tree line is defined as the area above the timberline, representing the highest possible occurrence of trees. The area in-between timberline and tree line is commonly referred to as a "krummholtz" zone, or the forest alpine ecotone (Arno and Hammerly 1984) . Areas above the tree line are considered "true alpine" environments. On southerly facing slopes the timber and tree line will be higher than on northerly facing slopes, due to the amount of precipitation and solar radiation received during the growing season (mid summer to late fall). The Pacific Northwest subalpine has one of the worlds' greatest vertical distances between timberline and tree line, ranging from 100m to 500m (cf. Lettmerding 1976; Mierendorf 1999: 1-24; Woodward, Schreiner and Silsbee 1995: 217-225).
- **3) Slope and Aspect**: This parameter also is related to floral and faunal distributions and solar exposure. As mentioned above, the occurrence of certain plant and animal communities will be a focus for human activity in the past. Steep slopes and northerly aspects will have a significantly lower potential for archaeological sites, than relatively flat, dry, southerly facing slopes (cf. Bennett 1976; Burtchard 1998: 103-110; Mierendorf 1998: 1-7; 1999: 1-24; Millennia 1997; Reimer 1998, 1999a:1-33 and b1-44; Woodward, Schreiner and Silsbee 1995).

- **4) Accessibility**: Refers to a site's ease of access from lowland valley settings, related to slope, aspect and elevation. Subalpine and alpine areas with relatively easy access will more likely have archaeological sites. (cf. Burtchard 1998: 103-110; Mierendorf 1998: 1-7; 1999:1-24; Millennia 1997; Reimer 1998, 1999a:1-33 and b:1-44).
- **5) Geological exposure**: Outcrops of suitable lithic materials for tool manufacture will have been centers for past human activity and hence have a high potential for archaeological sites. This parameter also refers to the occurrence of other lithic materials (stones) that may have been used for construction of cairns, temporary shelters and for ritual purposes (i.e. rock art and petro-forms). True alpine areas will have more exposed sediments than subalpine areas due to reduced vegetation cover, little or no soil development and a greater degree of potential paleoenvironmental fluctuation (see below). As a result, true alpine areas will most likely have fewer sites than subalpine ecotone areas (cf. Fladmark 1985:196-208; Green 1991: 171-179; Green et al. 1988: 563-579; McClure 1989: 59-70; Mierendorf 1998: 1-7, 1999: 1-24; Reimer 1998, 1999a:1-33 and b:1-44; Ryder and Thompson 1986: 273-287).
- **6) Degree and sensitivity of Paleoenvironmental fluctuation**: Significant fluctuations of tree lines and timberlines are documented for the south Coast Mountains Range during the early Holocene (Evans 1997:81-92; Clauge and Mathews 1989: 277-280, 1996: 1-24). During later Holocene times certain areas near modern glaciers also experienced effects of Neoglacial advances and retreats (Davis and Osborn 1987: 365-375; Clauge and Mathews 1989: 277-280; 1996: 1-24; Porter and Denton 1967:177-210; Ryder and Thompson 1986: 273-287). Such fluctuations will affect the

distributions of floral and faunal communities and hence the occurrence of archaeological sites (cf. Benedict 1970: 165-226; Reimer 1998, 1999a:1-33 and b:1-44; Ryder 1981: 119-147; 1998: 1-38).

- 7) **Soil Types**: This parameter is tied to the types of plant communities found in subalpine locations. Areas with significant soil deposition and development will result in a more mature plant community and hence more productive plant and animal communities and people. See floral and faunal distributions above (cf. Reimer 1998, 1999a:1-33 and b:1-44; Valentine 1976; Van Ryswyk and Okazaki 1979: 53-67).
- 8) **Distance to important resources-i.e. water, fuel, the tree line, and other archaeological sites**: The locations of spatially restricted resources will tie humans to specific areas in subalpine and alpine environments. Water, fuel, construction material, ease of access to lower and higher elevations and other resource use sites, will be factors determining site locations. High elevation archaeological sites commonly cluster in select areas suitable for habitation as defined by the other factors in this list (cf. Burtchard 1998: 103-110; Chamberlain and Karanka 1976; Mierendorf 1998: 1-7; 1999: 1-24; Millennia 1997; Reimer 1998; 1999a:1-33 and b: 1-44; Reimer n.d.).
- **9) Associated ethnographic place names**: High elevation areas with associated ethnographic place names also proved to be useful for locating archaeological sites (cf. ARCAS 1999; Bouchard and Kennedy 1976 a and b; Reimer 1998; 1999a:1-33: 1-44; n.d.).

5.2 Theoretical Expectations

Site types have been related to landform resource data. This is founded on the principle of hunter-gathers favoring specific areas in upper montane, subalpine and alpine areas for resource procurement. In addition, it is believed that Holocene climatic shifts (fluctuating tree lines and Neoglacial episodes) affected high elevation land use (cf. Burtchard 1998: 103-110; Fladmark 1985: 204-208; Reimer 1998; 1999; n.d.). Based on studies elsewhere in the Northwest it is believed that hunter-gather groups throughout the region used high elevation habitats by ranging out from short to moderate term residential base camps located in the upper montane forest/ subalpine ecotone (cf. Burtchard 1998; Mierendorf 1999; Reimer 1999a:1-33 and b:1-44; Reimer et.al.1999).

Based on the above data and the landform and site data based on similar surveys done at high altitudes in other areas, a series of 10 site types and their expected assemblages were produced (cf. ARCAS 1999; Burtchard 1998; Howe 1997; Frank 2000; Mierendorf 1998,1999; Vivian 1989 for examples).

Native peoples had several variables to consider before accessing high elevation areas. Constraints affecting use of high elevation habitats include; the seasonal availability of resources which is dependant on the nine variables listed above. In addition to these predictable variables, unpredictable variables would include the yearly/seasonal fluctuations in precipitation, temperature, force and direction of winds, and the size and persistence of snow packs, the degree of paleoenvironmental fluctuation (i.e. early Holocene high tree lines and later Holocene Neoglaciation) and the distance from the nearest village or camp. All these variables can affect the model of site types presented below, which is similar to that proposed by Burtchard (1998: 103-178) and Mierendorf (1999: 1-24).

Type One: Multitask Residential Base Camp

Predicted Site Function

These sites are expected to function as base camps used repeatedly by more than one group accessing local flora and fauna resources. Groups using these sites may range in size from a large extended family to a single nuclear family, with both accessing high elevations from a local valley bottom winter village. The length of occupation at these sites would be longer than any other site type found at high elevations. The length of stay would be dependent on the availability of subalpine and alpine resources, particularly deer, elk, goat, bear, marmot, ptarmigan, grouse and various plants species.

Expected Assemblage Characteristics

Artifact assemblages in such site types will be dominated by lithics, including a range of small and heavy tools. The density of debitage and raw material types will be high (for high altitude settings), but not as high as lithic quarry/workshop sites (see below). Features found on such sites may include hearths, berry and meat drying trenches (in the form of cultural depressions), post molds (representing small structures), trails and culturally modified trees.

Location

Multitask residential base camps will be found in upper forest and subalpine ecotone settings. These locations will offer suitable access to specific resource patches, as well as travel to other resource areas and low land villages. Additionally, such sites will offer shelter, water, and wood for fuel and construction material for and other camp activities.

Type Two: Limited Task Field Camps

Predicted Site Function

These sites represent the short-term use of an area by small groups of hunters traveling out from residential base camps. At such sites, activities may have included overnight camping, food preparation, tool maintenance and repair.

Expected Assemblage Characteristics

Again, these sites will be dominated by late stages of lithic reduction, with debitage and small tools. If located near a lithic quarry source such sites also may exhibit core and tool manufacture. Heavy tools such as large cores, bifaces, cobble/pebble tools are expected to be absent, but may be present if the site is near a lithic source. The proportion of light tools such as projectile points, microblades, small cores and debitage should be moderate. Hearths may be present and such sites maybe associated with other site types, such as cairns, butchering locations and residential base camps.

Location

These sites will most likely be found in subalpine/sub-alpine ectone to alpine settings which offer some shelter, construction materials and fire wood. They could include rock-shelters and overhangs.

Type Three: Low Use Hunting Locales

Predicted Site Function

Low use hunting camps (a single short term occupation) are expected to have had a similar use as limited task field camps, but with much lower overall numbers of tools, debitage and features, since they may not have involved an overnight stay.

Expected Assemblage Characteristics

They are expected to have low overall numbers of lithic debitage and tools and will most likely possess only one type of lithic raw material. Light tools (projectile points, microblades, flake tools) should be the only tool types present.

Location

These site types should be found in a wide range of environmental zones, from forest to alpine habitats.

Type Four: Butchery Stations

Predicted Site Function

Butchery stations are expected to be located near primary kill areas, in prime game habitats and used for initial game processing (i.e. hide removal, disarticulation, bleeding and partial drying).

Expected Assemblage Characteristics

Butchering stations will have a high ratio of cutting, chopping and piercing tools to debitage. The presence of "heavy tools" will depend on raw material availability. Utilized flakes and flake tools would have served as multifunctional cutting and scraping implements. The edges of such tools should show use wear and potentially blood residues of game animals.

Type Five: Lithic Procurement and Reduction Locations

Predicted Site Function

This site category actually includes two sub-types. One involved the direct procurement of lithic raw material at a source outcrop or source area. At such lithic procurement sites a high amount of lithic debitage will be found in association with cores, tool pre-forms and tools broken in manufacture. Early stages of lithic reduction should out number later stages. Lithic reduction sites are usually found in close approximation to lithic source areas. Curated cores and tools will be the end-results of the activities conducted at such sites. Residence and tool maintenance activities are not expected to be obvious parts of these site types.

Expected Assemblage Characteristics

Quarry and reduction station assemblages are expected to be dominated by early stages of lithic reduction and shatter of a single material type. Source materials may or may not be directly available, since paleo-environmental fluctuations may have altered raw material availability. If present, finished tool and prepared cores should be in very low numbers.

Location

These site types will be located near lithic raw material outcrops or sources, also often in association with high subalpine and alpine hunting areas.

Type Six: Cairns and Talus Feature Locations

Predicted Site Function

These sites are often associated with vision quest functions, hunting blinds, and travel and territory markers. Small rock enclosures representing vision-quest sites will most often have in no association with other cultural material, be in secluded locations far away from residential base camps and be small in size. These sites tend to be less visible since they are usually low lying and in remote areas. Alpine hunting blinds will be found in association with smaller cairns, forming a distinctive pattern aimed at procuring ungulate game. These sites will be visible from a distance and may be near other site types (camps or butchery stations). Travel and territorial markers such as isolated cairns may be found in association with trails, culturally modified trees and rock art panels, hence these sites will be very visible from a distance.

Expected Assemblage Characteristics

The nature of high elevation environments dictates that these sites will be located near a source of suitable construction material, thus they must be biased toward higher elevation subalpine and alpine areas, which have abundant glacial rubble and scree slopes.

Type Seven: Culturally Modified Trees

Predicted Site Function

Culturally modified trees include aboriginal logged trees, bark strips, blazes and other types. These features can be found on a number of tree species, with yellow cedar, western hemlock, Douglas fir and subalpine fir being the most common. The wood, bark and pitch from these trees was used for construction material, fuel, clothing and containers. The transport of food and lithic raw materials was made easier by the availability of such trees.

Expected Assemblage Characteristics

Culturally modified trees usually appear in small clusters on flat to steep slopes. Bark and wood removal occur on up slope sides of trees, since it is easier to fall down when peeling down slope sides. The shape and size of a bark strip, or wood removal scar, will depend on the planned function of the material being removed. Cut marks may or may not be present, while durable cultural materials will most likely be absent.

Location

The location of these sites is constrained mostly by habitat. Cedar prefers to grow in wetter areas and usually lower in river valleys. Yellow cedars are found as high as 1600 meters a.s.l. on some wetter northerly slopes, often associated with berry fields and gathering areas.

Type Eight: Plant Processing Locations

Predicted Site Function

Plant processing locations will be found in areas of prime berry and medicinal plant habitat, including meadows and heath settings.

Expected Assemblage Characteristics

Berry processing features will consist of elongated trenches, originally carrying mats lain over top a log or light pole frame-work. Many hot rocks may have been placed in the trench for holding and distributing heat in the drying and processing of many species of berries. As a result, an elongated hearth like feature will be present, with abundant fire cracked rock and charred macro-botanical berry remains. Lithic materials may also be found in low frequencies.

Location

Because such activities are time consuming, these sites will be found in close association with residential base camps, trails, culturally modified trees and other plant processing features.

Type Nine: Trails

Predicted Site Function

This site type is used to travel to and from other sites and were the roads and highways of the native high country, linking communities, resource locations and spiritual places.

Location

Trails will be found in the easiest and most sensible travel routes through mountainous terrain. If people were using the same area over and over again it made sense to travel in the same way one did before. Higher elevation trails will be focused on passes, cols and the tree line along river drainages.

Expected Assemblage Characteristics

Old trails are often difficult to locate because of over growth and current use by modern campers and hikers. However, most trails can be defined as faint to obvious linear depressions and other terrain irregularities. Other site types maybe found in association with trails. Buried, older trails may be represented by obvious cut banks in which the stratigraphy may indicate multiple generations of use. On the surface, trails may also be marked by CMTs (except in the alpine zone) and/or rock cairns.

Type Ten: Isolated Finds

Predicted Site Function

This site type probably represents the use of an area for very short-term hunting, plant gathering and/or camping activities. Isolated artifacts may be found to be of exotic origin and usually broken, representing the direct discard of a curated item. These sites will be affiliated with other site types and related to the activities of near by sites.

Expected Assemblage Characteristics

The assemblages of this site type will be very small, in order of one to three artifacts, found in loose association with one another.

Location

Isolated finds are part of the overall extensive archaeological record of any area, hence such sites will be found almost anywhere, from forest to high alpine areas.

Chapter 6: Results of the Surveys

There is a difference of knowing the path and walking the path.
-An old saying

6.1 Areas Surveyed

From 1996-1999 a total of five separate survey projects recorded 11 new archaeological sites in the Garibaldi/Squamish and 10 in Cathedral Park. Five of the Garibaldi/Squamish sites are located along the Squamish/Cheakumus River divide, one site at Russet Lake east of Whistler, and one site at Black Tusk Meadows. Four sites are between the Elfin and Mamquam Lakes locality of Garibaldi Provincial Park (Figure 15).

Initial plans were to focus only on the Squamish/Garibaldi region, but the record breaking snow falls of the winter of 1998-1999 (Figures 10-11) forced surveying to be undertaken in Cathedral Park (an area in a rain/snow shadow) where conditions were more favorable to finding archaeological sites.

Below are descriptions of all sites found in each area. Included are notes on their landform data, followed by a discussion on how these sites fit into the model proposed in the previous chapter. Crew members on surveys in the Squamish/Garibaldi region included Rudy Reimer, Geordie Howe, Brian Pegg, Chris Jordan, Jennifer White and Rose Reimer.

6.2 Squamish/Garibaldi Findings

Table 7 lists all the sites found on surveys and their physical attributes. The survey findings in the Squamish/Garibaldi region are discussed in sub-regional sections, including Elfin to Mamquam Lakes, Garibaldi Lake, Russett Lake and the

Squamish/Cheakumus divide. Maps with site locations are included with the discussion for each sub-region. Selection of survey areas was limited due to extreme snow during the winter of 1998-1999, therefore areas selected for survey had to be snow free and readily accessible. More sites would undoubtedly have been found if snow pack conditions had been more favorable.

Table 7. Physical Attributes of sites in the Squamish/Garibaldi Region.

Site	Latitude	Longitude	Elevation	Size
DkRr1	49° 47' 45"	122° 59' 26"	1490m	105m N-S, 80m E-W
DkRr2	49° 48' 0"	122° 59' 35"	1495m	10m N-S, 5m E-W
DkRr3	49° 47' 44.7"	122° 59' 24.3'	1460m	25m N-S, 15m E-W
DkRr4	49° 48' 53.8"	122° 56' 28.8"	1480m	50m N-S, 25m E-W
DlRs4	49° 57' 24.5"	123° 3' 59"	1660m	35m N-S, 25m E-W
EaRr4	50° 1' 32.1"	122° 51' 44.9"	1850m	125m N-S, 225m E-W
EaRt1	50° 3' 34"	123° 15' 25"	1713m	28m N-S, 24m E-W
EaRt2	50° 3' 41"	123° 15' 23"	1750m	200m N-S, 200m E-W
EaRt3	50° 3' 55"	123° 15' 24"	1838m	25m N-S, 25m E-W
EaRt4	50° 3' 37"	123° 15' 31"	1700m	80m N-S, 120m E-W
EaRt5	50° 1' 23"	123° 16' 12.5"	1615m	25m N-S, 40 E-W

6.2.1 Elfin Lake to Mamquam Lake Survey Results

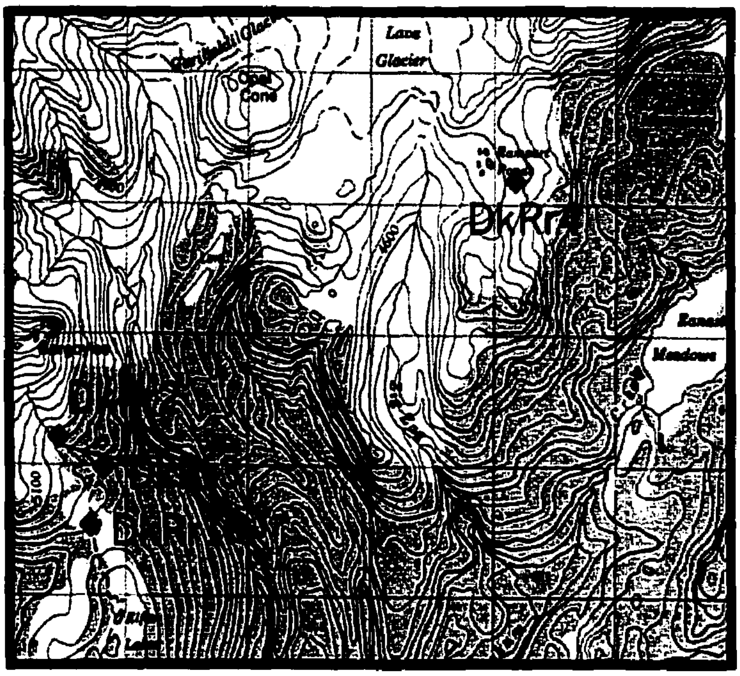

Figure 15. Site locations of DkRr1-4, Elfin Lake to Mamquam Lake sub-region, N.T.S series map 92G15, scale 1:50,000.

6.2.2 DkRr1

The site was initially recorded by Don Bunyan of the Archaeological Society of British Columbia (A.S.B.C.) and was test excavated by ARCAS Archaeological Consulting in 1991 (ARCAS 1999:1-11). The site was revisited in the summer of 1998 by Reimer (1999a:1-33) (see figure 16-17).

Two distinct clusters of Garibaldi Obsidian were noticed on the surface of the site (Figure 17) but no other features were visible. A total of three 1m square excavation units were placed over the lithic clusters 1 and 2. Cultural deposits were found to extend to a maximum depth of 25 cm below surface. Four natural sediment layers were encountered during excavation. Layer A, from 0-6 cm below surface, is a 10YR 2/2 very dark brown loam. Layer B, from 6-7 cm below surface, is a 10YR 2/1 black silt with very small flecks of charcoal. Layer C, from 8-12cm below surface, is a 10YR 4/6 very dark brown sand with pea gravel. Layer D, from 13-25 cm below surface, is a 10YR 7/4 very pale brown coarse sand and gravel.

A potential hearth feature found in excavation unit one, layer B, yielded an age estimate of 2850±40 BP (Beta 91385). Sediment analysis of matrix from around this feature concluded that the formation of layer B and the potential hearth may have been more likely due to natural processes than anthropogenic ones (ARCAS 1999:1-11). A total of 2617 pieces of Garibaldi Obsidian were recovered in the 1991 ARCAS test excavations (ARCAS 1999:1-11). Analysis of this material can be found in chapter 7.

Figure 16. DkRr1, Old Hiking Trial goes through the middle of the site.

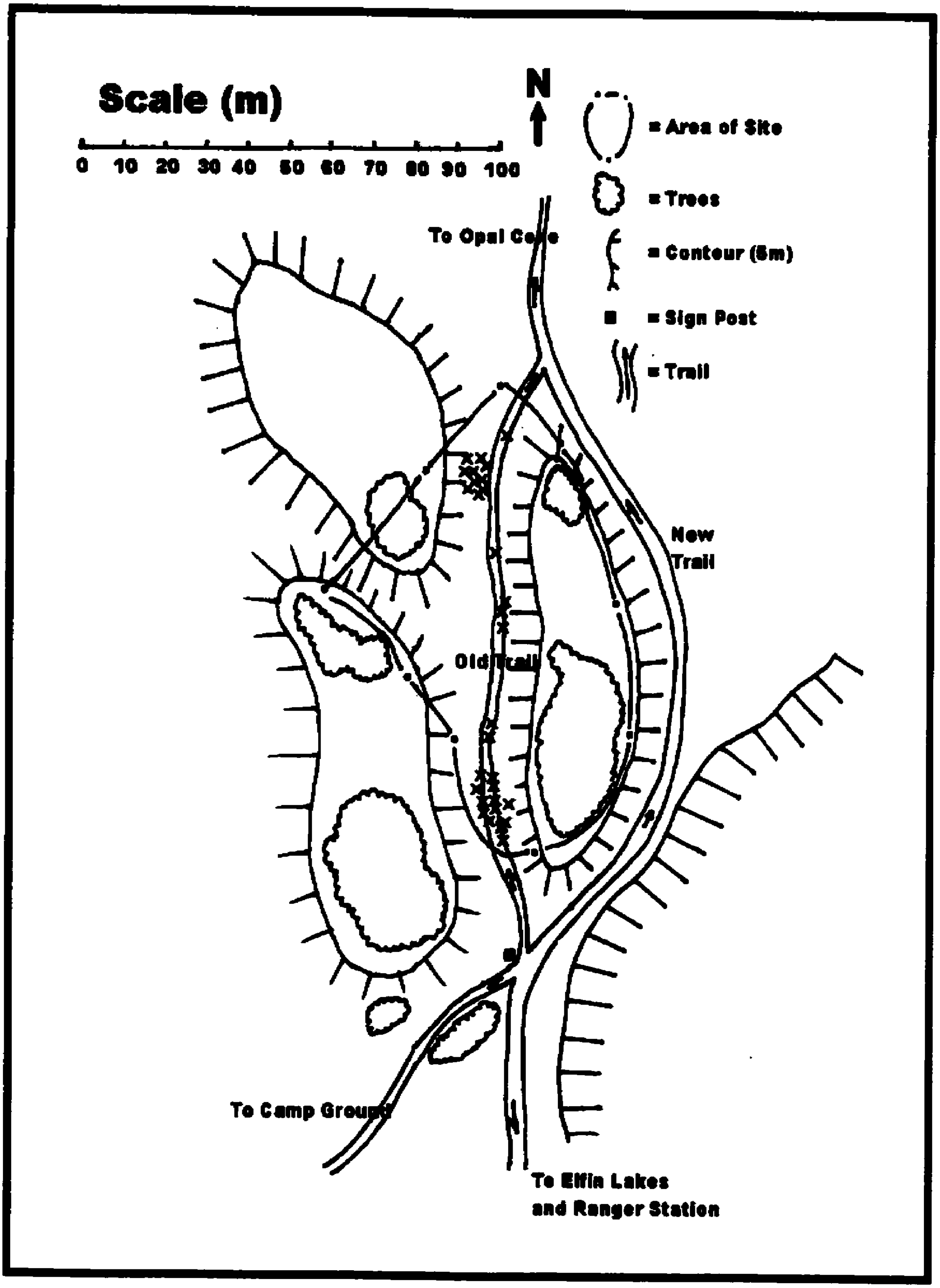

Figure 17. Map of DkRr1.

The site is located on a heath type plant community with numerous berry bushes, (Figure 16), in the subalpine park land setting, with little or no slope and aspect. Access to this site would have been relatively easy from low land valley settings. Even without a trail that leads to this area, travel from a low land village river setting would take approximately one day. There is only minimal exposure at this site, although a trail did go through its mid-section until Provincial Parks diverted it around the site boundaries. Along with numerous plant resources, and abundant game, this site would have been most likely occupied during summer and fall seasons. Plenty of water and firewood also is locally available.

6.2.3 DkRr2

The site was originally recorded by ARCAS Archaeological Consulting and tested in 1992 (ARCAS 1999:1-11). The site was revisited by the author in 1998 (Reimer1999a: 1-33) (Figure 18).

During the ARCAS test excavations one 1x1 m unit was placed on a section of a presumed rock and earthen cairn. However, it was discovered that this feature was likely natural in origin (ARCAS 1999:1-11), formed from cryoturbation. A thick heath mat obscures much of the ground surface, making site visibility poor, however cultural deposits were revealed in s wind blow out. Strata in such blow-outs appear to consist of two layers. Layer A is a 10 YR 3/3 dark brown organic loam 0-3cm below surface. Layer B is a 10 YR 6/3 light brown sandy silt. Two separate clusters of Garibaldi Obsidian were found on these blow out deposits (Figure 18). They appear to have been frost heaved to the surface and are therefore out of their original cultural context. A total of 19 flakes and debitage represent the site assemblage, which is analyzed in Chapter 7.

The site is situated in a heath subalpine plant community. Numerous subsistence plants (berries) are present. There is a slight rise in slope to the west of the site, so the site has a slight eastern aspect. Access from low land areas would take a long day of foot travel. Plenty of fuel for fires is locally available, while abundant plant and animal resources can be found nearby.

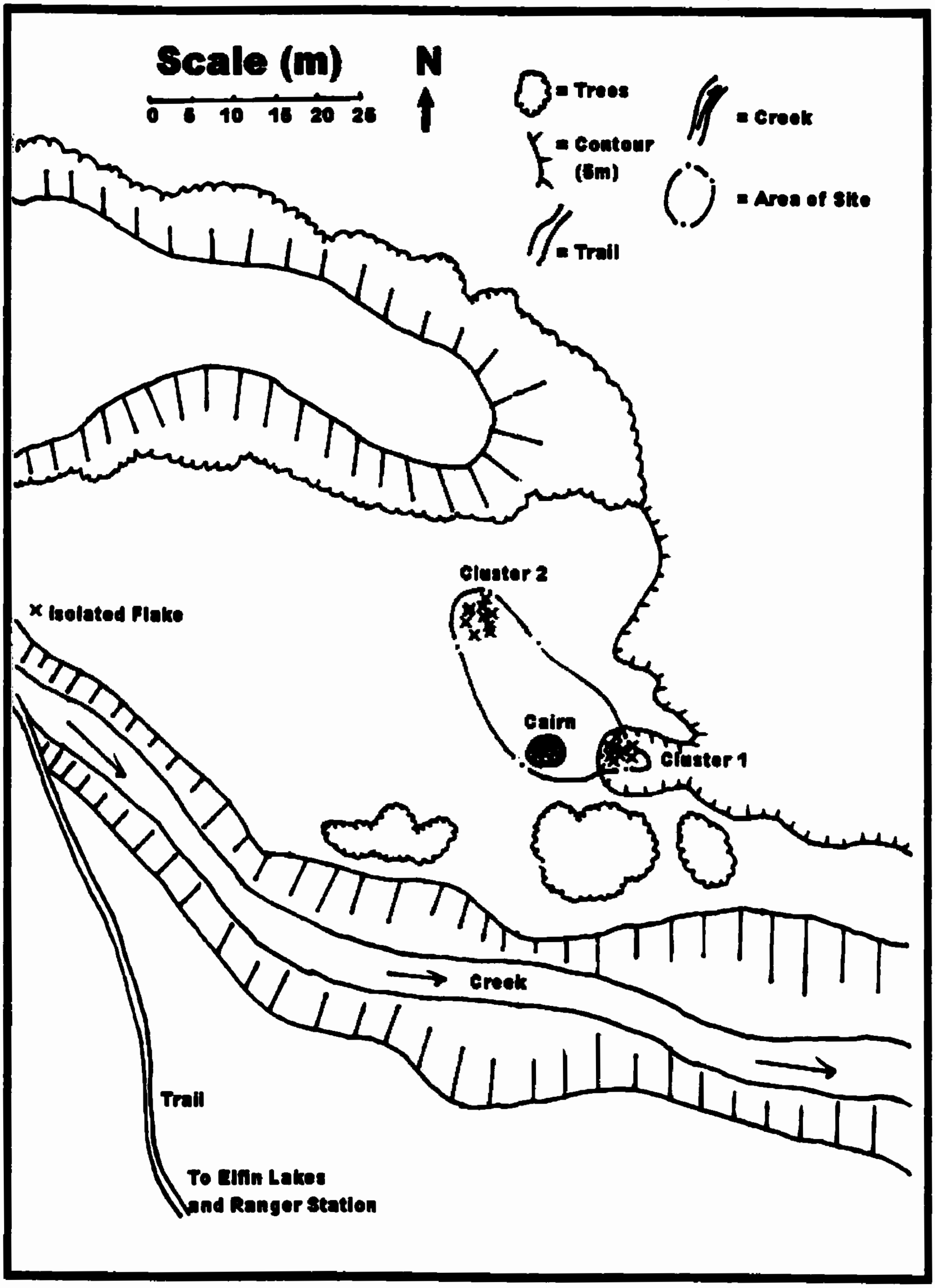

Figure 18. Map of DkRr2.

6.2.4 DkRr3

The site was recorded in 1998 (Reimer 1999a:1-33) and analysis of lithic materials can be found in Chapter 7, which are all of Garibaldi Obsidian. The site is in the heath subalpine plant community, on top of a small ridge (Figure 19-20). Each side of the ridge is a small slope with minimal aspect. Access to this site would take a long day of travel from the nearest low land settings. Exposures on the sides of the ridges around the site suggest that this area has been affected by cryoturbation and wind erosion. The exposures exhibited two distinct natural sediment layers. Layer A, is a 10 YR 3/3 dark brown organic loam 0-5 cm below surface. Layer B, is a 10 YR 6/3 light brown sandy silt with gravel and pebbles. Lithic materials were more readily visible on these "cinder flat" like blow out surfaces, compared to the thick heath plant mat around the site (Figure 19-20).

Figure 19. DkRr3, located on top of the small ridge.

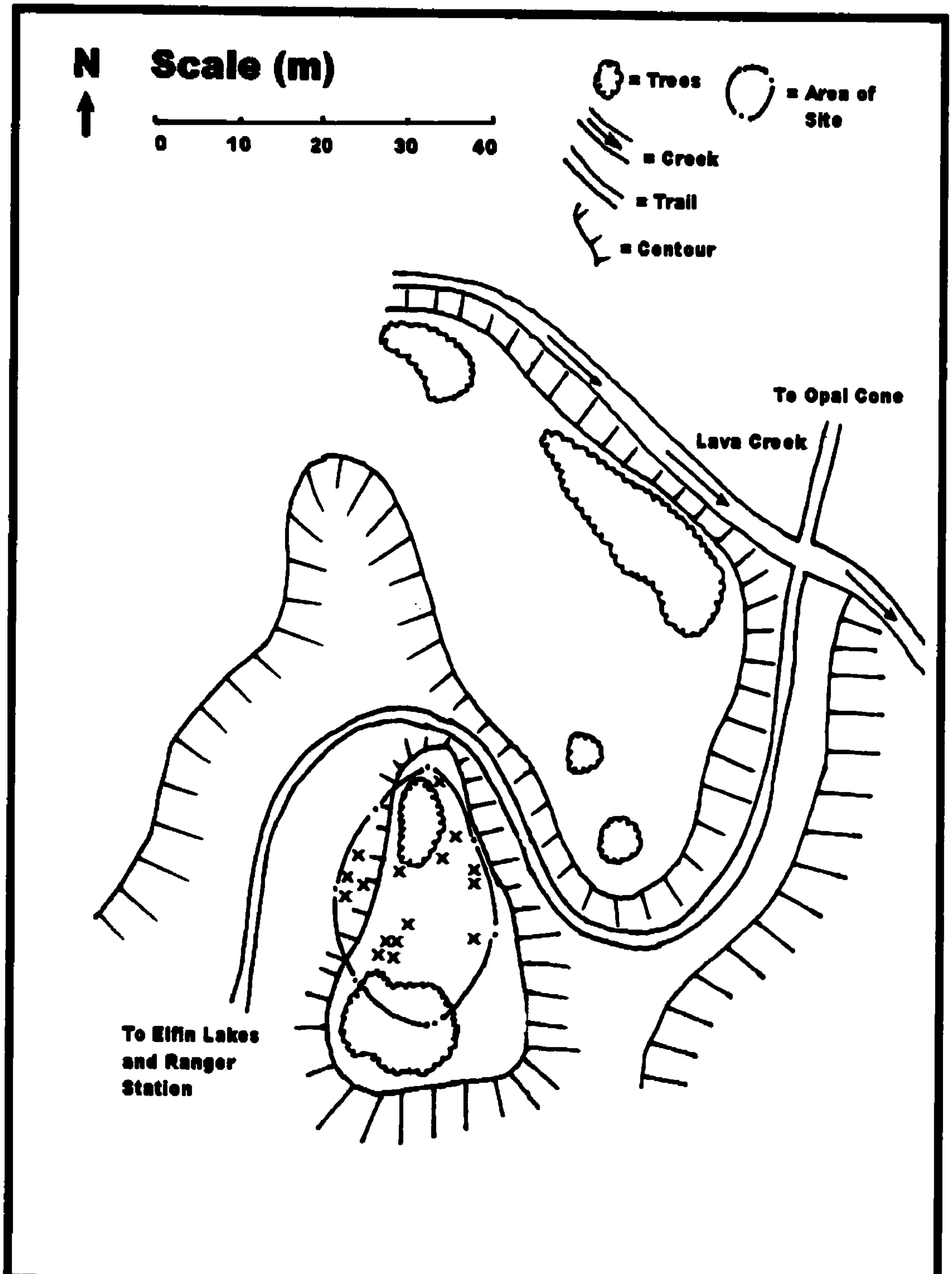

Figure 20. Map of DkRr3.

6.2.5 DkRr4

The site was recorded by Reimer (1999a:1-33) and analysis of lithic materials which include Garibaldi Obsidian and Ring Creek Basalt, can be found in Chapter 7. Over 20 microblades and one core were found in a one by one meter cluster (Figures 21-22). Surrounding this microblade production area were small flakes from microblade core preparation. The site is located on top of a high wind swept alpine ridge overlooking Rampart Ponds and Mamquam Lake. Virtually no plant life is present on top of the ridge, or to the west of the ridge. The slopes leading down to Mamquam Lake to the east are covered by a heath sub alpine parkland plant community. Since there was little to no plant life on the ridge top, site visibility was excellent (Figure 21-23). Geological exposure on this ridge top is due to high winds and the near proximity of Garibaldi glacier. Surface deposits were a 10 YR 7/3 very pale brown to 10 YR 6/3 pale brown.

Figure 21. DkRr4. The baseball hat is at the center of a 1x1 meters microblade cluster. Looking southeast.

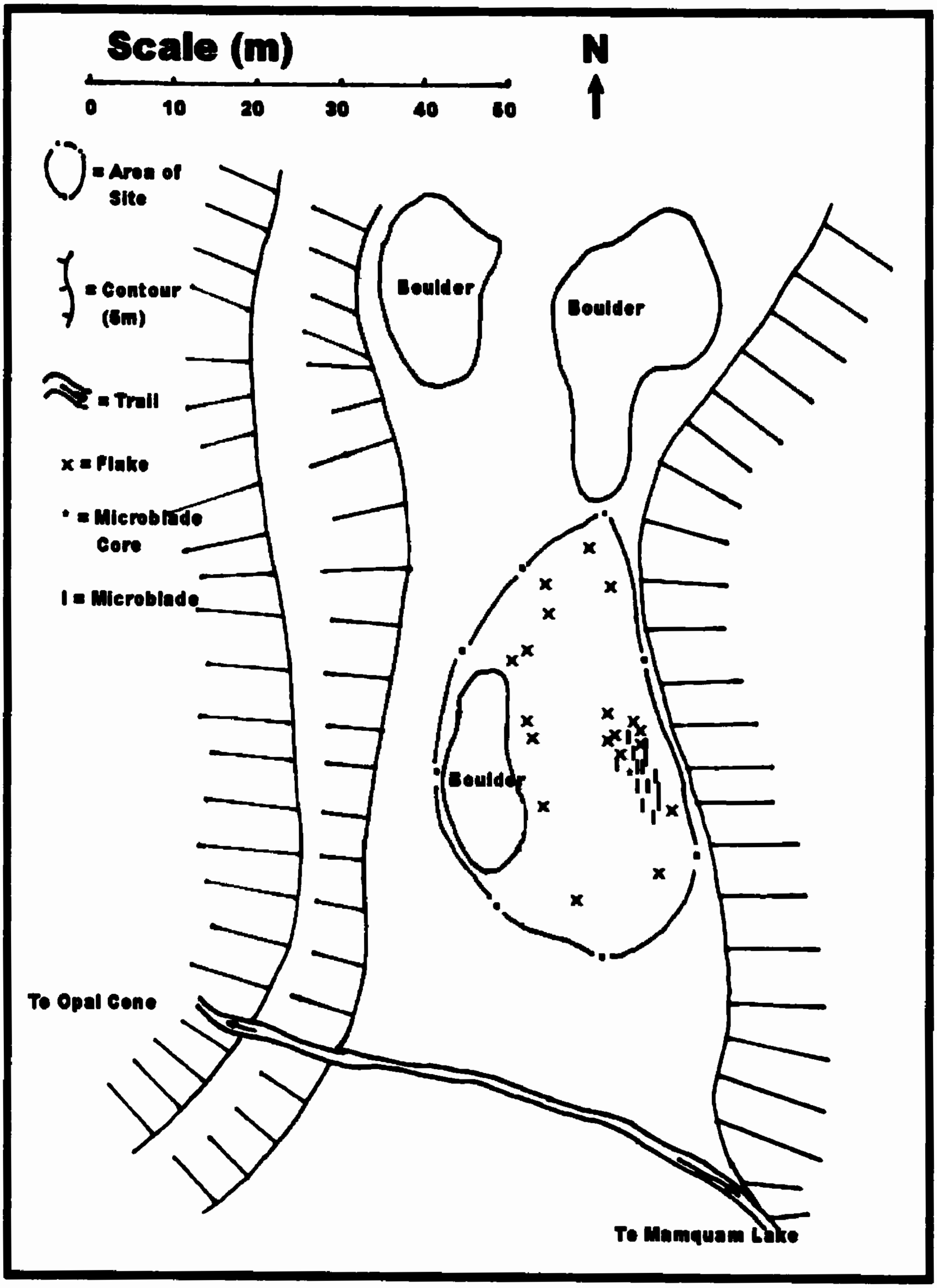

Figure 22. Map of DkRr4.

Figure 23. A portion of the Garibaldi Obsidian lithic scatter at DkRr4.

This location offers an incredible view of the surrounding terrain and access to two separate valley systems. The top of this ridge is flat and has no aspect. Access from low land settings would have taken a very long day or two complete days of foot travel.

6.3 Garibaldi and Russet Lakes Survey Results

Below are maps (Figures 24,25) with site locations in the Garibaldi and Russet lakes region.

Figure 24. Site location for DlRs3, N.T.S. series map 92G14, 1:50,000 scale.

Figure 25. Site location for EaRr4, N.T.S. series map 92G15, 1:50,000 scale.

6.3.1 DlRs4

The site is located on a small ridge overlooking Parnasus Creek, in a subalpine meadow plant community (Figure 26). Numerous plant resources listed in Chapter 3 can be found in an area of less than one square kilometer around this site. On site lithic analysis indicates that locally available materials (Black Tusk Dacite and other unidentifiable materials) were used for basic core/flake tool production. Four bipolar spall tools were noted in the site assemblage. A berry drying trench feature was also found on site. It measure 3.5 meters long N-S, 2.5 meters wide E-W and 0.75 meters deep. A pile of fire altered rock is located near this feature. This is the most northerly known recorded site of this type (see Frank 2000:21-40; Mack 1989:49-58; Mack and McClure 1998:1-11). Access to this site from low land areas would have taken two to three days travel time. No wind blow out areas, or indications of severe cryoturbation were noticed, hence the depth of cultural deposit is unknown.

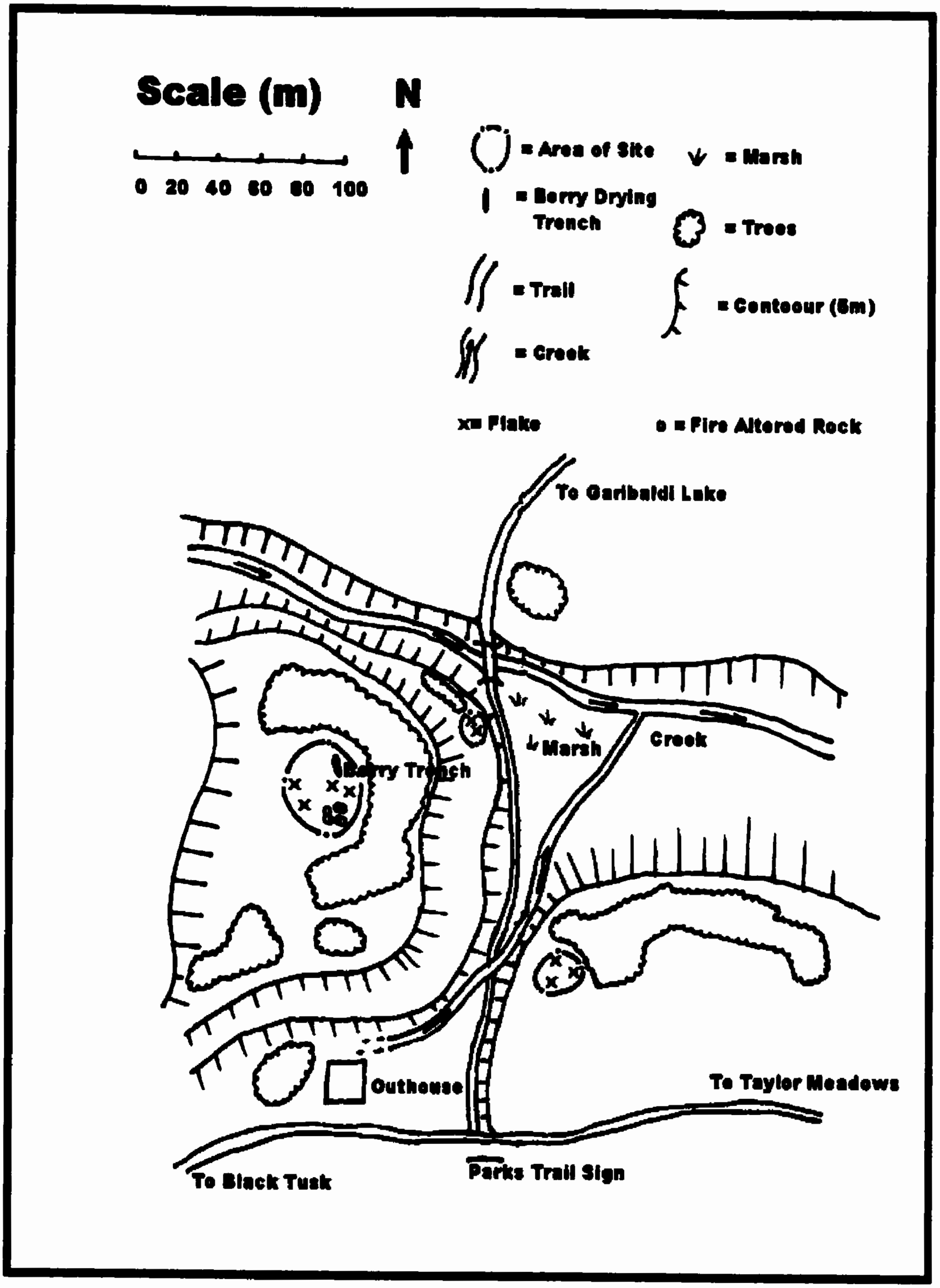

Figure 26. Map of DlRs3.

6.3.2 EaRr4

The site is on a small ridge on the north side of Russet Lake (Figure 27). It is in the alpine zone, but small stunted trees grow less than 100m away. This site is situated on a small plateau pass and is highly wind swept. Its exposure is high since cryoturbation and wind blow out areas are common. Cultural materials were found down to a maximum depth of approximately 10 cm below surface. Definable strata in the wind blown out cut banks on site include: Layer A, a 10 YR 6/3 pale brown sandy silt with cyroturbated gravel, pebbles and cobbles found 0-4cm below surface, and Layer B, a 10 YR 7/2 light gray coarse sand lying 5-10 cm below surface. No definable features were noticed on the surface of the site. Analysis of lithic materials can be found in Chapter 7. Access to this site from low land valley settings would take a long one to two day hike. Natural resources are sparse in the immediate area, but more abundant resources are available less than 1 km away. While approaching the site via Singing Pass several economically important species of plants and animals were noticed (see Chapter 3).

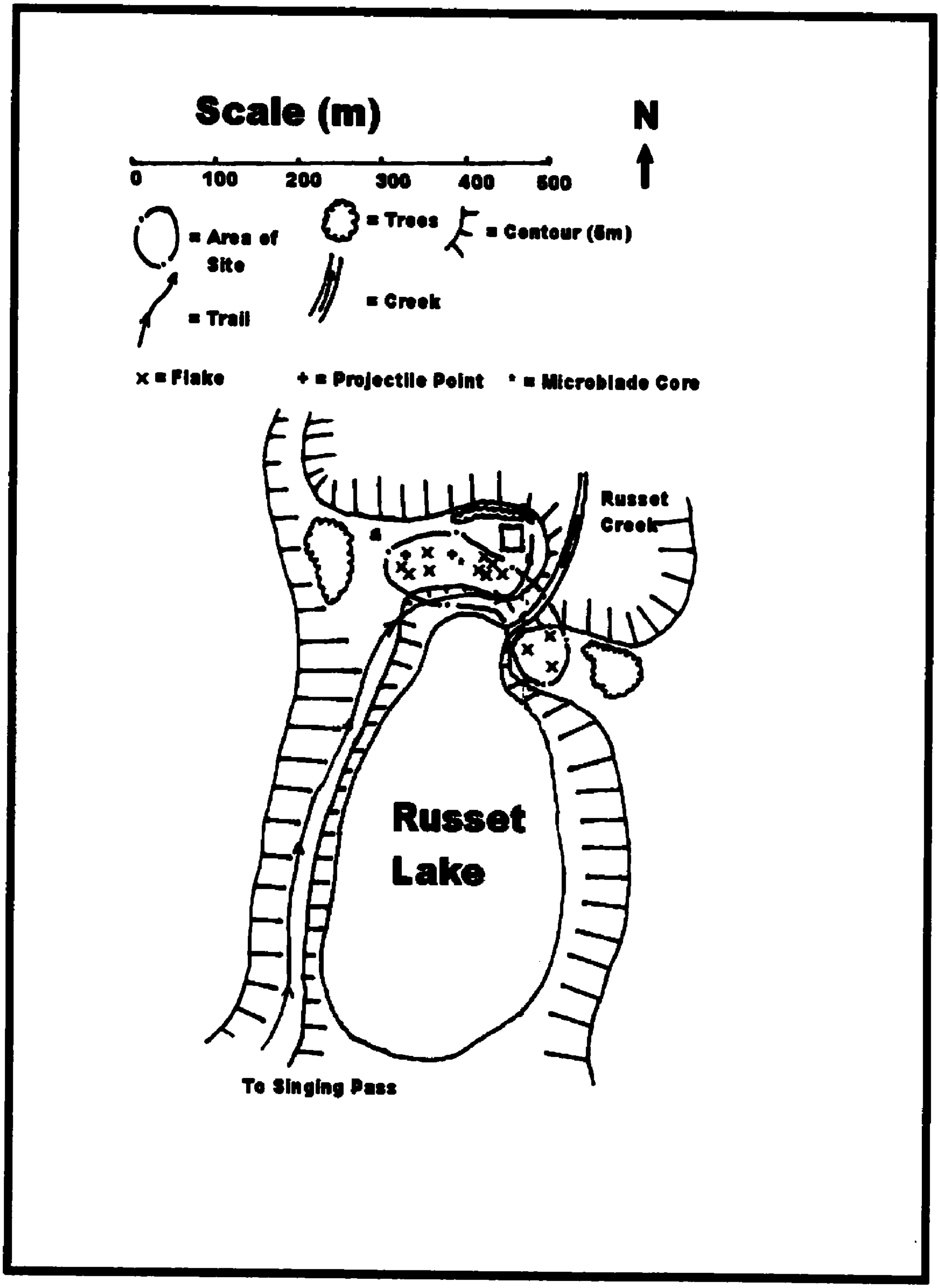

Figure 27. Map of EaRr4.

6.4 Squamish/Cheakumus Divide Survey Results

Figure 28. Site Locations of EaRt1-5, N.T.S. series map 92J3, 1:50,000 scale.

6.4.1 EaRt1

The site was recorded in 1996 by members of ARCAS (1999:1-11) (Figures 28-29). Lithic analysis of materials found on this site can be found in Chapter 7. All lithic material collected and analyzed from this site is a fine grained vitreous dacite.

The site is at the boundary of subalpine heath and alpine environmental zones. Melt water from the surrounding cirque basin collects in a tarn and then drains via a small unnamed creek. The site has a slight slope and a westerly aspect. Access from low land valley areas would take two to three days of hiking. A small number of useful plant foods were noticed while recording this site and signs of mountain goat were very apparent. Wind blow out areas had cut banks with artifacts present to 8-10 centimeters below surface. Strata in these exposures includes Layer A, an organic loam 10 YR 2/2 measuring 0-4cm below surface. Layer B a 10 YR 5/6 to 5/8 yellowish brown silty sand with pebbles, gravel, cobbles and boulders. Layer C is a 10 YR 7/2 light gray coarse sand/glacial till or moraine deposit.

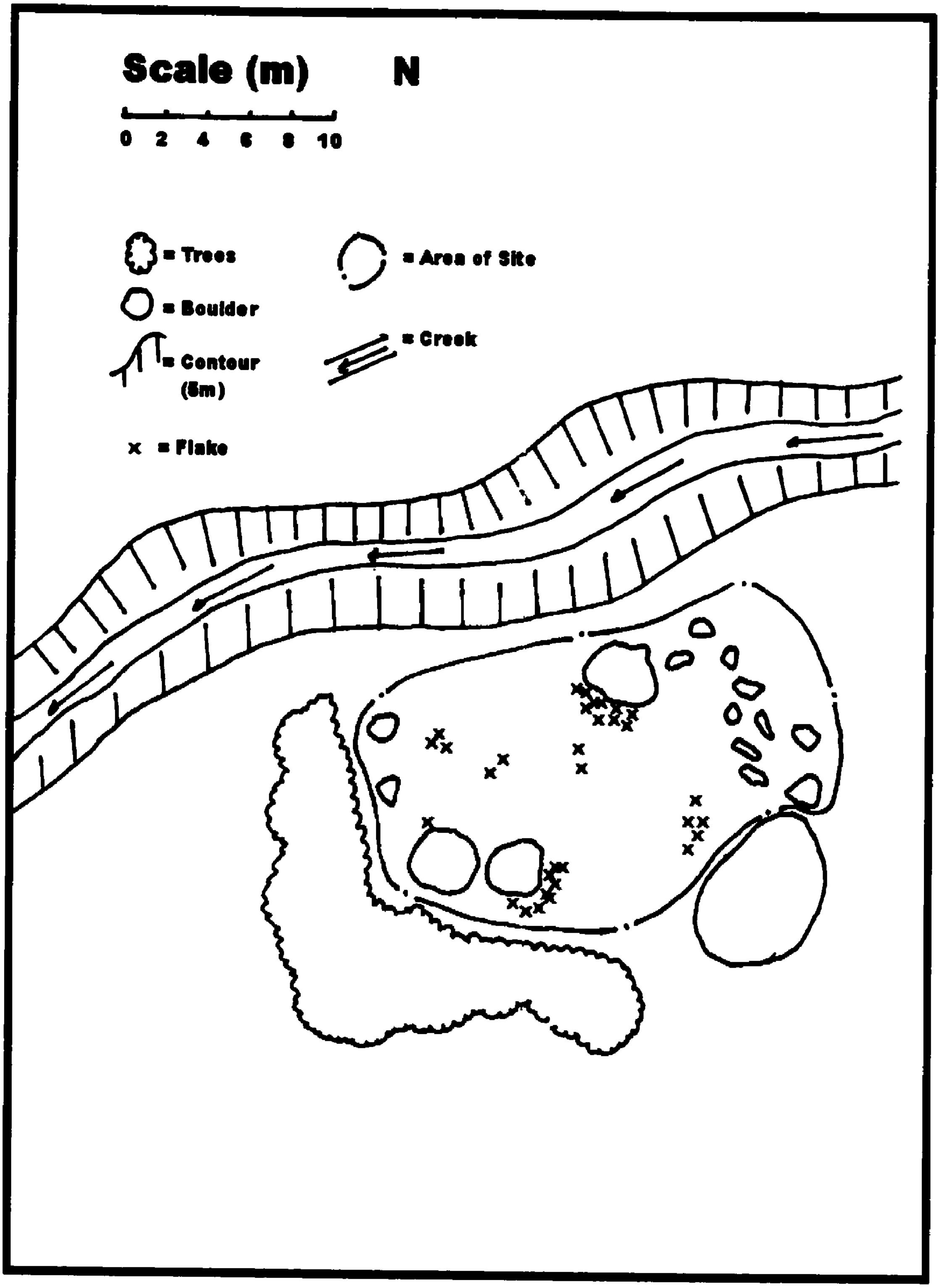

Figure 29. Map of EaRt1.

6.4.2 EaRt2

This site's dimensions are inflated due to the surrounding alpine tarn (see Figures 28, 30). Artifacts were located on several small rises above this lake. Lithic analysis of artifacts from this site can be found in Chapter 7, but material types include coarse and fine grained vitreous dacite.

This site is in the alpine zone and due to wind erosion and cryoturbation a rock field surrounds the tarn. The site is relatively flat and has a westerly aspect. Access to this area would likely take two to three days hiking from low land valley settings.

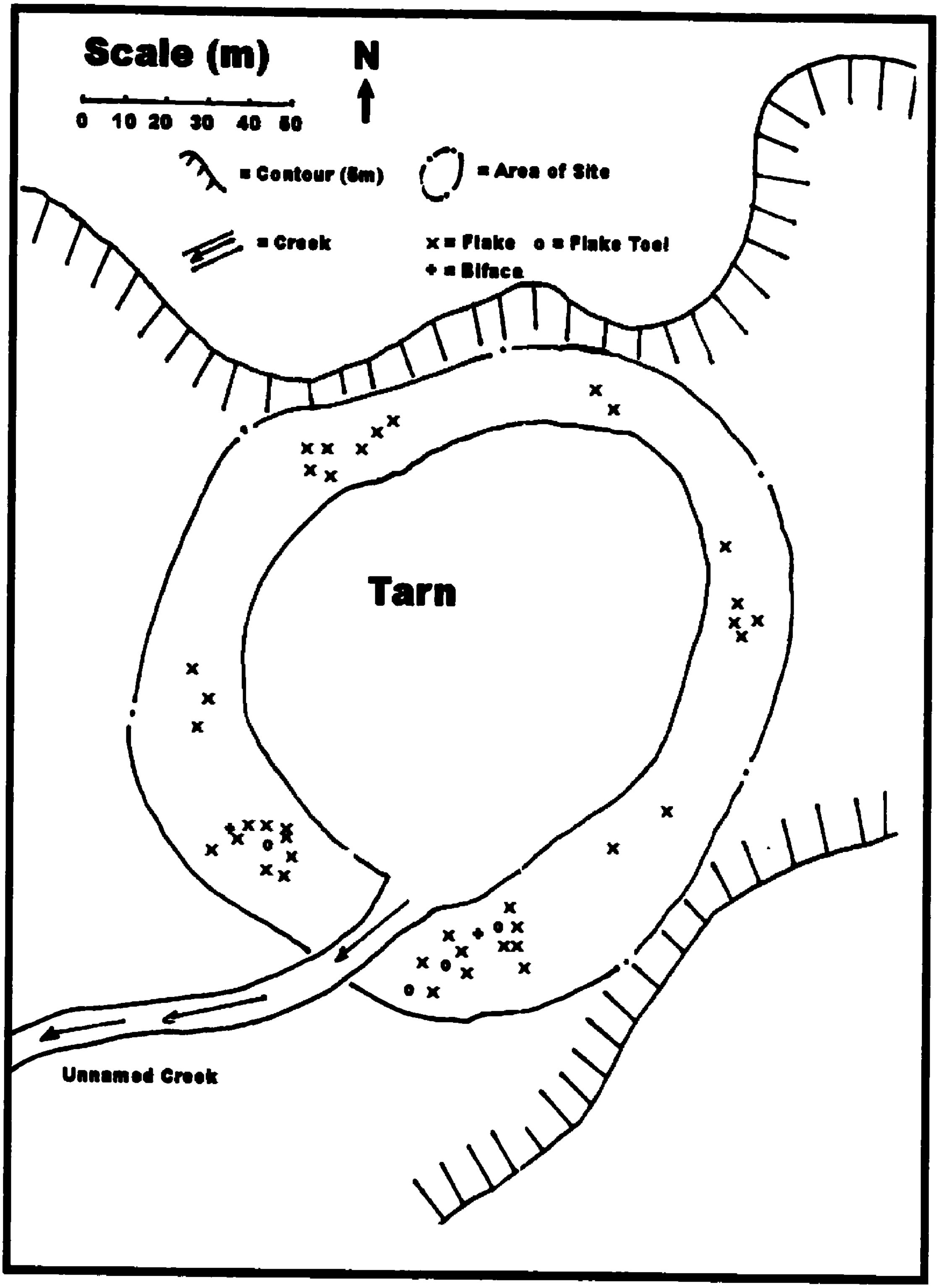

Figure 30. Map of EaRt2.

6.4.3 EaRt3

This site offers an excellent view of surrounding terrain and its surface consists of a boulder, cobble and pebble and gravel field (Figures 28, 31), in a true alpine setting. It also is near EaRt1-2 and 4. Five biface projectile points and several coarse grained dacite flakes and debitage were noticed while recording this site. Lithic analysis of this material can be found in Chapter 7.

The site is on a flat ridge and has little or no westerly aspect. Wind and cryoturbation in this alpine setting results in high ground and site visibility, but no cut banks or wind blow outs were noticed, due to little or no soil development. Access to this area would take at least two or three days hiking from low land river valley settings.

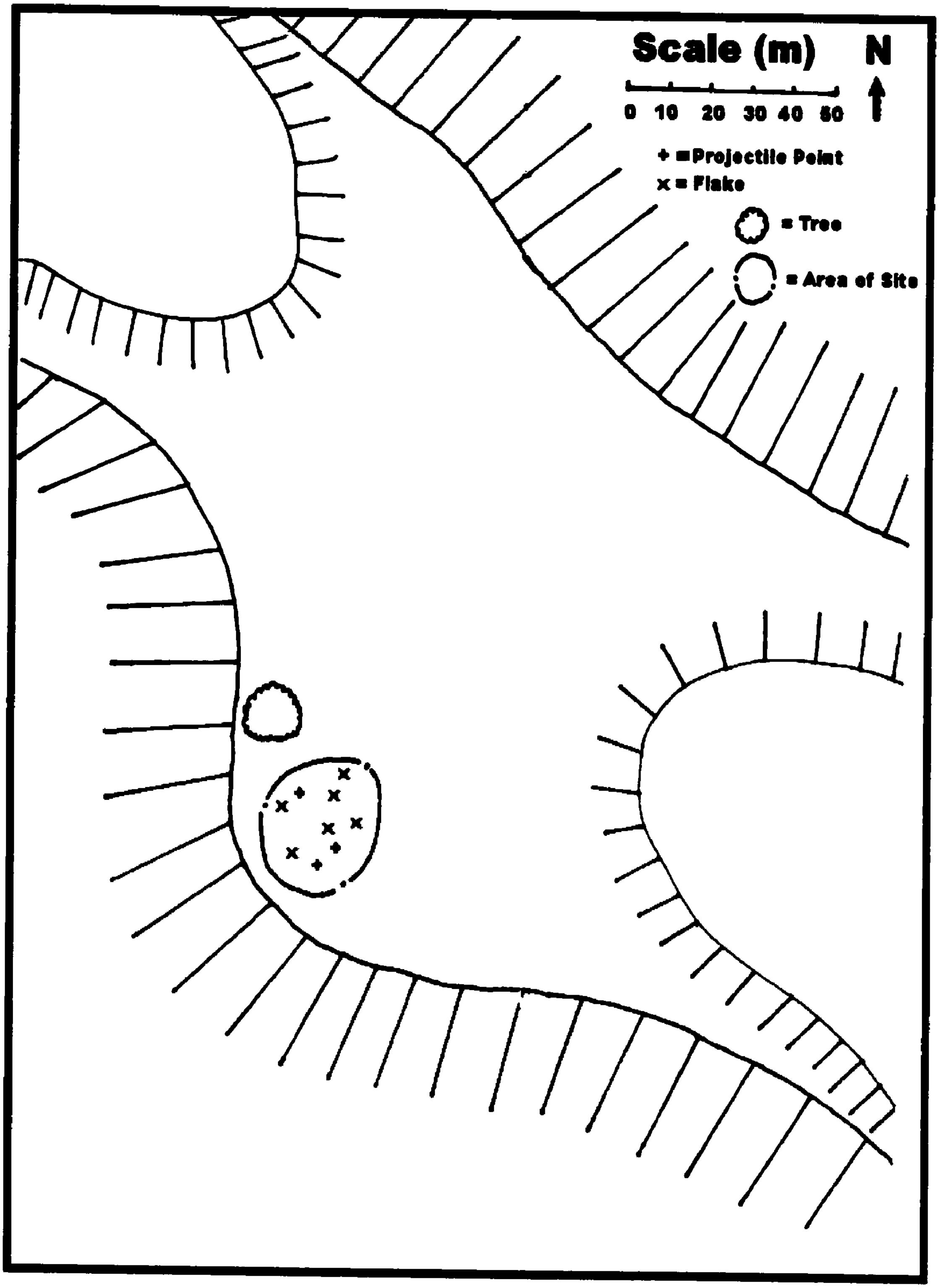

Figure 31. Map of EaRt3.

6.4.4 EaRt4

The site is within a small cirque near an unnamed creek, near EaRt1-3 (Figures 28, 32). Lithic analysis can be found in Chapter 7. This site is within the upper heath subalpine plant community, and plenty of water and fuel for fires is near by. Abundant signs of game and few economically important plant species were noted in the surrounding area. The site has a slight slope (10-15%) and a westerly aspect. Wind and cryoturbation have caused several blow out sections to develop, revealing cultural materials down to a depth of approximately 10 centimeters. Strata include Layer A, which is an organic loam, 10 YR 2/2 extending 0-4cm below surface. Layer B, is a 10 YR 5/6 to 5/8 yellowish brown silty sand with pebbles, gravel, cobbles and boulders. Layer C is a 10 YR 7/2 light gray coarse sand/glacial deposit (soil parent material). Access to this site would take one long or two shorter hiking days from the nearest low land valley setting.

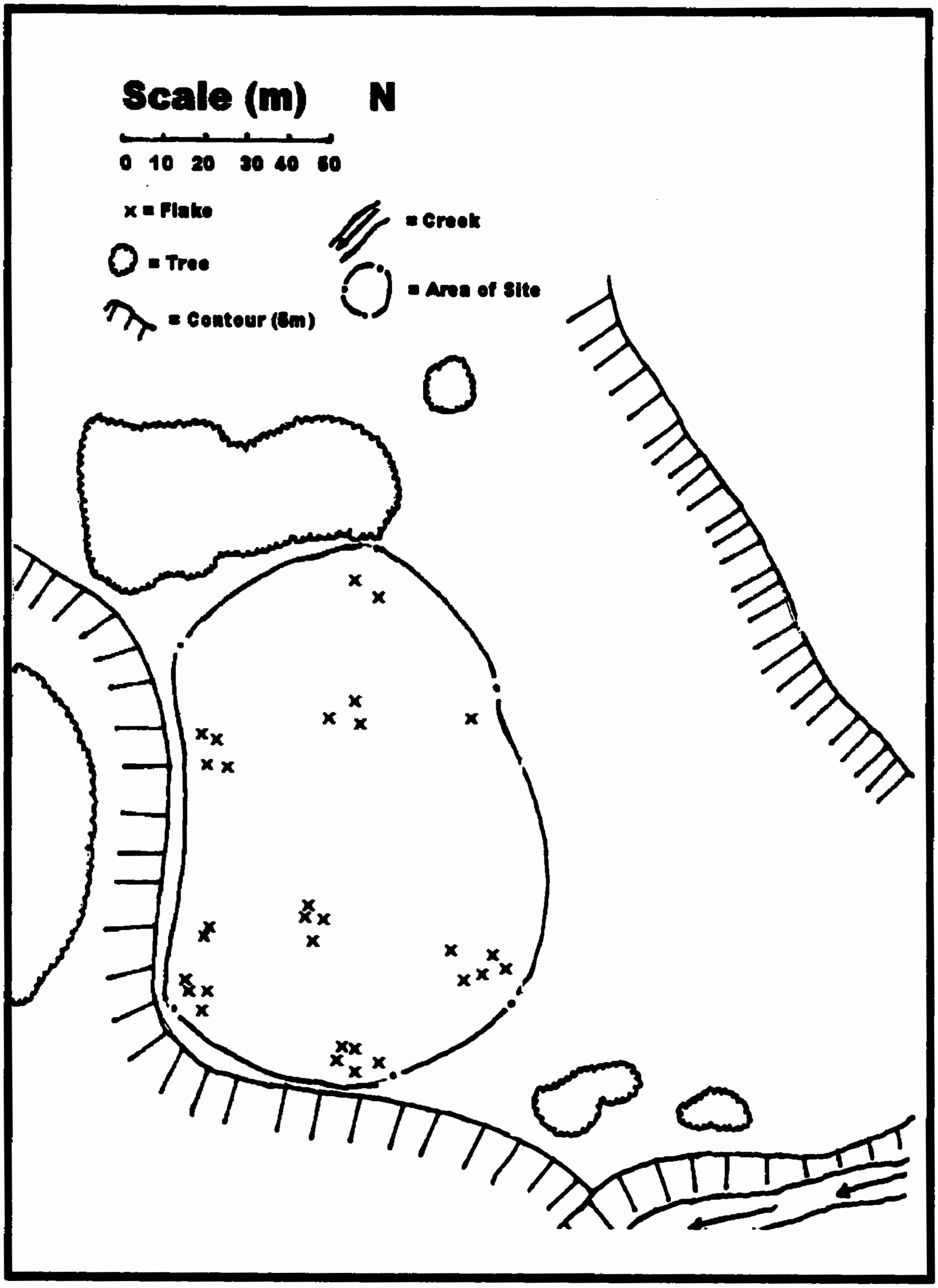

Figure 32. Map of EaRt4.

6.4.5 EaRt5

The site is situated a small ridge overlooking a medium sized lake on a small alpine plateau (Figures 28, 33), and analysis of materials from the site can be found in Chapter 7. Lithic material types include coarse and fine grained dacite, quartz crystal and obsidian. Artifacts include microblades and a microblade core, along with small flakes and debitage.

The site is in the alpine zone with plenty of water nearby, but very little wood for fires. Like other sites, wind and cryoturbation have caused several blow outs to develop, revealing cultural materials to a depth of approximately 10 centimeters. Layer A, organic loam 10 YR 2/2, extends 0-4cm below surface. Layer B, 10 YR 5/6 to 5/8 yellowish brown silty sand with pebbles, gravel, cobbles and boulders, extends from 5-10cm below surface. Layer C, 10 YR 7/2 light gray coarse sand/glacial deposit and measures greater than 10cm below surface. Access to this site would take a long day hike from the nearest lowland settings.

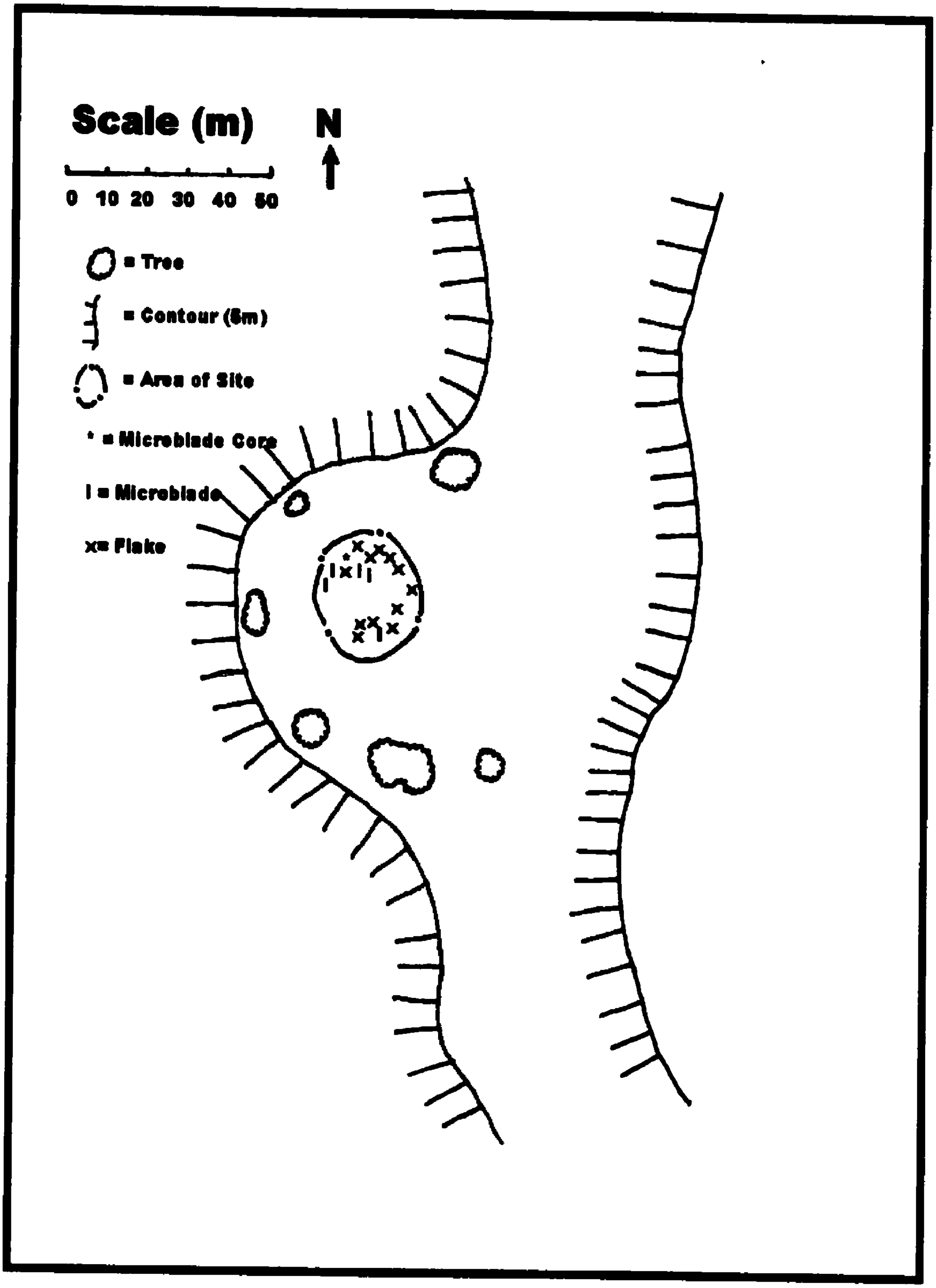

Figure 33. Map of EaRt5.

6.5 Cathedral Park Survey Findings

Over four days, 10 new archaeological sites were discovered in subalpine and alpine areas of Cathedral Park. They included two possible pre-contact rock alignment sites, five lithic scatters, a rock cairn and one historic site consisting of two rock alignments (Figure 34 and Table 8). In respect to the Lower Similkameen Indian Band's desire to not have these sites recorded with the Provincial Archaeology Branch these sites will be referred to by an arbitrary name (Reimer et al.1999:1-71). Other sites have been located on previous archaeological surveys in this area, but those site descriptions can be found in Vivian (1989: 17-38) and will not be included here.

Field crew on this survey included Rudy Reimer, Cameron Smith, Jason Nesbitt, Ara Soderman, Brenda Gould and Wilson Wylie.

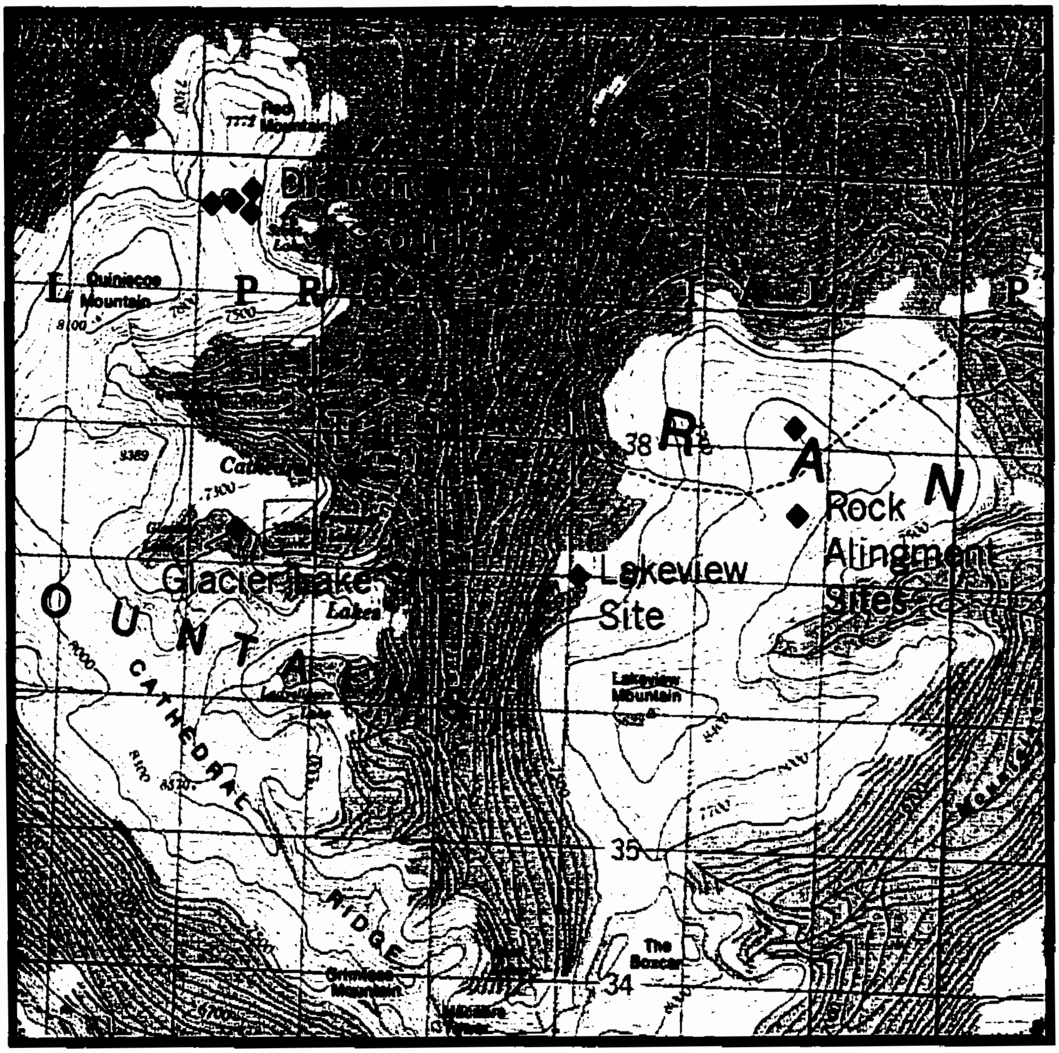

Figure 34. Site Locations in Cathedral Park, N.T.S. series map 92H1, scale 1:50,000.

Table 8. Physical Site Information of sites in the Cathedral Park Region

Site	Latitude	Longitude	Elevation	Size
Glacier Lake Rock Cairn	49° 3' 24.5"	120° 12' 13.8"	2160m	1m N-S, 0.75m E-W
Lakeview Ridge Rock Alignment 1	49° 3' 45.3"	120° 8' 53.6"	2360m	25m N-S, 10 m E-W
Lakeview Ridge Rock Alignment 2	49° 3' 33.2"	120° 8' 32.4"	2380m	32m N-S, 24m E-W
Scout Lake Lithic Scatter	49° 4' 35.9"	120° 11' 41.1"	2000m	18m N-S, 15m E-W
Quinesco to Lake of the Woods Lithic Scatter	49° 3' 30.2"	120° 11' 31.3"	1960m	6m N-S, 35m E-W
Lakeview Mountain Lithic Scatter	49° 3' 7"	120° 9' 54"	2220m	20m N-S, 20m E-W
Diamond Lake Lithic Scatter 1	49° 4' 36.4"	120° 12' 14.5"	2180m	5m N-S, 8m E-W
Diamond Lake Lithic Scatter 2	49° 4' 35.4"	120° 12' 15.7"	2185m	3m N-S, 3m E-W
Diamond Lake Isolated Find	49° 4' 40.4"	120° 12' 8.4"	2180m	1m N-S, 1m E-W
Centennial Trial Historic Camp	49° 4' 35"	120° 12' 5.2"	2170m	15m N-S, 5m E-W

6.5.1 Glacier Lake Rock Cairn

The Glacier Lake Rock Cairn is located near Glacier Lake in Cathedral Provincial Park (Figures 34-36). It measured 1 meter E-W, 0.75 meter N-S and 0.25 meter high. The cairn is near the southeast side of Glacier Lake and an unnamed creek. A large rock, that may have provided shelter, is located 3 meters northwest of the cairn.

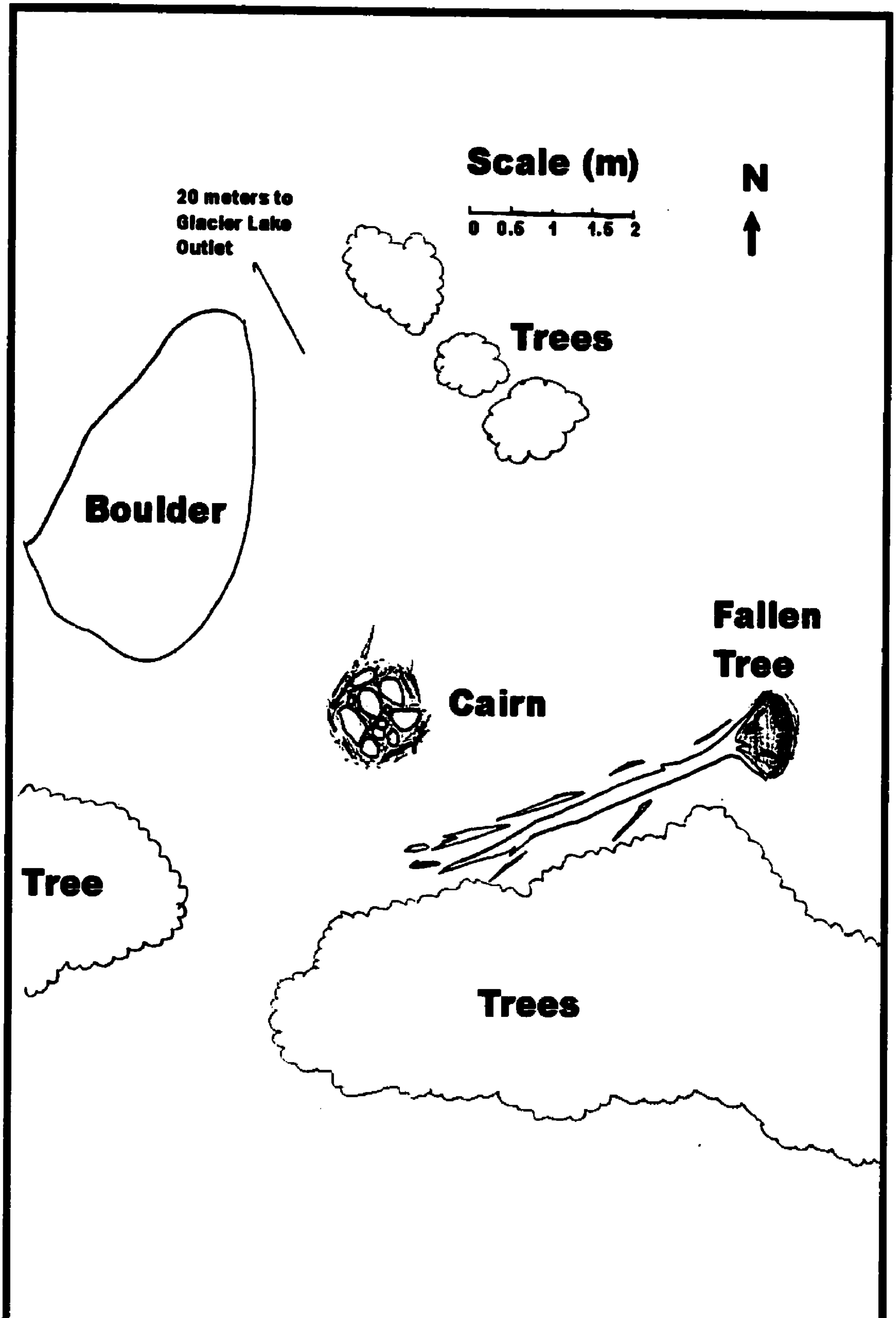

Figure 35. Map of the Glacier Lake Rock Cairn.

The cairn is most likely a food cache or cooking feature related to native seasonal camping at Glacier Lake. The association of this cairn with the three other recorded sites in this locality is unclear. No other cultural material was found with this feature (Figures 35,36). This site is located at the lake side in the meadow subalpine plant community. Abundant plant resources are available and the site is on a flat area with little to no slope and aspect. This area would be accessible from low land settings by hiking for two to three days. Geological factors and degree of paleo-environmental exposure are difficult to gauge. Minor cryoturbation certainly has taken place and soils are weakly developed. Again, the site is located near water, while plenty of wood for shelter and fires also is nearby. Three other previously recorded lithic scatter sites are close by and it is likely this feature is related to these sites.

Figure 36 Picture of Glacier Lake Rock Cairn Feature. Members of the survey crew left to right; Brenda Gould, Jason Nesbitt, Ara Soderman, Rudy Reimer.

6.5.2 Lakeview Mountain Ridge Rock Alignment One

This site is on a high alpine ridge north of Lakeview Mountain's peak (Figures 34, 37-40). It consists of four rectangular rock alignments on a slope of 20-25 percent. Rocks tend to be cobble sized. Alignment one is made up 63 rocks, Alignment two, 41 rocks, Alignment three 49 rocks, and Alignment four 49 rocks (Figure 37).

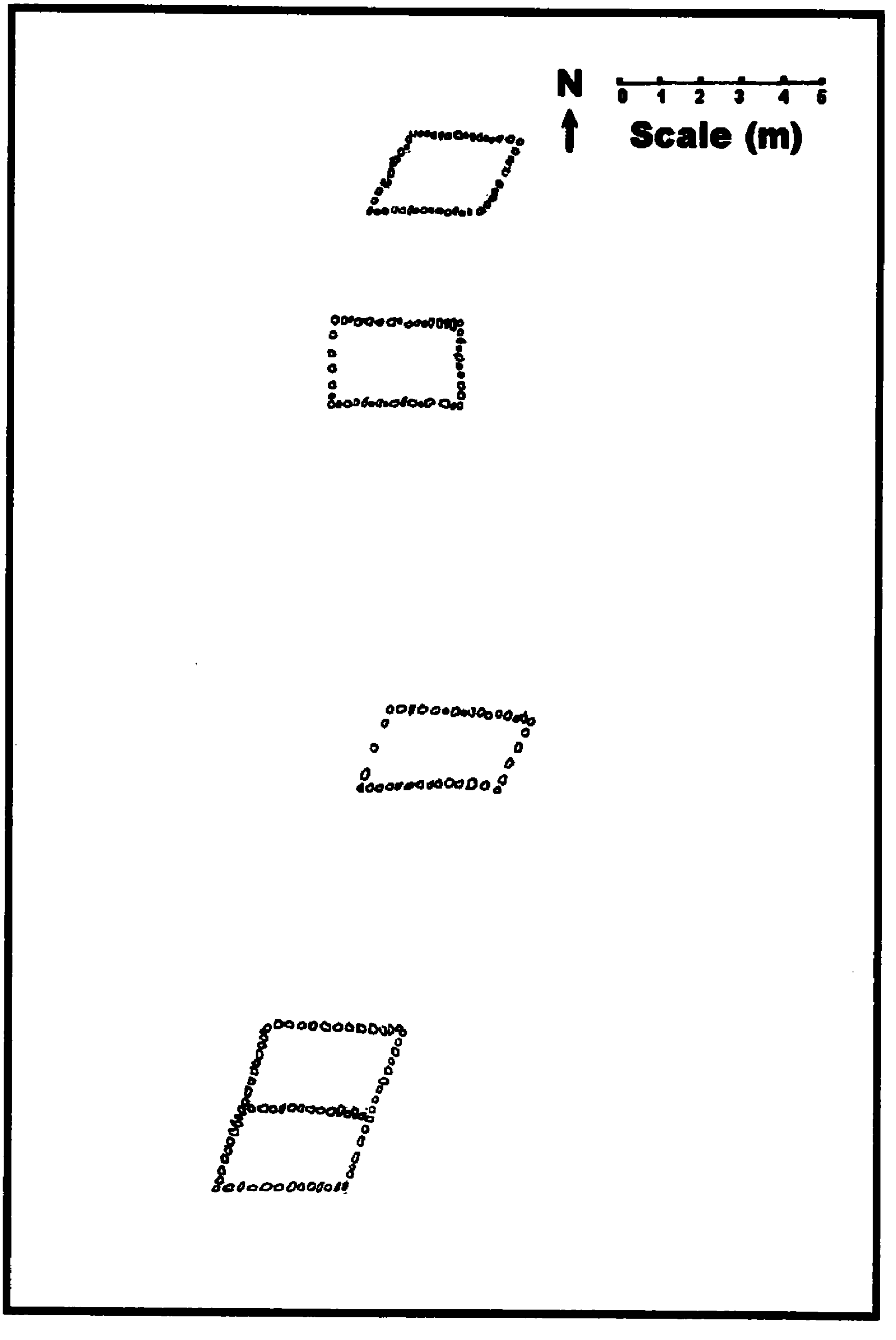

Figure 37. Map of Lakeview Mt. Rock Alignment One.

The Centennial Trail is approximately 30 meters due north of the site and one small piece of quartz crystal debitage was found 30 meters NNE of rock alignment four. Additional buried cultural material may be present in the area surrounding the site.

Figure 38. Lakeview Rock Alignment 1, Looking Northeast and down slope.

Figure 39. Lakeview Rock Alignment 1, Looking North.

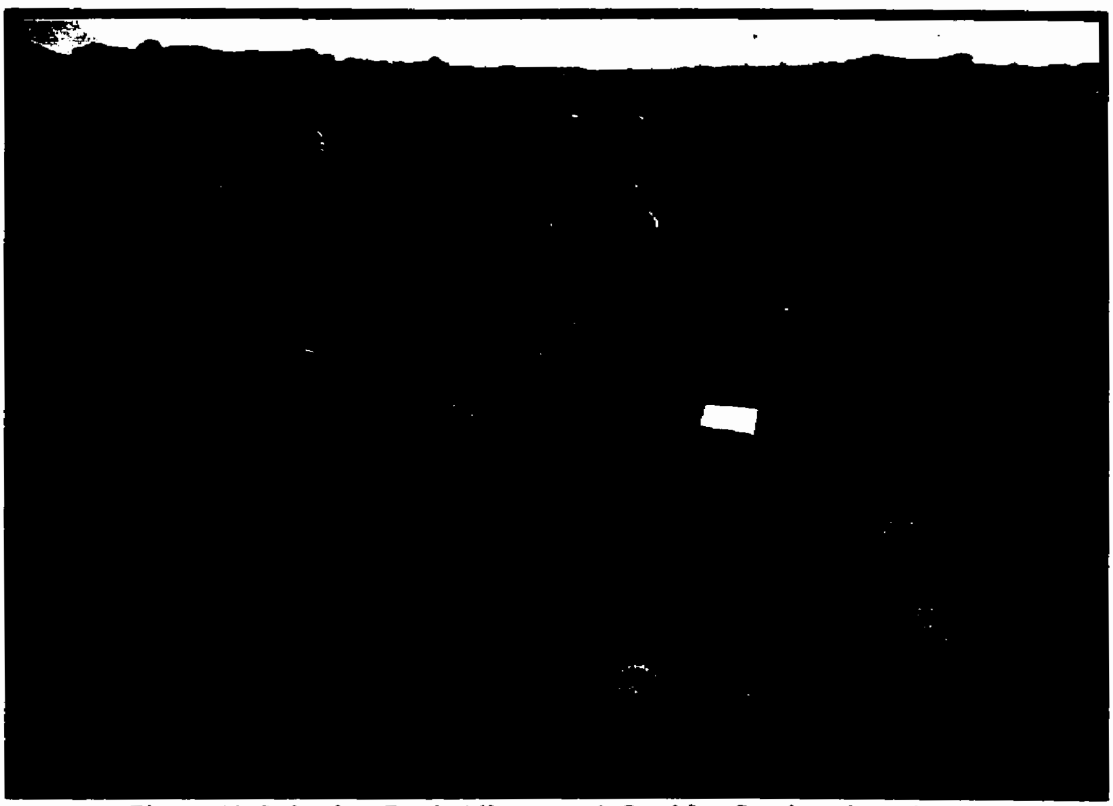

Figure 40. Lakeview Rock Alignment 1, Looking South and up slope.

The site likely represents an aspect of spiritual activity related to spirit quests, fasting and praying. The occurrence of four alignments suggests that it may have been used by more than one individual (Haynal 1999:1-20; Nicolas 1999:1-43). It offers an excellent view of several landforms important to Salishian Okanagan/ Athapaskan Similkameen beliefs, including Crater Mountain, the Ashnola River Valley, a section of the Similkameen River Valley and Twin Buttes. The rocks making up the alignment are of local origin and are partially "socketted in" a silty sand matrix. The rocks have plenty of lichen growth covering them. Lichens grow very slowly in alpine environments, while silt deposition is slow, suggesting that these rocks have been "socketted in" place for some time (cf. Reeves 1996 4-6). Inspection underneath the rocks in the alignment found no organic material. The partially buried nature of this site offers low visibility to the causal hiker, but since it is located close to the Centennial Trail it should be monitored on a regular basis.

This site is on a high alpine ridge, with very little in the way of plant resources available. Mt. Sheep and Mt. Goats could have be hunted in these locations, since there are numerous natural rock outcrops where such game could be ambushed. The site is not a good camping spot, with a 20-30% slope and northerly aspect and would be very inhospitable during cold periods. Other nearby sites include Lakeview Mountain Ridge Top Rock Alignment Two and the Lakeview Mountain Subalpine Lithic Scatter. Lakeview Mountain Ridge Rock Alignment could be accessed from low land settings by hiking two to three days.

6.5.3 Lakeview Mountain Ridge Rock Alignment Two

The site is on the flat top of Lakeview Mountain Ridge, approximately 1 km south of Lakeview Mountain Ridge Rock Alignment One (Figure 34). The site consists of 193 weathered cobble sized granite rocks forming a large square alignment. The rocks used to make the alignment are weathered red in color and have less lichen growing on them than surrounding naturally deposited rock and rocks found at Rock Alignment One. This suggests that the rock alignment is younger in age than the parent rock material. This feature also is likely younger in age than the first rock alignment found to the north (Figure 41).

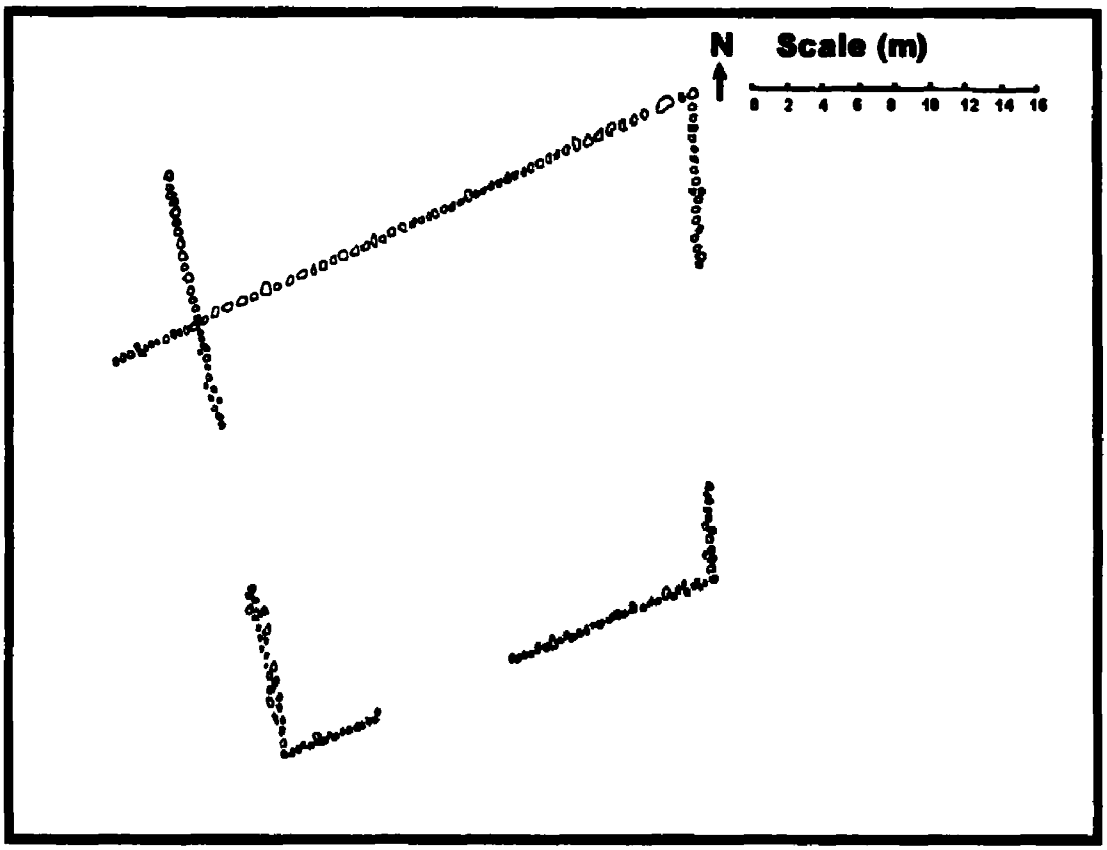

Figure 41. Map of Lakeview Mt. Rock Alignment Two.

This site, like Lakeview Mountain Ridge Rock Alignment One, may be related to spirit quest, fasting and praying activities (Haynal 1999:1-20; Nicholas 1999:1-43). The overall rock alignment at this site is much larger than Rock Alignment One. Openings occur at the mid points of east, south and west walls. Several natural rock features due to cryoturbation were found both inside and outside of the rock alignment (Figure 42). None of the rocks in alignment two are "socketted in," or have substantial lichen growth on them.

Figure 42. Section of Lakeview Mt. Rock Alignment Two.

This site is located on a high alpine ridge with little to no plant and animal life, on a flat land surface with no aspect, in an unappealing camping area. It can be reached from low land settings by a two to three day hike. Geological exposure offered plenty of construction material for this feature. Soils are weakly developed and Lakeview Mt. Rock Alignment One and the Lakeview Mt. Subalpine lithic scatter are the only sites nearby.

This site does not reflect everyday subsistence needs, therefore different variables such as context should be considered when attempting to reconstruct the function of such non-subsistence sites.

6.5.4 Scout Lake Lithic Scatter

The site is beside a trail on the east side of Scout Lake. It consists of one yellow chert biface (wood or antler billet) flake, a single piece of black chert debitage, one piece of flaked quartzite, a split dacite cobble tool worked along one edge, (fire cracked rocks), and charcoal from past camping fires. More cultural material may be present below the surface (see Figures 34, 43-47).

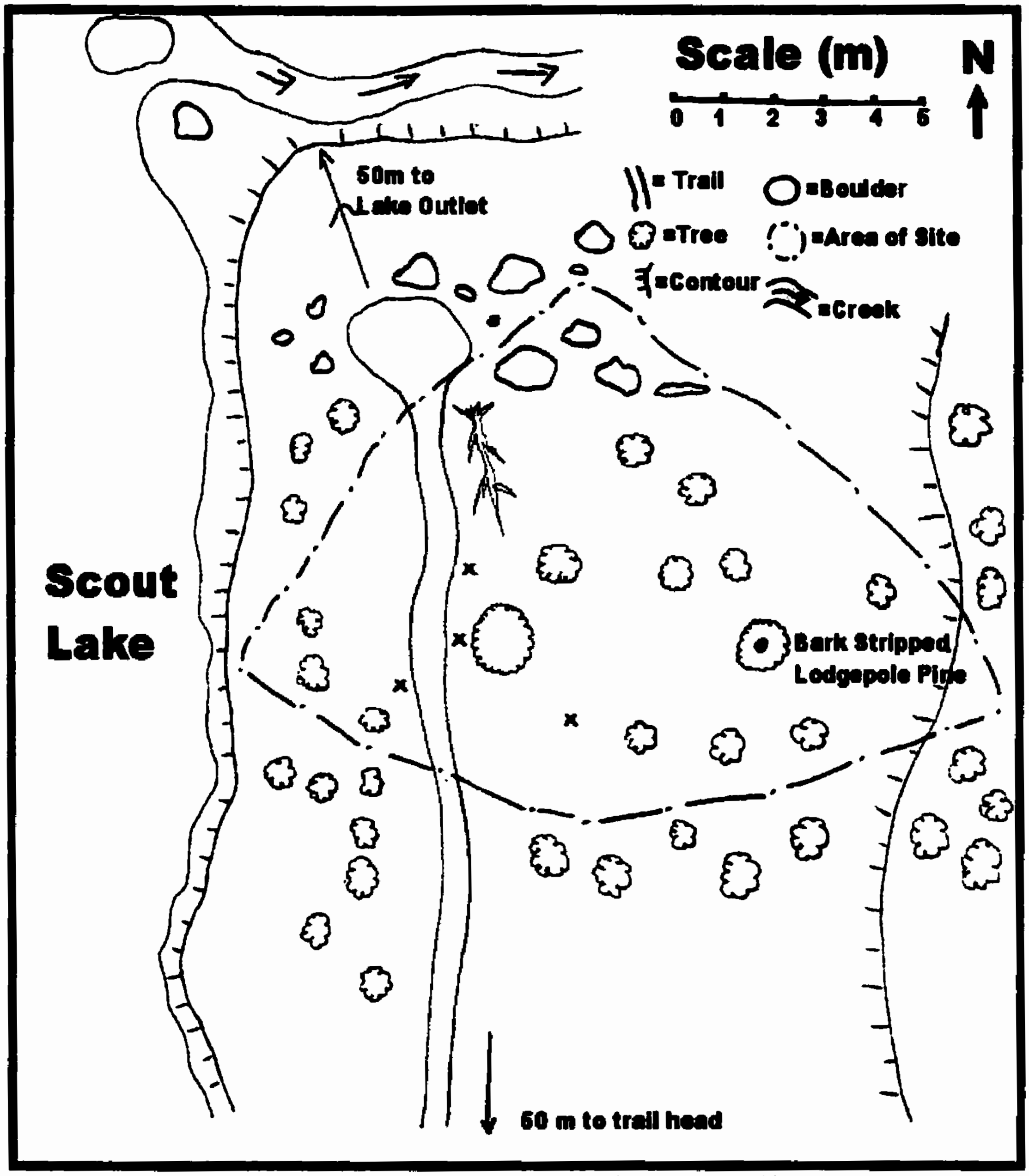

Figure 43. Map of the Scout Lake Lithic Scatter Site.

Figure 44. Location of the Scout Lake Lithic Scatter. The Site is at the far left middle center of the photo, near the outlet of the lake.

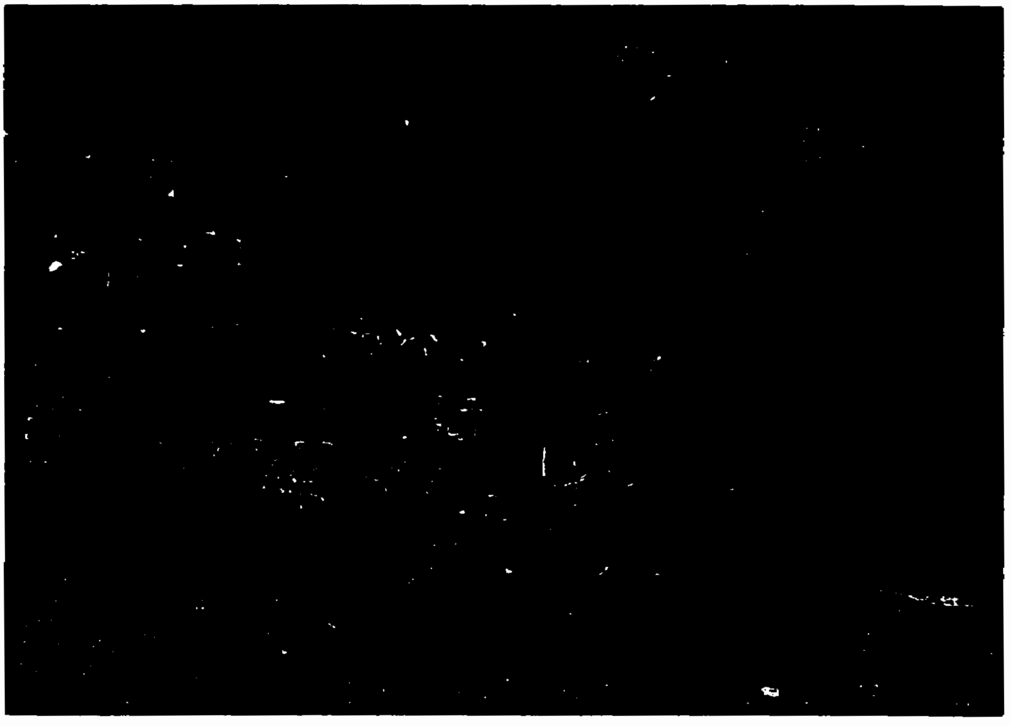

Figure 45. View of site from on top Red Mountain, looking down at Scout Lake. Again the site is located near the center of the photo, near the trees close to the lakes' outlet stream.

Figure 46. Chert Biface Flake at the Scout Lake Site.

A single bark stripped lodgepole pine tree was associated with the site (Figure 47). The slope around the tree is flat, there are tool marks from cambium removal at the base of the scar and slight gouges from scraping can be found at the mid point and top of the bark strip scar. The measurements for this culturally modified tree are as follows;

Length: 90 cm,
Width: 18 cm (at the mid point of the scar, also the widest point),
Thickness: 5.5 cm,
Scars' Height Above Ground: 41 cm,
Diameter of Tree At Breast Height: 158 cm.
No increment boring was done to determine the age of this feature.

Figure 47. Photo of Scout Lake Culturally Modified Tree, Ara Soderman poses for scale beside the tree.

The site is located in the subalpine park land plant community, with numerous plants and animals present. It is on flat land one meter above modern lake levels and has no aspect. The lake itself is in a large cirque basin which is filled by melt water from a higher elevation and drains via a small creek at its northeast end. Access from low land areas would take one to two days hiking time. This location may have been the first camp area used by natives entering the region from the north (i.e. up the slopes of Scout Mountain). Foot surveying along the northern slopes of Scout Mountain located several relatively easy travel routes from lowland areas.

Geological exposures are apparent in trail cut banks and wind blow out areas. Soil development is weak in some locations, and plant cover limits visibility in other areas around the site. A hiking trail through the middle of the site may have directly impacted a major portion of the sand and silt sediments. Campers and hikers going along the trail may have taken artifacts from the Scout Lake lithic scatter.

6.5.5 Quinisco to Lake of the Woods Trail Lithic Scatter

Sections of this sites' silt to fine sand sediments have eroded out along the meter wide hiking trail between Quinisco and Lake of the Woods (Figure 48). The site extends 2.5 meters to the north and south of the hiking trail. Two chert core fragments and four chert flakes were observed on the surface (Figures 48-50).

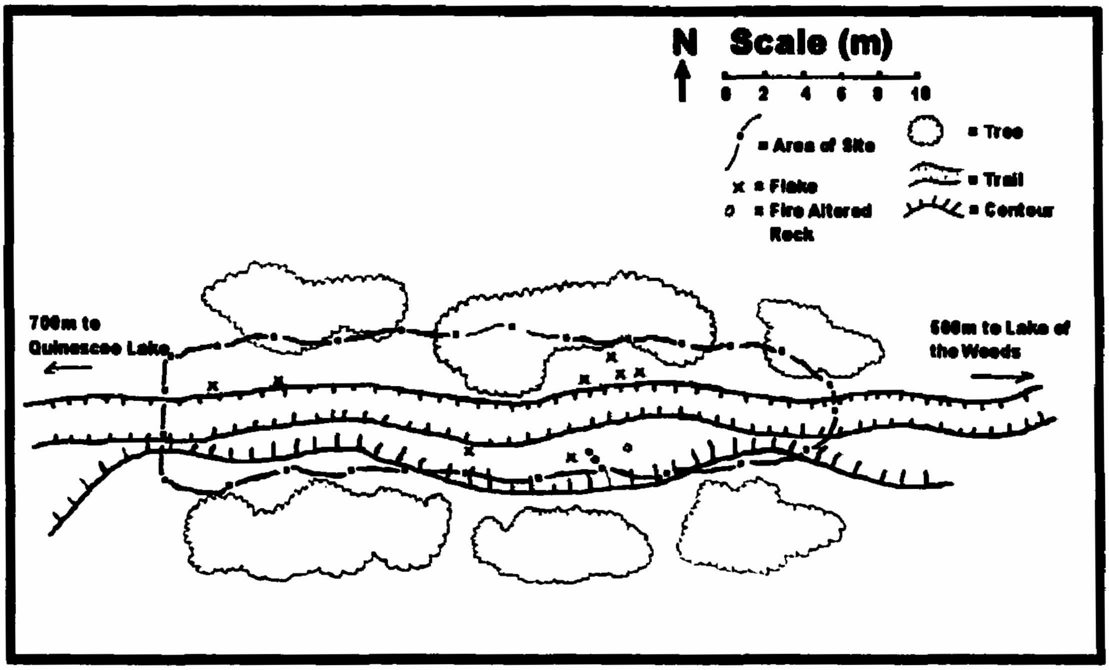

Figure 48. Map of Quinesco to Lake of the Woods Lithic Scatter Site.

The flakes presumably were for expedient cutting, scraping, piercing and other activities related to hunting and/or gathering of resources. More cultural material may be underground and beside the hiking trial, which may alter this preliminary interpretation. This site will continue to be impacted since it is located close to the hiking trail, and continued monitoring should be conducted.

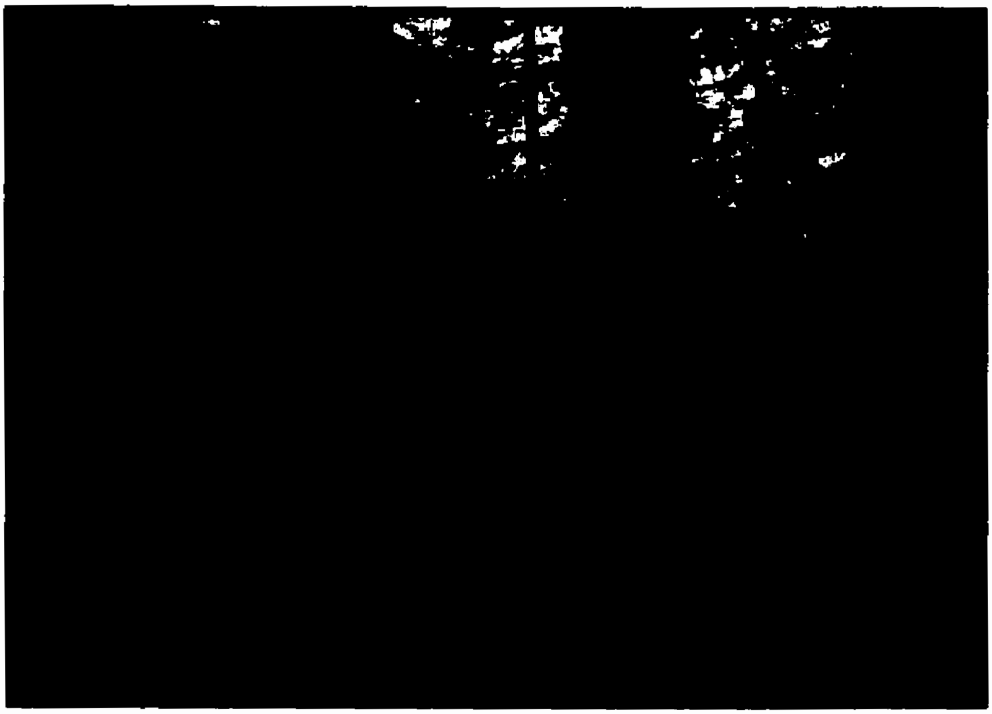

Figure 49. Location of the Quinesco to Lake of the Woods Trial Site.

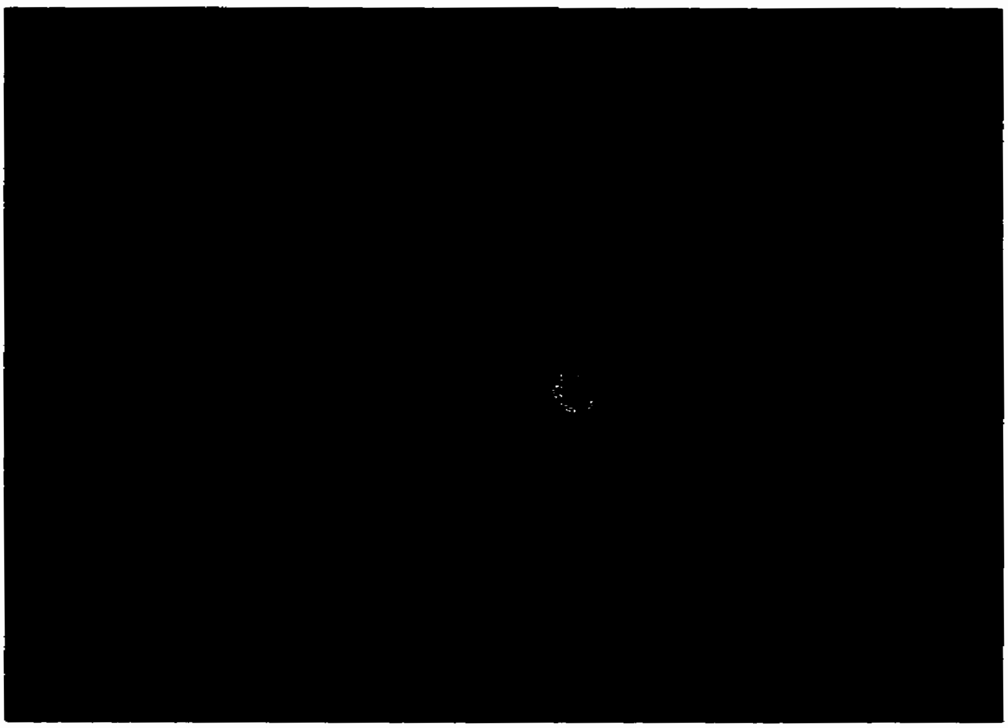

Figure 50. Flake found along side trail.

This site is located in the upper montane forest plant community, where the brush is broken by small grassy meadows. This locality is attractive for numerous game animals. The site is on a 20% slope with a northerly aspect. Access from low land settings would take one or two days travel time. Geological exposure is limited to the cut banks of the hiking trail that goes through the site. They indicate that the site extends to a depth or approximately 10 cm. Soils in these cut banks are weakly developed.

6.5.6 Lakeview Mountain Subalpine Lithic Scatter

This site is located in a small cirque like basin on the west slopes of Lakeview mountain (Figures 34, 51). A large chert outcrop is located 300 meters at 100 degrees from the site.

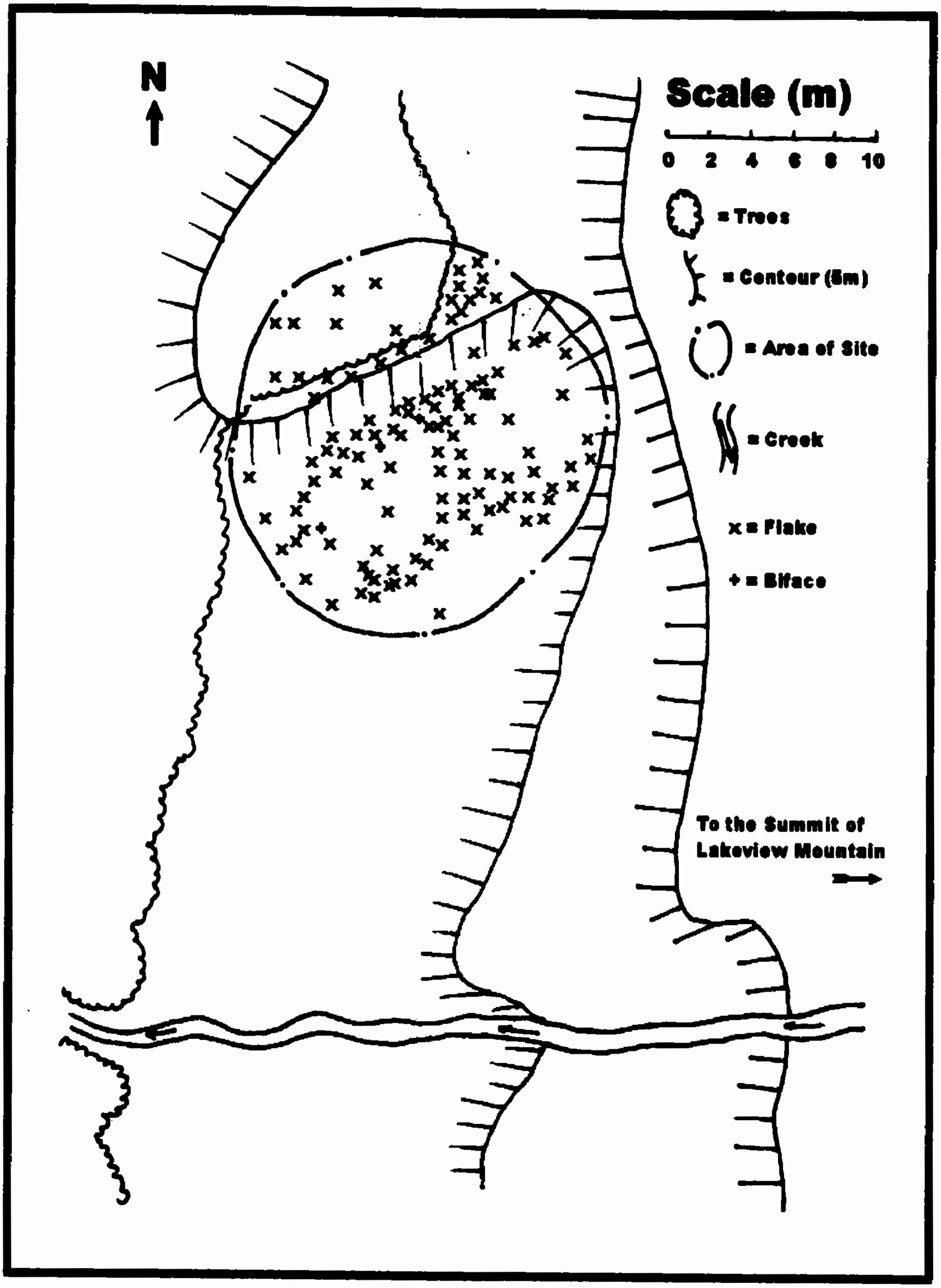

Figure 51. Map of Lakeview Mt. Subalpine Lithic Scatter.

The site assemblage consists of over 100 chert flakes, tool flakes and debitage (Figures 51-55), with all stages of stone tool manufacture represented. Three biface knife tools were found among the numerous flakes and debitage. Several artifacts were found laying flat, or pointing out of the ground surface at a variety of angles, probably due to ongoing cryoturbation of the coarse sand to silt sized sediments present on site.

While recording this site, it was noted that there were three large patches of snow present nearby. If these snow packs last almost year round they would offer a refuge to game animals during the hot summer month when insect pests are at their most numerous. Pre-contact hunter most likely knew of this animal behavior and used the snow packs in the area to funnel and ambush game. Snow packs also may have been used to store foods until further processing could be done on them.

Figure 52. Location of the Lakeview Mountain Subalpine Lithic Scatter.

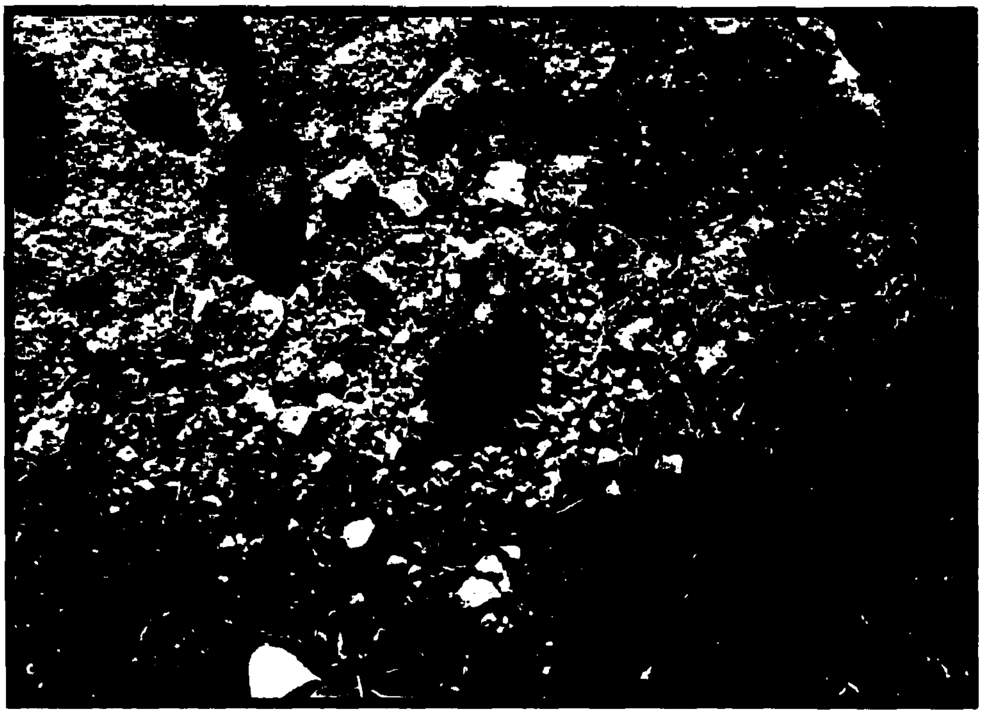

Figure 53. Photo of Biface One found at the Lakeview Mountain Subalpine Lithic Scatter.

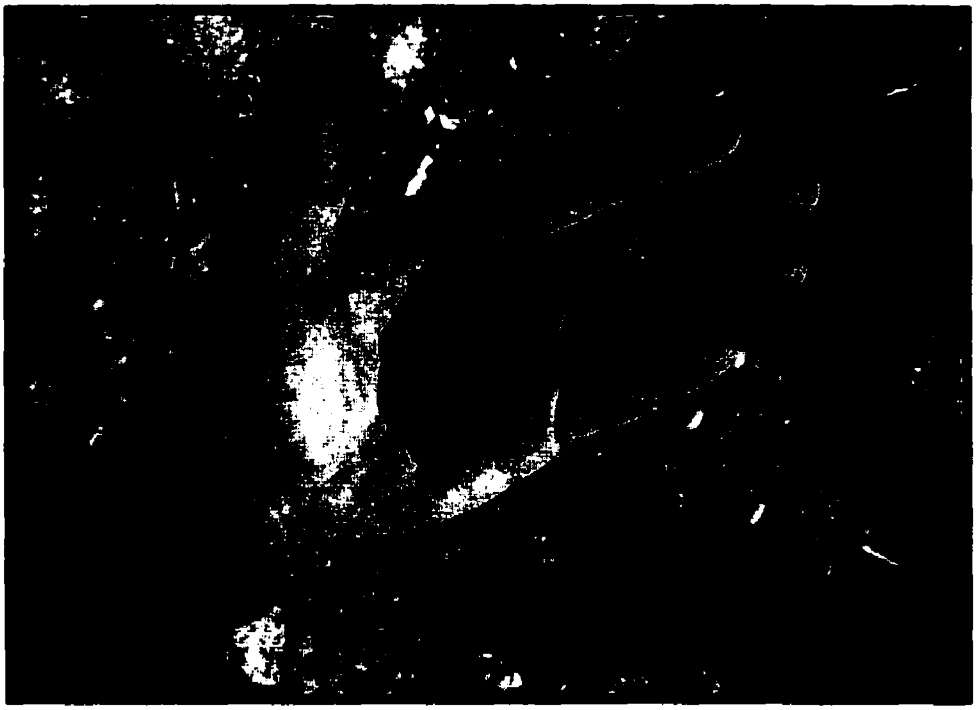

Figure 54. Photo of Biface Two found at the Lakeview Mountain Subalpine Lithic Scatter.

Figure 55. Photo of Biface Three found at the Lakeview Mountain Subalpine Lithic Scatter.

This site is presently in the upper subalpine meadow parkland plant community, (Figure 49), on a 20% slope with a westerly aspect. It can be accessed from low land settings in two days travel. Geological exposures cause good site visibility, with wind blow outs and cryoturbation moving artifacts to the surface (Figures 53-55). Soil development is weak and artifacts were seen in a cut bank exposures to approximately 5 cm below surface.

6.5.7 Diamond Lake Lithic Scatter One

The site is on a small ridge near Diamond Lake (Figures 34, 56-59). Scout Mountain is almost directly north, Red Mountain is almost directly southwest, while the Centennial Trail is 20 meters due east. Two lithic clusters of lithic scatter comprise this site. Over 20 chert flakes were found in cluster 1 at the center of the site (Figure 56) while three flakes were found in Cluster Two on the east side of the site (Figure 56). Cluster One measured 5m N to S, and 8m E to W. Cluster Two is 20m from Cluster One and measures 1m N to S, 1m E to W (Figure 56).

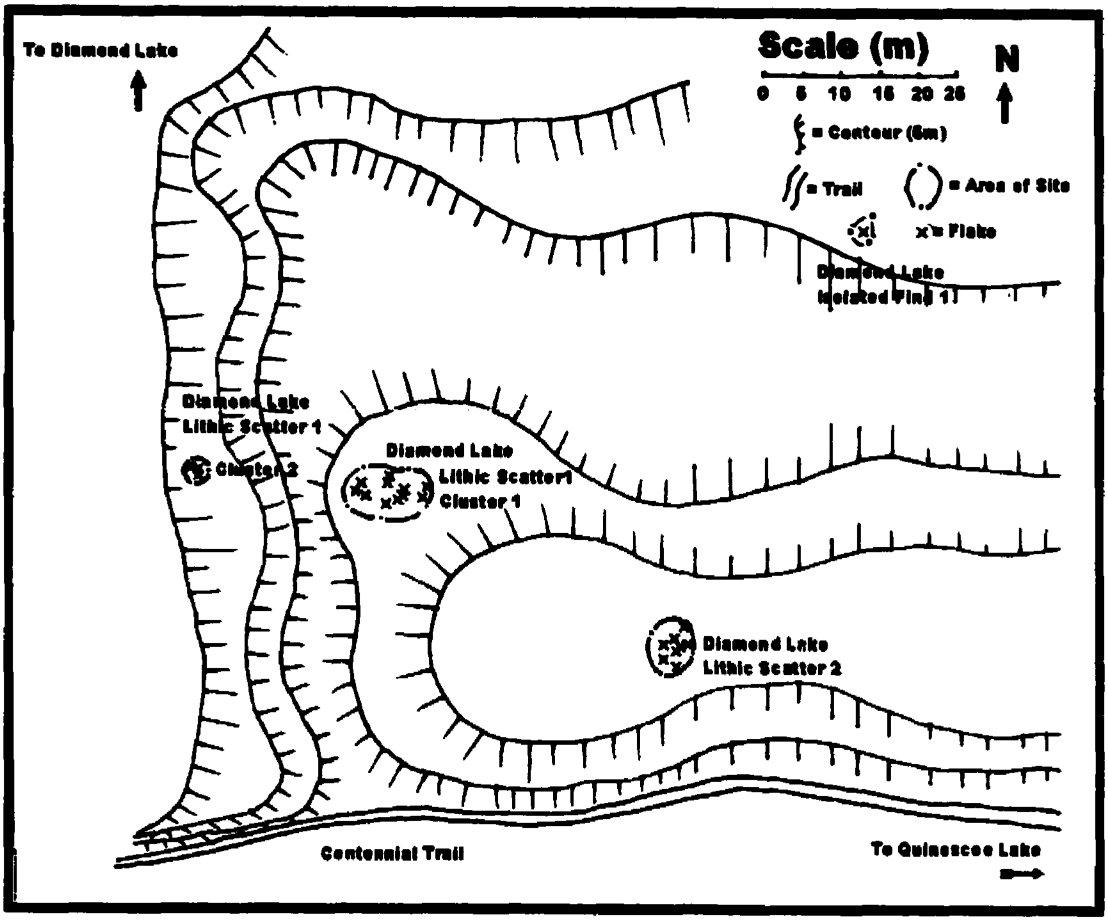

Figure 56. Map of Diamond Lake Lithic Scatters One, Two and the Isolated Find.

All the lithic material in Cluster One is small in size and probably the result of re-sharpening of a biface no longer present or visible on the surface. Bifacial tools were most likely used to hunt, butcher and process game animals, but more specific uses cannot be extrapolated. The lithic material present in Cluster Two appears to be the result of flake production for cutting, piercing and scraping purposes. The site is not in any immediate danger, but natural freezing and thawing of the silt to fine sand sized sediments is displacing some of the artifacts (Figures 57-59).

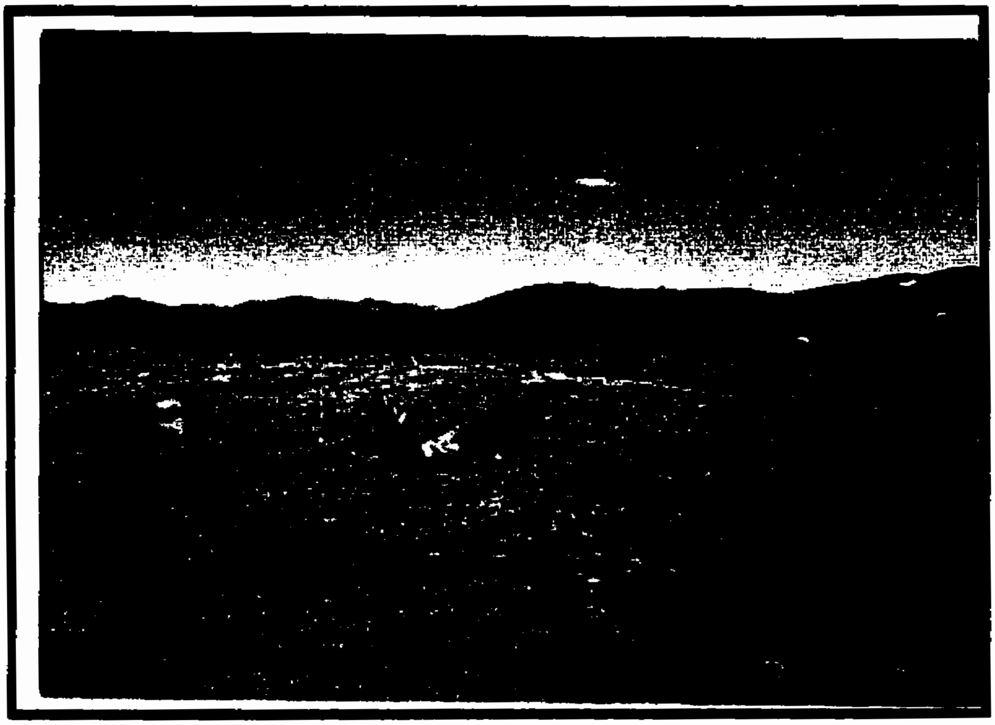

Figure 57. Cameron Smith Analyzing lithics at Diamond Lake Lithic Scatter 1.

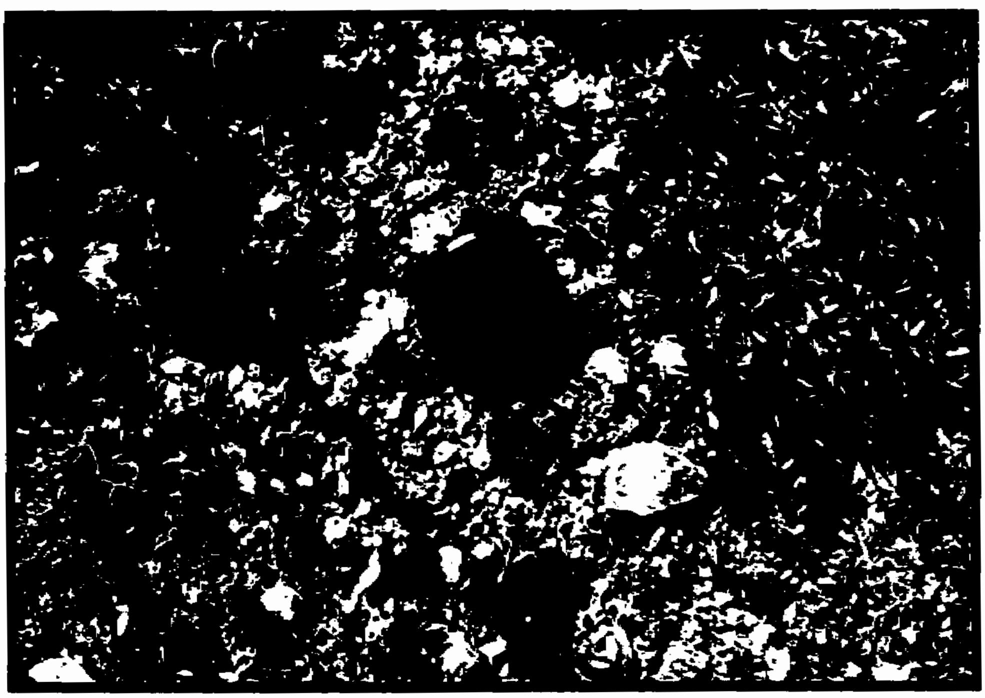

Figure 58. Flakes found at the Diamond Lake Lithic Scatter.

Figure 59. More flakes found at the Diamond Lake Lithic Scatter.

This site is located on a high alpine ridge with little to no plant life present. The top of this ridge is flat and has no aspect. The site could be accessed from a low land setting in a two to three day hike. Geological exposure is high and soils are weakly developed. Cryoturbation also has caused artifacts to be pushed to the modern land surface.

6.5.8 Diamond Lake Lithic Scatter Two

Although this site is only 40 meters away from Diamond Lake Lithic Scatter One its artifacts indicated a separate cultural event (Figures 34, 56, 60).

The assemblage consists of 10 chert flakes, including three large flake tools which were probably used for cutting meat and bone (Figure 56). Other lithic material is not diagnostic and is probably a by-product of tool production. Natural displacement of artifacts by freezing and thawing of the silt to sand sized sediments is constantly occurring (Figure 60). This site also is in close proximity to the Centennial Trail and should be monitored on a regular basis.

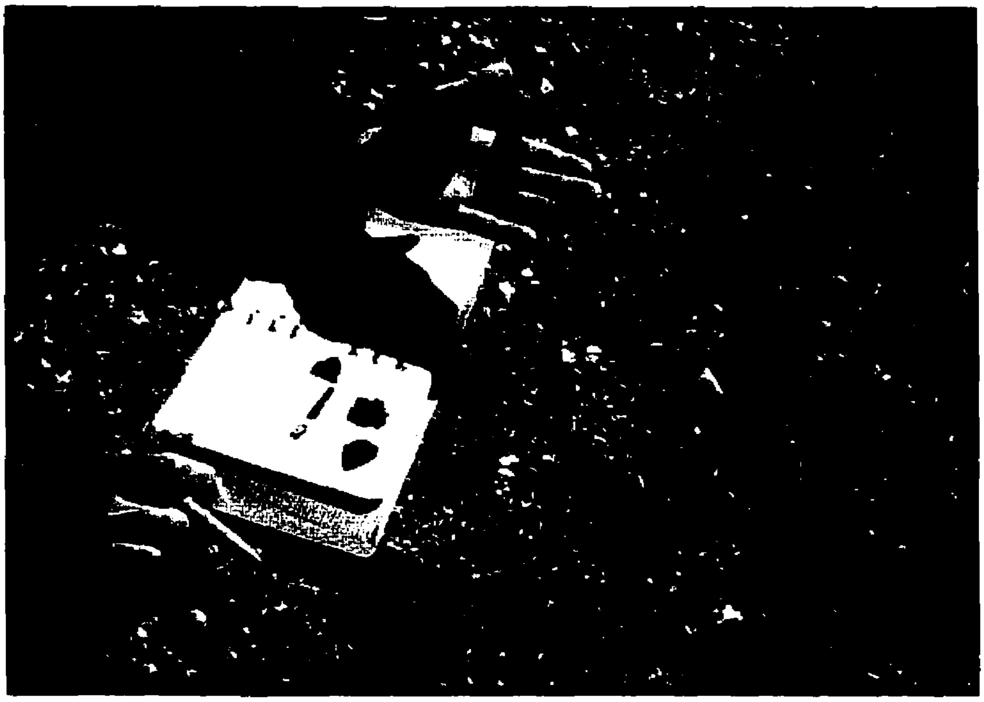

Figure 60. Flakes found at the Diamond Lake Lithic Scatter 2 site.

This site is located on a high, flat alpine ridge with no aspect and little or no plant life nearby. It could be accessed from a low land settings in two day hike. Geological exposure is good, soil development is weak and, again cryoturbation has caused artifacts to be pushed to the modern land surface.

6.5.9 Diamond Lake Isolated Find One

This site consists only of a single flake of green petrified wood (Figures 34, 61). The site is located on a small ridge 50 meters from the Diamond Lake Lithic Scatters. The site is in no immediate danger of being disturbed, but should be monitored, along with Diamond Lake Lithic Scatters One and Two.

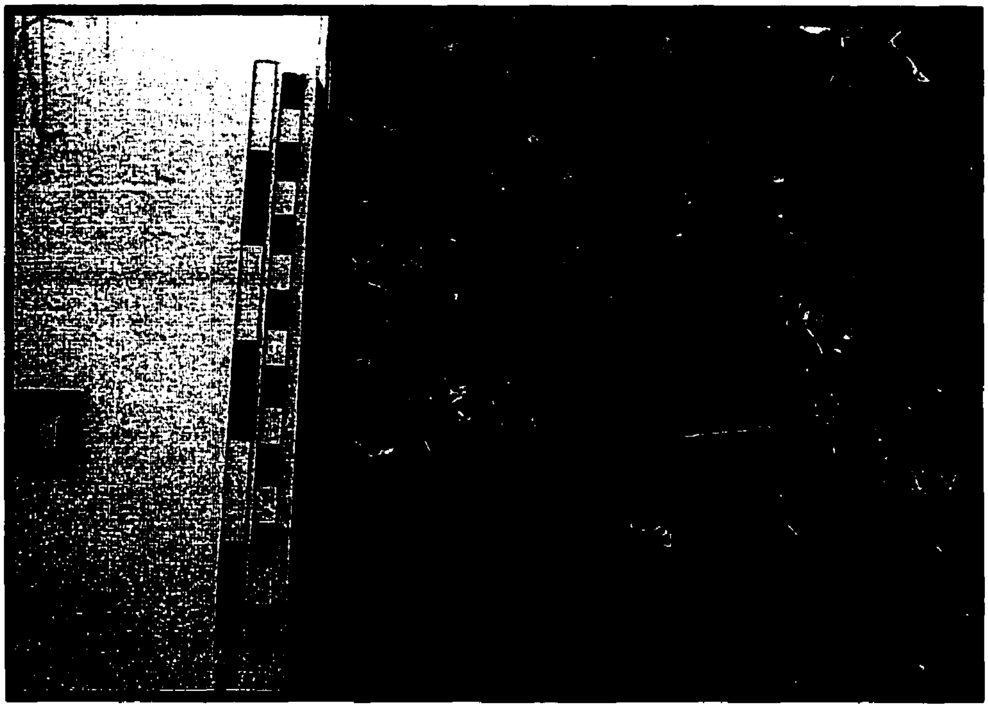

Figure 61. Photo of Isolated Flake found near Diamond Lake.

Much like the Diamond Lake lithic scatters, this site is located on a high alpine ridge. It is considered a separate site because of its lithic material, since the petrified wood is believed to come from Crater Mountain, 10 km to the NE. The site is on a flat surface with no aspect. Geological exposure is high, soil development is weak and it is likely that cryoturbation has pushed this artifact to the surface. The area is accessible in a two day hike from low land locations.

6.5.10 Centennial Trail Historic Camp Sites

Two rock alignments were found in direct association with the Centennial Trial near the Diamond Lake locality (Figures 34, 62, 63). They are most likely historic in origin since they are in close proximity to the Centennial Trail and are still standing in up right positions. They lack substantial lichen growth, while deposition of silt to sand sized sediments around the rocks is minimal to none. Diamond Lake Rock Alignment One is located one meter north of the Centennial Trial and measures 4m N-S, 3.5m E-W. Diamond Lake Rock Alignment Two is 5m due south of Diamond Lake Rock Alignment One, has an ovoid shape and measures 3m N-S, 5m E-W. These features are visible once one hikes up the Centennial Trial from the west side of Scout Mountain.

This site is located on a high alpine ridge at the side of a historic trail, in a flat area with no aspect. Geological exposure is high and offers plenty cf "construction material" for such features. Soil development is weak and small historic artifacts from the past century were found around the site. Travelers could access this area from low land valleys in one to two days time via the Centennial Trail. The age of this site is likely 100-10 years old.

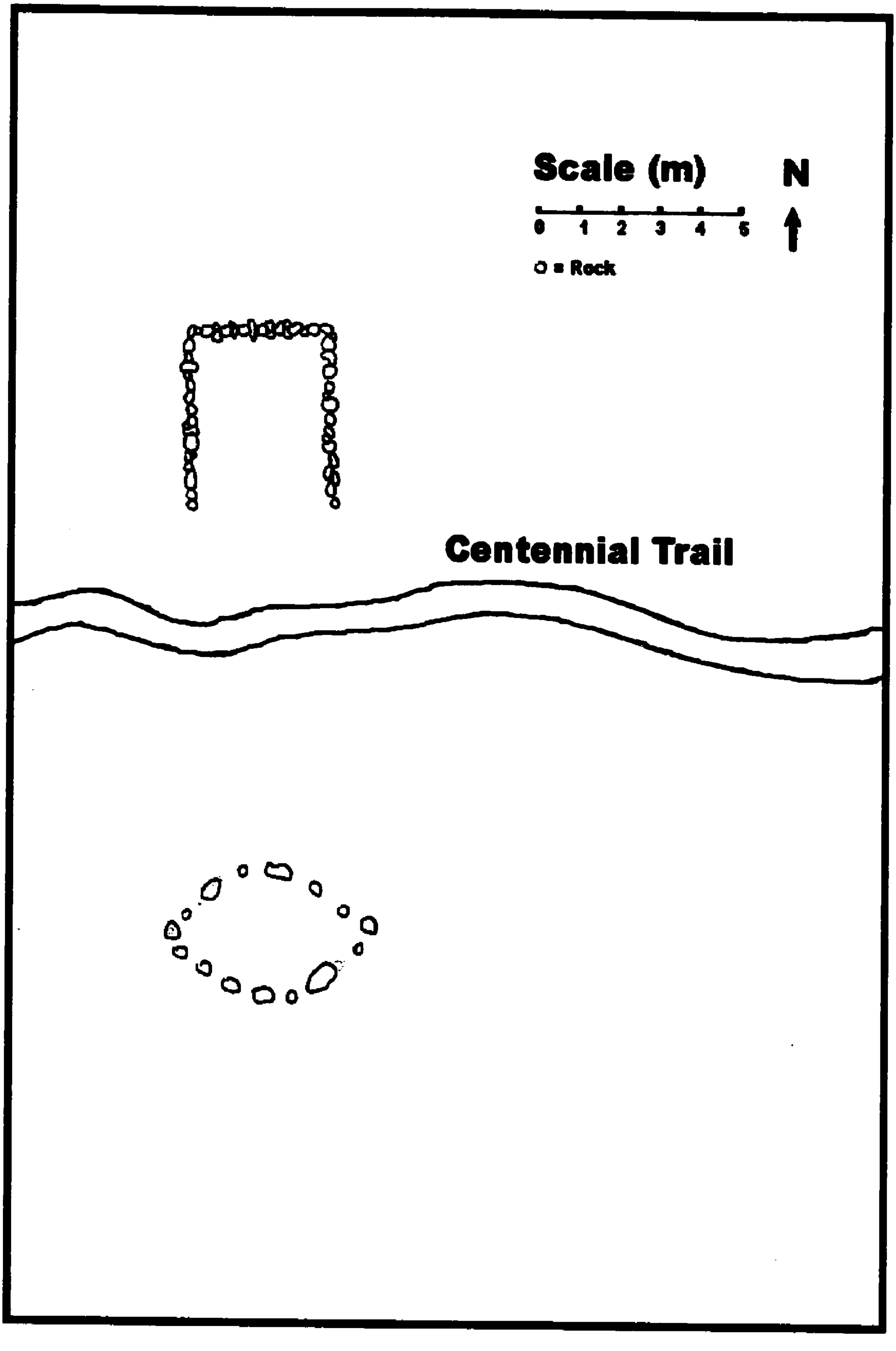

Figure 62. Map of the Centennial Trial Historic Rock Alignments.

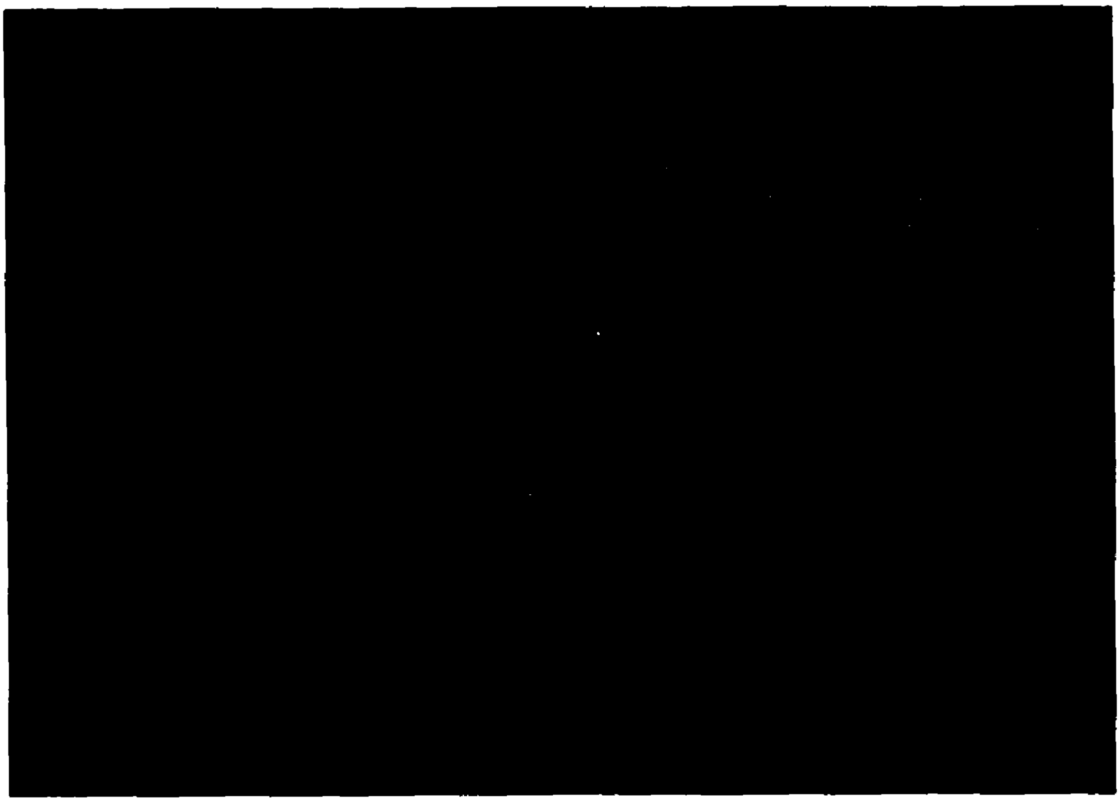

Figure 63. Cameron Smith stands beside Historic Rock Alignments found near the Centennial Trial and Diamond Lake.

Chapter 7 Lithic Analysis

Sometimes even when the wind is with you, it's against you.
-A mountaineers' saying.

7.1 The Role of Lithic Scatters in Archaeological Interpretation

The recent investigation of archaeological sites at high elevations partially fulfills a data gap that existed in British Columbia archaeology (Frank 2000:7; Sullivan 1992:99-115). Native use of the entire landscape of British Columbia can no longer be debated, with the increase in the number of mountain archaeology studies and the number of known high elevation sites (Chapter 2).

In order to better understand resource use at high elevations a combination of variables must be controlled. In such extreme environments lithic design and use are affected by two main constraining variables, mobility and the availability/quality raw materials (Andrefsky 1994:21-34,1998; Cowan 1999:593-608; Hayden et al. 1996:9-50; Kelley 1988:717-734). People using high altitude areas of the interior and coastal zones would have had to be highly mobile while in pursuit of specific resources (see Chapter 3 for lists of such resources). Hence, sites at high altitudes will reflect that high mobility, with limited archaeological deposits comprising only stone tool production and use (Reimer 1999a: 1-33, 1999b:1-44; Reimer et al.1999:1-71).

Most archaeological data for native use of high altitudes comes from that most common, but least understood site type, the lithic scatter. The lack of investigation and understanding of such sites reflects their dismissal by most archaeologists as "uninformative" compared to larger and more complex lowland sites (including shell middens and villages). The challenge for archaeologists is to identify variation in not just one or two such sites, but numbers of lithic scatter sites distributed across a large block of land and time. Lithic scatters vary in size and proportions of lithic materials, reflecting a wide range of activities, such as processing food and non food resources, acquisition of lithic raw materials and/or lithic reduction. However, lithic scatters are commonly assigned to the category of "limited activity" site or "special activity" site, disregarding their potential occupational and or organized variability (Sullivan 1992:99-115, 1995: 49-64). Several scholars have suggested that two main modes of lithic production and use occurred over native North America (cf. Cowan 1999:593-608; Kelley 1988:717-734). One involved basic core and flake tool production and the other involved the shaping of bifaces (Cowan 1999:593). Below are examples of some of the recent methods and theories ideas that can be used to interpret lithic scatter sites across time and space.

7.2 Lithic Analysis

Lithic analysis in this thesis employed a number of methods. To determine flake types, a basic Sullivan and Rozen (1985:755-779) analysis was conducted while on site, or when materials were brought back to the lab. The Sullivan and Rozen technique divides flake attributes into four distinct categories determined by a hierarchical key, broken down as follows:

1) The first dimension: Is there a single interior surface to the flake, if yes proceed to 2, if no the item is categorized as debitage.

2) The second dimension: Is there a point of applied force, if yes proceed to 3, if no the item is categorized as a flake fragment.

3) The third dimension: Are their intact margins to the flake, if yes proceed to 4, if no the item is categorized as a broken flake.

4) The fourth dimension: Is there a single interior surface, a point of applied force and intact margins all present to form a complete flake.

In addition, lithic analysis determined the type of percussion (hard, soft, pressure and bipolar) used while reducing lithic materials (Andrefsky: 1998:59-134; Cotterill and Kamminga 1987:675-708 ; Crabtree 1972; Hayden 1980:2-7; Hayden and Hutchings 1989: 235-258).

7.3 Squamish/Garibaldi Region Lithic Analysis

Of the 11 sites found in the Squamish/Garibaldi region, DkRr1 has the largest artifact assemblage (N=4218) and DlRs4 the smallest (N=6) (ARCAS 1999:1-11; Reimer 1999a, 1999b:1-44). In all sites, lithic assemblages dominate the archaeological remains. Since limited test excavation was done at one of these sites (DkRr1), surface collections are the main source of data (ARCAS 1999:1-11; Reimer 1998, 1999a:1-33, 1999b: 1-44). When taken alone, a single lithic scatter may not offer much interpretive information to archaeologists, since artifact samples tend to be small and relatively uninformative. However, the combination of overall trends at these sites may offer insights to the technological strategies used to cope and survive in high elevation environments.

Below are summaries of lithic analysis of the sites in the Squamish/Garibaldi region. They provide basic information needed to aid in the formulation of the Model of High Country Archaeology discussed in the next chapter.

7.3.1 Artifact Classes

Table 9 summarizes the size of artifact assemblages recorded during site survey. It is likely that the total number of artifacts at those sites is higher than presented here, since they probably have sub-surface deposits. This will be discussed in later sections. Table 9 illustrates the generally low numbers of artifacts and lack of diagnostic artifact types in the Squamish/Garibaldi sample. Hence, it is difficult to use established artifact typologies and chronological indicators at such high altitude sites (Carlson 1983b:13-32, 1990:60-69, 1996:215-226; Fladmark 1982a; Matson and Coupland 1995:49-298). Nevertheless, temporally diagnostic artifacts were found at DkRr4, EaRr4, EaRt2, EaRt3, and EaRt5.

Microblade industries were found at DkRr1, DkRr4, EaRr4 and EaRt5. Microblade assemblages at lower elevation sites along the Southern Northwest Coast are common between 7,500-1,500 BP (Carlson 1983a:90-93, 1990:67-68, 1996:9-10; Fladmark 1982a:101-122; Wright 1996:205-210). This wide range of ages make microblades only a very rough chronological indicator in this area. Such tools are usually taken as indications of highly mobile populations (e.g. Hayden et al.1996:9-50), which is true for most people using high altitude areas. The microblades found at these four high elevation sites also are likely the result of fairly early occupations (Reimer 1999a:1-33; Wright 1996: 205-210). More detailed analysis and theoretical implications of these implements will be presented later, but see Figures 64-68 below.

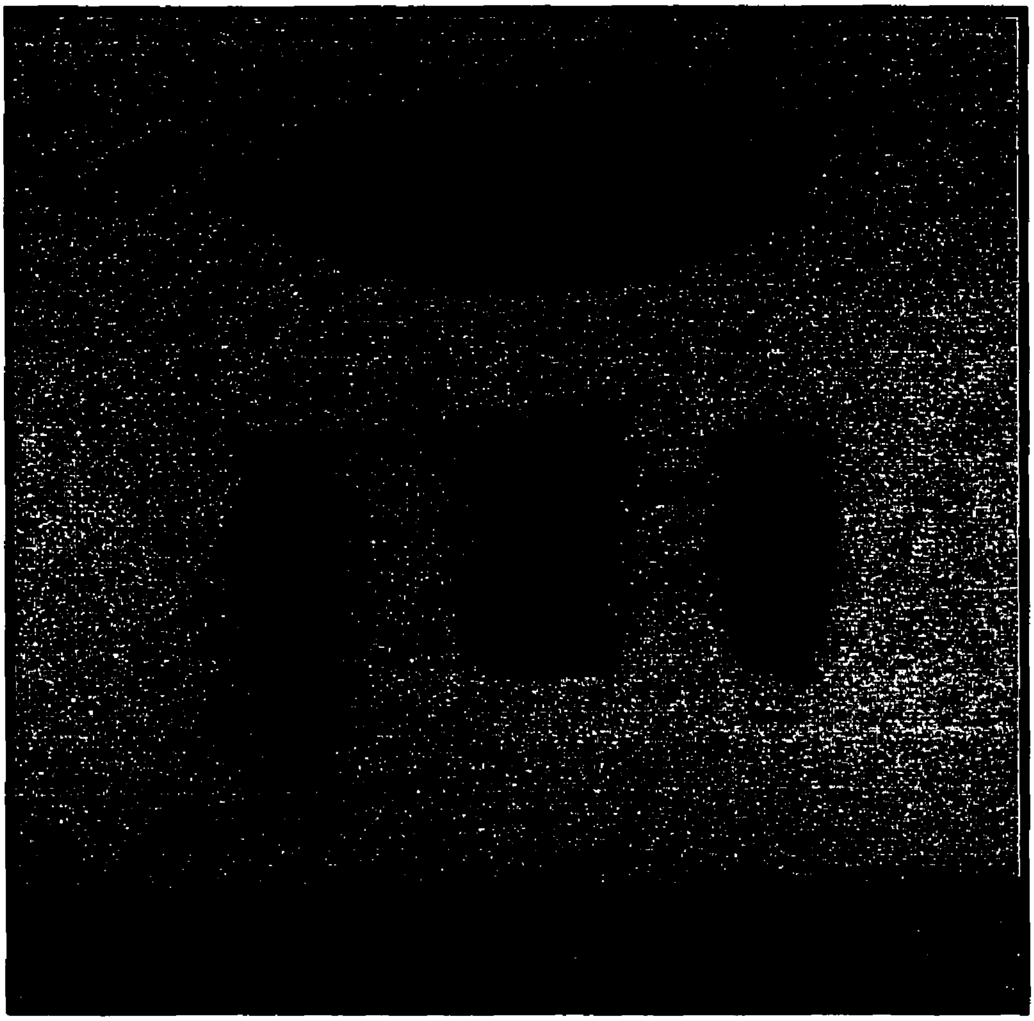

Figure 64. Microblades and flake tool found at DkRr4, scale in centimeters.

Figure 65. A microblade core found at DkRr4.

Figure 66. Microblade core found at EaRr4.

Figure 67. Microblades from EaRt5.

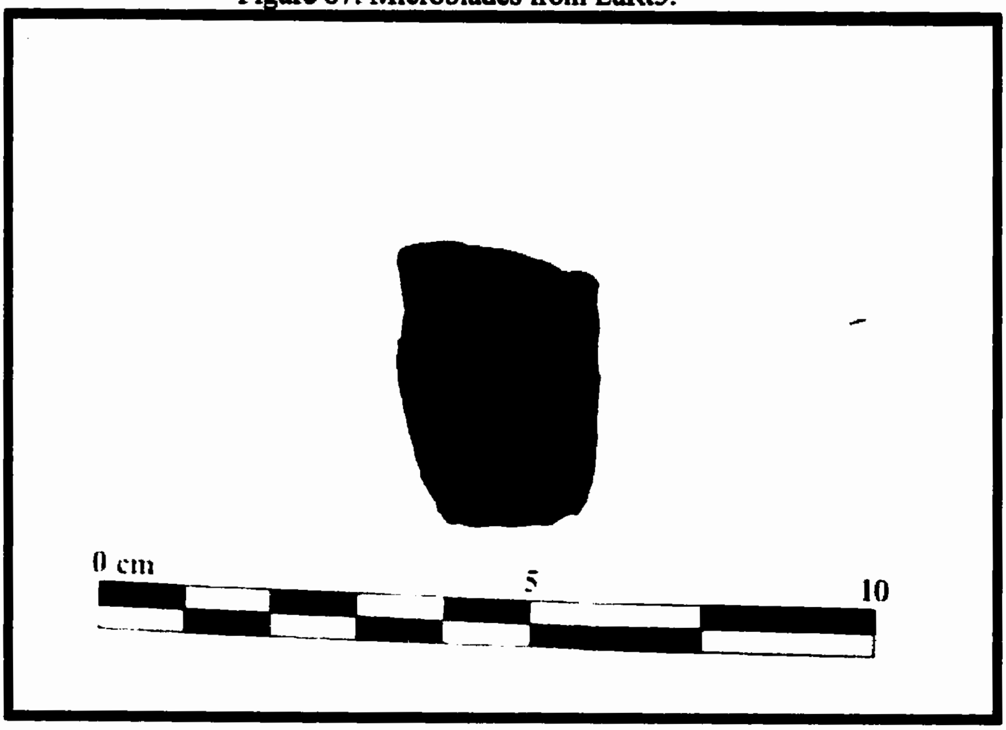

Figure 68. Microblade core from EaRt5.

Biface/ projectile point technology was found at EaRr4, EaRt2 and EaRt3. Projectile points from EaRr4 include a single weakly shouldered basal fragment similar to those found of the Lochnore Phase of the Interior Plateau dated 5,500-3,500 BP (Figure 69) (Stryd and Rousseau 1996:191-197).

Another projectile point base from EaRr4 is very small and not very diagnostic (see figure 69, 70). It is likely representative of later time periods, ca. 5,000-1,500 BP (Fladmark 1982a:110-115).

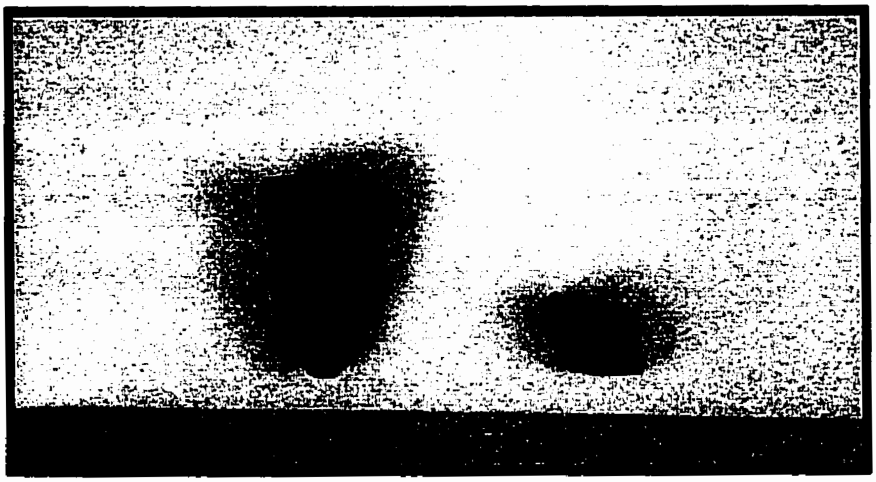

Figure 69. Projectile point bases from EaRr4. The smaller point at left is also in figure 70 below.

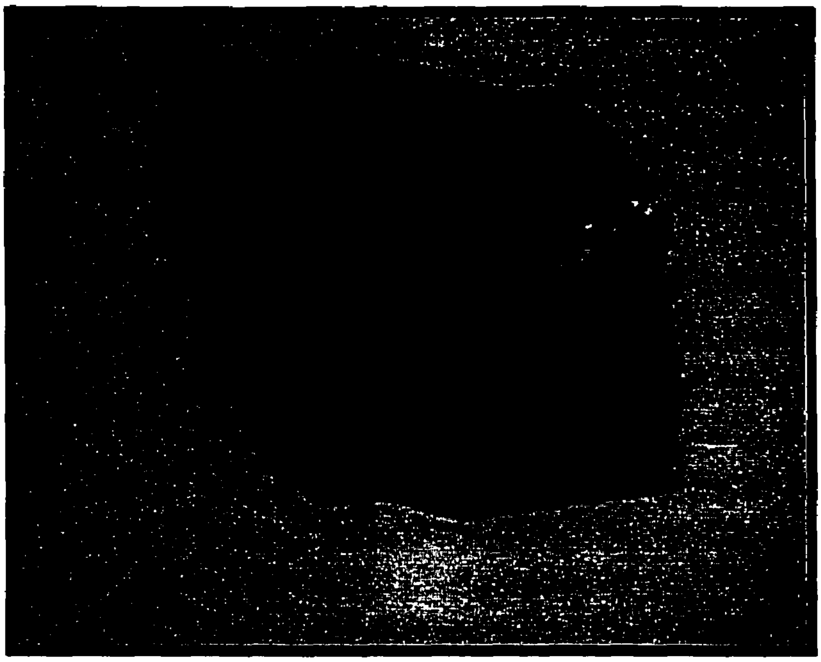

Figure 70. Small undiagnostic projectile point bases from EaRr4. Image is x10 original size.

A broken projectile point found on the surface of EaRt2 is large and leaf shaped (Figure 71). Points of these types are common to earlier periods of the Northwest Coast cultural sequence, ca. 8,000-5,000 BP and are often referred to as "Cascade Points" (e.g. Carlson 1990: 61-62, 1996: 8-9; Fladmark 1982a:106-113; Matson and Coupland 1995:66-81; Mitchell and Pokotylo 1996: 65-82).

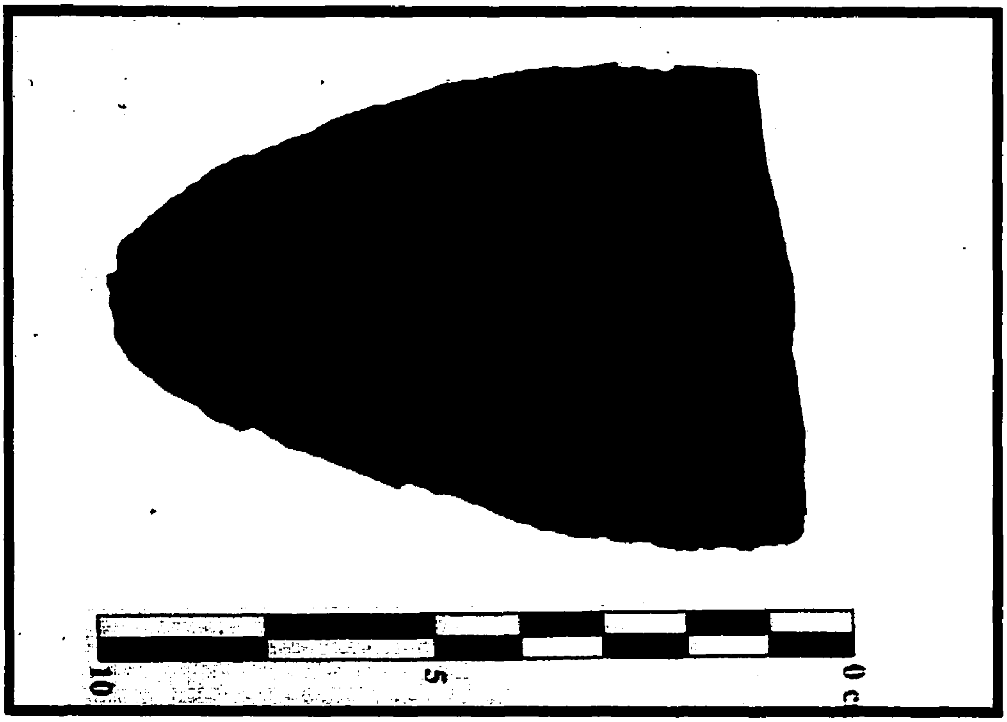

Figure 71. A Large Laurel Leaf Shaped Projectile Point Base from EaRt2.

Two projectile points broken at the base were found at EaRt3. One is unfinished, but resembles those of the contracting stemmed variety common in southern Northwest Coast sites dated ca. 5,500-2,500 BP (Carlson 1983b:22-28; Fladmark 1982a: 110-115) (Figure 72). The other point base is of the leaf shaped variety common in southern Northwest Coast sites dating ca. 5,500-1,500 BP (Carlson 1983b:22-28; Fladmark 1982a: 110-115) (Figure 72).

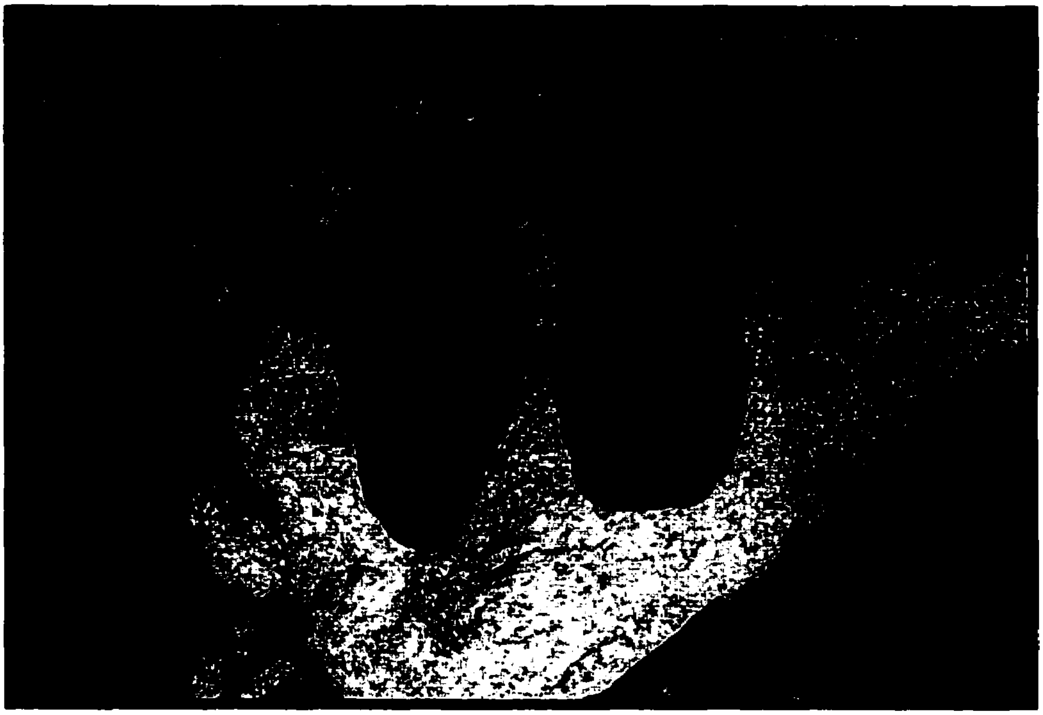

Figure 72. Contracting Stem Projectile Point Base at left and Leaf Shaped Point Base at right, from EaRt3.

It is important to note that there is a total absence of ground stone technology at all these sites. This is due other lithic raw materials being common in the local area. Ground stone technology begins to appear along the southern British Columbia Coast approximately 5,500 years BP (Ames and Maschner 1999:57-112; Carlson 1996:9-10; Matson and Coupland 1995:97-295; Mitchell 1990:340-353).

Table 9. Artifact Classes.

Site	Artifact Total	Cores	Flake Tools	Points	FAR
DkRr 1 Surface	425	7	4	0	0
DkRr 1 Below Surface	2192	17	7	0	0
DkRr 2	19	1	4	0	0
DkRr 3	12	0	2	0	0
DkRr 4	40+	1	20+	0	0
DlRs 3	16+	1	1	0	11+
EaRr 4	25+	0	1	2	0
EaRt 1	17+	1	0	0	0
EaRt 2	46+	1	3	1	0
EaRt 3	3+	0	0	3+	0
EaRt 4	2+	0	0	0	0
EaRt 5	21+	1	5	0	0
Totals	2818	30	47	5	11

Note the difference between artifact total in the above table is inflated by counting of projectile points and fire altered rock (FAR) in the assemblages.

7.3.2 Technological Focus

The main technological focus in the Squamish/Garibaldi sites is simple core reduction and flake production. This seems especially true from surface collected and excavated areas of DkRr1. Note the high occurrence of flake fragments, debitage and hard hammer reduction at the sites in Table 10. Useful flakes, tools and cores made at these locations were then transported off site to be used in other high country areas (e.g. DkRr2, DkRr3, DkRr4), or taken to low land settings to be used there, or traded. Implications of the movement of lithic materials will be discussed in later sections. In the non debitage category, a microblade technology is the next most frequently represented technological trait, found at DkRr1, DkRr4, EaRr4 and EaRt5. A bifacial technological strategy is represented at DkRr1, EaRr4, EaRt2, EaRt3 and EaRt4. At DkRr1 bifaces are not represented by formed tools/points, but are only represented in the flake/debitage assemblage.

Table 10. Results of Lithic Analysis for sites in the Squamish/Garibaldi Region.

Site	Context	CF	BF	FF	D	HH	SH	Press	Bipolar
DkRr1	cluster 1a	2	1	5	4	12	2	0	0
DkRr1	cluster 1b	12	16	73	84	173	2	7	3
DkRr1	cluster 1c	9	4	16	3	28	2	0	2
DkRr1	cluster 1d	10	0	8	3	20	0	0	1
DkRr1	cluster 1e	6	3	8	38	54	1	0	0
DkRr1	cluster 2	9	8	41	58	111	3	0	4
DkRr1	EU#1	4	1	8	7	18	1	1	0
DkRr1	EU#2	1	1	3	5	9	1	0	0
DkRr1	EU#3	68	31	285	1777	2067	11	30	7
DkRr2	cluster 1a	3	2	9	4	18	0	0	0
DkRr3	cluster 1a	2	2	3	5	12	0	0	0
DkRr4	cluster 1a	20+	1	7	17	20+	0	20+	0
DlRs3	cluster 1a	1	1	1	3	4	0	0	6
EaRr4	cluster 1a	2	5	3	10	17	2	1	0
EaRt1	cluster1a	1	3	2	11	16	1	0	0
EaRt2	cluster 1a	4	6	4	27	35	4	2	0
EaRt3	cluster 1a	0	0	1	2	3	0	0	0
EaRt4	cluster 1a	0	0	0	2	2	0	0	0
EaRt5	cluster 1a	7	2	4	8	11	4	5	0
Totals	**2797**	**161**	**87**	**481**	**2068**	**2640**	**34**	**66+**	**23**

CF= Complete Flake, BF= Broken Flake, FF= Flake Fragment, D= Debitage, HH= Hard Hammer, SH= Soft Hammer, Press. = Pressure Flake, Bipolar = Bipolar Flake (see methodology above).

For determining the potential of sub-surface remains from a surface lithic scatter, data from DkRr1 surface collection and test excavation graphed. It is clearly shown that the surface scatter at DkRr1 does have a high correlation with its sub-surface deposits (Figure 73 and Downum and Brown 1998:111-123). Sub-surface testing at other high elevation sites may yield similar results.

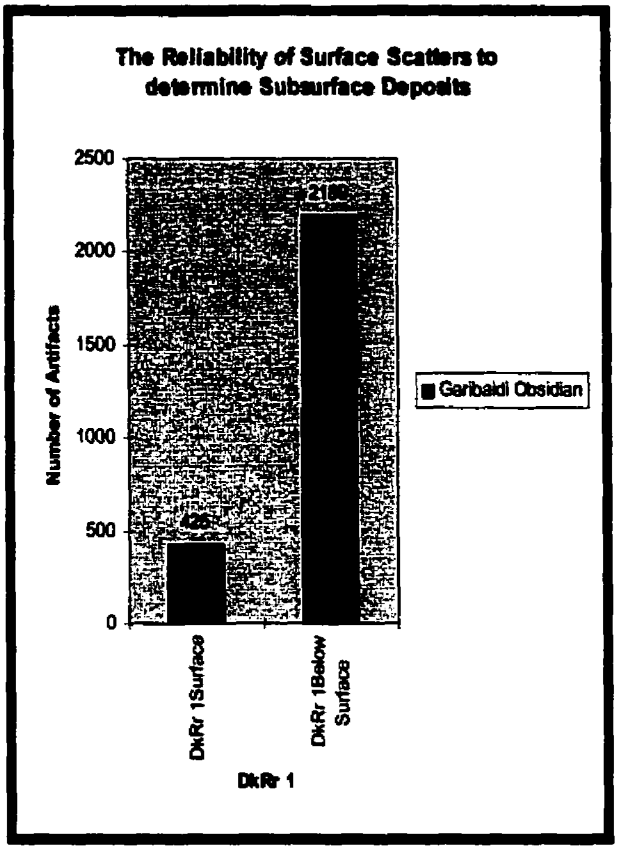

Figure 73 Graph of "surface lithic scatter reliability" using data from DkRr1.

The potential for this method of prospecting is good, since many larger-sized artifacts on high elevation sites tend to be cryoturbated to the surface (Benedict and Olsen 1978:42-44; Reimer 1999a:1-33, 1999b:1-44; Ryder 1998:1-38). That usually indicates that smaller and more abundant artifacts will be present below the surface. This certainly proved to be true during analysis of flake/debitage material from DkRr1. Larger size flakes/debitage and cores were found on the surface, or in excavation levels close to the surface. The potential for the occurrence of microdebitage in subsurface contexts of high elevation sites is therefore also likely to be high, except in deflated aeolian contexts (Fladmark 1982b:205-220). This basic analytical technique should be tested on other sites in different regions and settings, as long as depositional and post depositional processes are understood by the investigator.

If the reliability of surface scatters as indicators of sub-surface cultural deposits holds, the potential for detecting multiple occupations and uses of lithic scatter sites is also high. This offers archaeologists interpreting surface deposits a more dynamic understanding of landscape use over time. The potential for delineating separate occupations at lithic scatter sites also might be done by attempting to differentiate varying modes of lithic reduction and tool use across a site.

Again, data from DkRr1 are used to illustrate the potential of determining separate occupations based on detecting varying reduction strategies, although a basic understanding of depositional and post-depositional processes is required. Figure 74 below helps to indicate the distribution of artifacts at DkRr1.

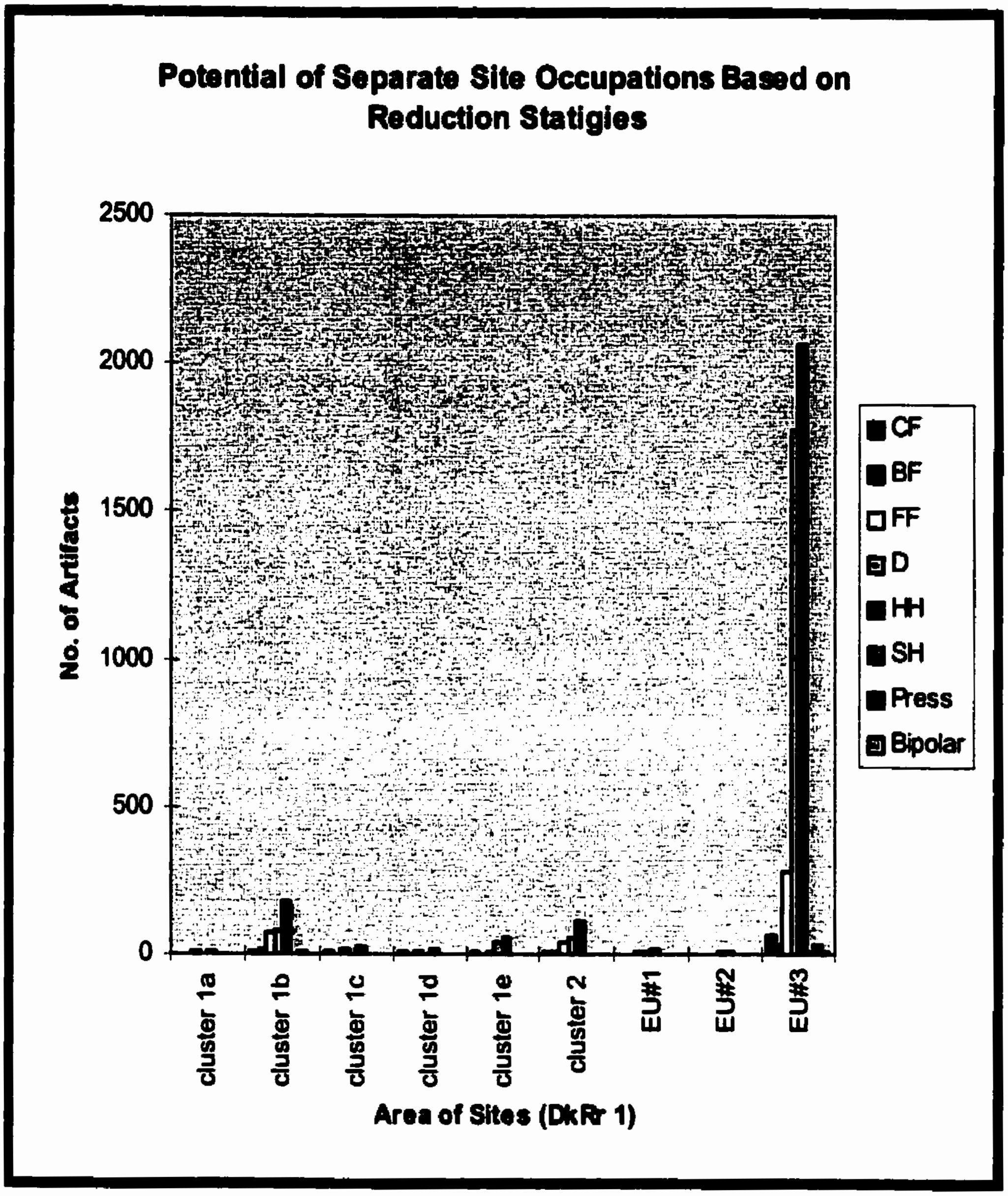

Figure 74. Separate Occupations or Activity Areas at DkRr1.

It is apparent that three separate reduction events have taken place at DkRr1, reflected by clusters 1b, and 2 and Excavation Unit #3. Reduction events at cluster 1b are surrounded by material from clusters 1a, 1c, 1d and 1e. This material is likely part of the central reduction event at 1b and may be due to post-depositional cryoturbation and slope wash affecting artifact distributions. Cluster 2 represents another potential reduction event, while materials found in Excavation Unit #3 are most likely part of several other reduction events, representing the main site occupation(s). It is important to note that basic core/flake production is still the main technological focus in all the clusters of artifacts at DkRr1.

DkRr1 does offer a relatively large artifact assemblage to formulate models such as the one presented above. Smaller and less dense lithic scatters may lie outside of this basic method of site interpretation. Data compiled from all sites in the Squamish/ Garibaldi study are presented in Figure 75 below. It illustrates the overall general trend in lithic reduction and technological organization of all sites in the region. Based on this information the types of activities that may have taken place on site also may be inferred.

7.3.3 Squamish/Garibaldi Technological Organization

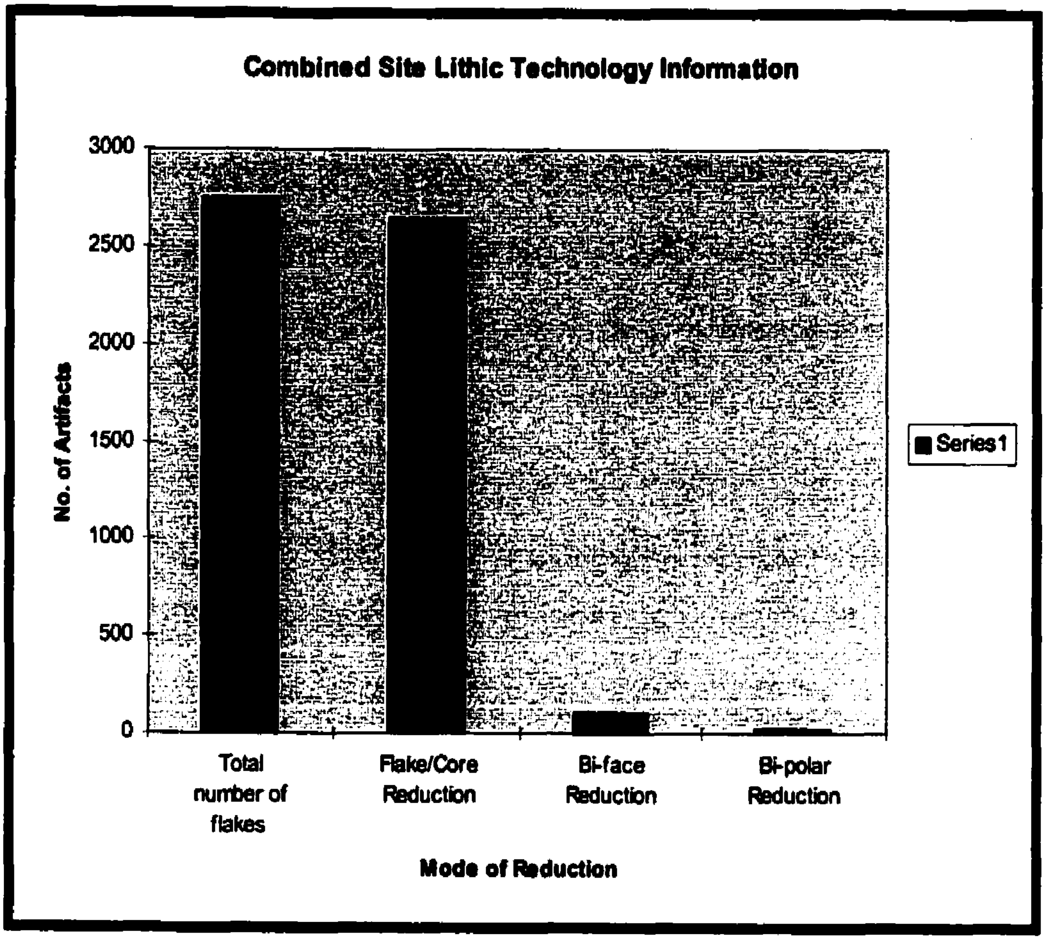

Figure 75. Squamish/Garibaldi Litihc Reduction Techniques.

The high occurrence of flake fragments, debitage and hard hammer reduction products at the sites is likely due to the abundance of locally available raw materials (Reimer 1998, 1999a: 1-33;1999b:1-44; Souther 1980:1-11; Souther and Yorath 1991:373-401). This may also help explain the absence of ground stone. Below are tables that describe the properties and types of raw materials that were available to pre-contact stone knappers visiting the Squamish/Garibaldi subalpine and alpine areas.

7.3.4 Raw Materials Present on Sites

Table 11. Raw Material Distribution at Sites in the Squamish/Garibaldi Region.

Site	Garibaldi Obsidian	Quartz Crystal	Cryptocrystaline Silicates	Dacite Rhyodacite
DkRr1 Surface	425			
DkRr1 Below Surface	2189	1	1	
DkRr2	19			
DkRr3	20+			
DkRr4	30+			
DlRs3				6
EaRr4	1		2	25+
EaRt1				7
EaRt2				44
EaRt3				4+
EaRt4				2+
EaRt5	1	1		19
Totals 2797	**2685**	**2**	**3**	**107+**

The large number of pieces of Garibaldi obsidian is inflated by the sample from the test excavations at DkRr1. However, even without that sample, Garibaldi obsidian is still the most common raw material found on 11 Squamish/Garibaldi sites, except DlRs3 (Tables 11-12).Inflation of obsidian numbers is also due to the source area for this material being located at the head waters of Ring Creek, although there is no single source quarry/outcrop. I searched for workable raw material (Reimer1998, 1999a:1-33;1999b: 1-44) and found that pieces ranging in size from small pebbles to medium sized cobbles occur in lateral and terminal moraines along the headwaters of Ring Creek. The nodules in moraine deposits tend to be angular, while those found along the upper channels of Ring Creek tend to be sub-angular (Reimer 1998, 1999a:1-33; 1999b:1-44). At the source area, raw material was readily available in workable forms and could be gathered with relatively low cost in time and energy. This raw material source must have been found early, since it has been in continuous use since Pebble Tool Tradition Times, ca. 10,500-5,500 (Carlson 1994:307-361; Reimer 1998, 1999a:1-33, 1999b:1-44; Wright 1996:205-210). Fluctuations in the use of this material and the implications of its connections as a trade material will be discussed in Chapter 8. However, for local people, the source for this material was so close it relieved the need to have to carry an extensive curated tool kit from low elevations to high elevations. This also explains the mode of reduction and use of this material close by high elevation sites.

Due to its complex geological history it is likely that other secondary sources of obsidian occur elsewhere in the Garibaldi volcanic belt. Potential candidates include The Table, Enastick Meadows, Mt. Fee and Mt. Cayley (Mathews 1952:81-103; Reimer 1999a:1-33, 1999b:1-44; Souther 1980:1-11; Souther and Yorath 1991:373-401; Cathy Hickson personnel communication 2000).

The second most common lithic materials are locally available dacites and rhyodacites, which also can be found almost anywhere in the Garibaldi volcanic belt (Bye et al. 2000:1-9; Green et al. 1988: 563-579; Mathews 1951:357-380, 1952:81-103, 1975; Reimer 1998, 1999a:1-33; 1999b:1-44; Souther and Yorath 1991:373-401; Souther 1980:1-11). Again, such availability relieved the need for people to carry an extensive tool kit around at high elevations, since tools always could be made expediently from local rocks. More exotic and rare materials are quartz crystal and cryptocrystaline silicates (C.C.S. below). These items may have been found in small outcrops and curated for their specific properties, or traded in from elsewhere. The physical properties of these materials are given below.

Table 12. Lithic Raw Material Properties in the Squamish/Garibaldi Region.

Property	Garibaldi Obsidian	Quartz Crystal	Cryptocrystaline Silicates	Dacite Ryodacite
Crystal Structure	none	crystal	crystal	weak crystal
Texture	very fine to fine grain	very fine grain	fine grain	fine to medium grain
Cleavage	little	little to none	little	little to tabular
Fracture	conchoidal	conchoidal	conchoidal	conchoidal
Hardness	5-6	7	6-7	6
Color	10 YR 2/1	clear	gley 4/2	10 YR 7/1 to 3/1
Lusture	glassy	glassy	glassy	glassy to peraly

Based on Andrefsky's (1994:30, 1998:154) model of raw material availability and quality, lithic technological organization in this area will be primarily informal (Table 13). Social cultural and ideological factors also may have played a role in the selection of materials used at different high elevation sites. Again, this will be discussed further in later sections.

Table 13. Raw Material Availability and Quality.

Lithic Abundance	Lithic Quality	
	High	**Low**
High	Formal and Informal Tool Production	Primarily Informal Tool Production
Low	Primarily Formal Tool Production	Primarily Informal Tool Production

From ethnographic and archaeological references the following basic spatial/ temporal settlement model can be outlined for the Squamish/ Garibaldi area (Table 14 and Burtchard 1998:111-178; Carlson 1996:215-226; Mierendorf 1998:1-7, 1999:1-24; Reimer 1998, 1999a:1-33, 1999b:1-44; Reimer et al. 1999:1-71).

Table 14. Basic Settlement Patterns in the Squamish/Garibaldi Region.

Period	Functional Role	Mobility
Late (3,500-200 BP)	Seasonal Base Camps	Medium
Middle (5,500-3,500 BP)	Logistical Camp	Medium
Early (10,500-5,500 BP)	Logistical Camp	High

7.3.5 Lithic Design Considerations and Technological Organization

People accessing high elevation areas in the Squamish/Garibaldi region had to have been highly mobile. Traveling on foot, they only could have carried a limited amount of materials, unless they used packs, dogs or slaves to lighten their loads.

As indicated by Cowan (1999:593-608) the role of flake tool and core production does fit well with the high mobility patterns of the Squamish/Garibaldi region sites (see Tables 13-15). It is therefore likely that materials found at high elevations played multiple roles within the cultural system. It is probable that flake tools and cores were used at high elevations, but also were curated to low elevation sites for later use and trade, as will be discussed in Chapter 8.

Table 15. Cost and Benefits of Technological Organization.

Cost and Benefits	Flake Tools from Cores	Bifacial Tools
Production Cost	Low	High
Tool Use Life	Short	Long
Raw Material Consumption	High	Low
Multifunctional Utility	Low	High
Hafting Costs	High	Low
Portability	Low	High

Table 16. Material Variability and Site Function in the Squamish/Garibaldi Region.

Site	Total Debitage	Raw Material Type Count	Debitage: Material Ratio	Material: Debitage Ratio
DkRr1 Surface	190	1	425.0	0.002
DkRr1 Below Surface	1777	3	1777.0	5.63
DkRr2	4	1	4.0	0.25
DkRr3	5	1	5.0	0.20
DkRr4	10+	2	5.0	0.2
DlRs3	2	2	1.0	1
EaRr4	10	4	2.5	0.4
EaRt1	6+	2	3.0	0.33
EaRt2	27	2	13.5	0.074
EaRt3	10+	2	5.0	0.2
EaRt4	2+	1	1.0	0.5
EaRt5	7	4	1.4	0.57

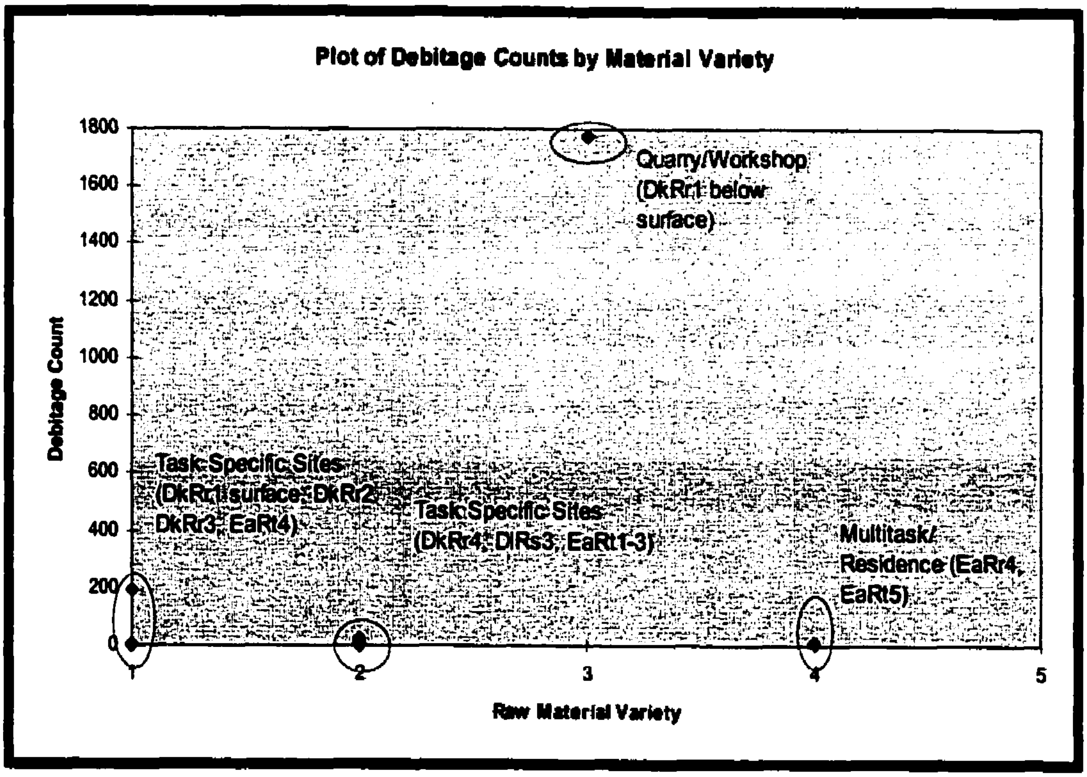

Figure 76. Plot of Debitage Counts by Raw Material for the Squamish/Garibaldi Region.

Again, DkRr1 stands out from the other sites in the Squamish/Garibaldi study (see Table 16 and Figure 76). It has abundant lithic material representing core and flake production for use at other locations in the immediate area and lowland settings. It can be called a lithic workshop, or a lithic procurement/reduction site. It is likely that DkRr1 also served as a Multitask Residential Base camp since it seems to be the dominate site in the region. In contrast, DkRr2, DkRr3, and DkRr4 are Low Use Hunting Localities, based on their assemblage characteristics. DkRr4 could be called a Limited Task Field camp, but its location also would fit well with a more prolonged occupation (see Table 16 and Figure 76).

Artifacts found at DkRr1-4 were small and light, presumably to fit with highly mobile tasks. Edge angles are low and artifact forms suggest that the tools were used for hunting, butchering and processing ungulate game. Tools found on these sites (flake tools and microblades) could be used either in hand held or hafted fashions. Since these tools were small their expendable use life is expected to be short (i.e. a single task use). These implements also were used in situations where they easily could be repaired/replaced and resharpened to suit varied functions encountered during high elevation risky hunting forays. For example, microblades at DkRr4 could be hafted into a projectile point and after this use be used as a cutting/butchery tool. If materials failed, easy access to raw material sources could alleviate repair and replacement costs (see Table 16 and Figure 76).

Assemblage characteristics and features at DlRs3 indicate that this site served as a task specific, plant-processing locality. Artifacts tend to be larger and heavier than at other sites, reflecting the low degree of mobility associated with gathering and processing plant foods. Edge angles and forms of implements from this site suggest that they did not need to be hafted, and experienced long term use, without repair or sharpening. Multifunctional bipolar flakes and tools for plant processing activities required low cost in raw material consumption and could be replaced with any locally available low grade lithic materials (Table 16 and Figure 76).

EaRr4 represents a multitask residential base camp. The assemblage is diverse and the site is in a logical location for many different activities (e.g. ungulate hunting, plant gathering and processing). Suitable lithic raw materials in this area are rare and tool production costs would be high. As a base camp this site has a range of artifact sizes and weights (although all are still relatively small and light), related to a number of activities. Bifaces found on site were multifunctional implements. They tend to be small, due to numerous flake removals, repairs, and re-sharpening. Probably they were hafted and used as projectile points and, once broken and removed from the haft, used as cores to help in processing meat (Kelly 1988:717-734; Reimer et.al.1999:1-71). Bringing bifaces in from other areas, with more suitable raw materials, aided in lowering the level of risk in ungulate hunting. Bifaces are high performance tools with low use wear and failure rates (Hayden et al.1996:9-50; Jones 1980:153-165). Flake tools, debitage and a minor microblade industry at the site suggest that local low quality raw materials were used for short term expedient and multifunctional uses, probably related to animal procurement and processing (Table 16 and Figure 76).

EaRt5 also is a multitask residential base camp, with a microblade industry, flake tools and debitage. The diversity of raw materials also suggests that this site was utilized more than once. Nevertheless, the length of stay at any one time, was likely short, by a small number of people (Table 16 and Figure 76).

EaRt2 is graphed as a task specific site but is more likely a multitask residential base camp. Its assemblage is diverse and it is likely that many different activities took place at that location. A biface strategy similar to EaRr4 is represented, although its bifaces tend to be larger and more robust than those found at EaRr4. Raw materials are more readily available in this area, and the bifaces found at both EaRt2 and EaRt3 are more likely mainly cores than tools, even though they exhibit some use wear (Hayden et al.1996:9-50; Kelley 1988:717-734; Reimer et al.1999: 1-71). Again, such implements aid in lowering risk (low use and failure rates) during high risk ungulate hunting. The size and location of the site also suggest that it was a multitask residential base camp (Table 16 and Figure 76).

EaRt1 and EaRt4 represent limited task camps probably related to nearby EaRt2, and flake tools found on those sites probably represent activities related to those taking place at EaRt2 (i.e. hunting/butchering/processing/camping) (Table 16 and Figure 76).

EaRt3 most likely represents a task specific butchery location. Implements (bifaces and large flake tools) found on the site exhibit heavy use wear. It suggests that those tools were used to cut, skin, scrape and chop ungulates hunted in the local region. Edge angle, form, and size suggest that a high degree of robustness was needed in tools used to process ungulate flesh. Larger implements could be easily made at this site due to a high amount of suitable raw material present locally, so tool production cost was low (Table 16 and Figure 76).

7.4 Cathedral Park Lithic Analysis

Of the 13 sites found in Cathedral Park, DhRb6 has the largest artifact count with over 200 pieces, while four other sites are isolated finds (Table 17; Reimer et al. 1999:1-71; Vivian 1989:17-38). It is likely that additional cultural material exists below ground surface at those isolated find sites, since cryoturbation features (Ryder 1998:1-38) were found to be less common in Cathedral Park than in the Squamish/Garibaldi region (Reimer 1999a:1-33, 1999b:1-44; Reimer et al.1999:1-71).

7.4.1 Artifact Classes

Table 17. Artifact Classes for sites in the Cathedral Park Region.

Site	Artifact Total	Cores	Flake Tools	Bifaces	FAR
Lakeview Rock Alignment 1	1	1	0	0	0
Scout Lake Lithic Scatter	4	0	1	0	0
Quinesco Trail	8	1	2	0	3
Lakeview Subalpine Lithic Scatter	120+	3	5	3	0
Diamond Lake 1	14	1	0	0	0
Diamond Lake 2	8	2	1	0	0
Diamond Isolated Find	1	0	0	0	0
DgRb1	50+	0	2	0	0
DgRb5	4	1	0	0	0
DgRb6	200+	2	2	2	0
DgRb8	13	0	0	0	0
DgRb10	1	0	0	0	0
DgRb11	1	0	0	0	0
Totals	**425**	**11**	**13**	**5**	**3**

One artifact from DgRb6, from the Cathedral Park sample, is diagnostic of the Plateau Shuswap Horizon (ca. 4,000-2,400 BP) (see Table 7.9 and Richards and

Rousseau 1987:26 Figure 16 example b). Bifacal implements found at other sites (see Chapter 6 Figures 50-52), are unfortunately not diagnostic of any particular time period (e.g. Copp 1996:1-94; Pokotylo and Mitchell 1999:81-102 ; Reimer et al.1999:1-71; Richards and Rousseau 1987:22-31; Rousseau 1993:14-183; Stryd and Rousseau 1996:177-204; Vivian 1989:17-38).

7.4.2 Technological Focus

Table 18. Results of Lithic Analysis for sites in the Cathedral Park Region.

Site	Context	CF	BF	FF	D	HH	SH	Press	Bipolar
Lakeview Rock Alignment 1	surface cluster 1a	1	0	0	0	1	0	0	0
Scout Lake Lithic Scatter	surface cluster 1a	2	0	0	2	2	2	0	0
Quinisco Trail	surface cluster 1a	2	2	1	3	8	0	0	0
Lakeview Subalpine Lithic Scatter	surface cluster 1a	45+	25+	25+	25+	20+	80+	20+	0
Diamond Lake 1	surface cluster 1a	8	2	2	2	2	8	4	0
Diamond Lake 2	surface cluster 1a	5	0	0	3	4	4	0	0
Diamond Isolated Find	surface isolated find	1	0	0	0	1	0	0	0
DgRb1	surface Cluster 1a	35	5	5	5	5	40	5	0
DgRb5	surface cluster 1a	2	1	0	0	3	0	0	0
DgRb6	surface cluster 1a	138	12	14	36	48	125	25	2
DgRb8	surface cluster 1a	1	1	1	10	13	0	0	0
DgRb10	surface cluster 1a	1	0	0	0	1	0	0	0
DgRb11	surface cluster 1a	1	0	0	0	1	0	0	0
Totals		**242+**	**48+**	**48+**	**86+**	**109+**	**258+**	**54+**	**2**

CF= Complete Flake, BF= Broken Flake, FF= Flake Fragment, D= Debitage, HH= Hard Hammer, SH= Soft Hammer, Press. = Pressure Flake, Bipolar = Bipolar Flake.

7.4.3 Cathedral Park Technological Organization

Biface manufacturing and maintenance seems to be the major lithic technology focus at most of the sites in Cathedral Park (Table 18, Figure 77), represented by a total of 312 soft hammer and pressure flakes. Core flake tool production is also represented by 111 hard hammer and bipolar reduction products.

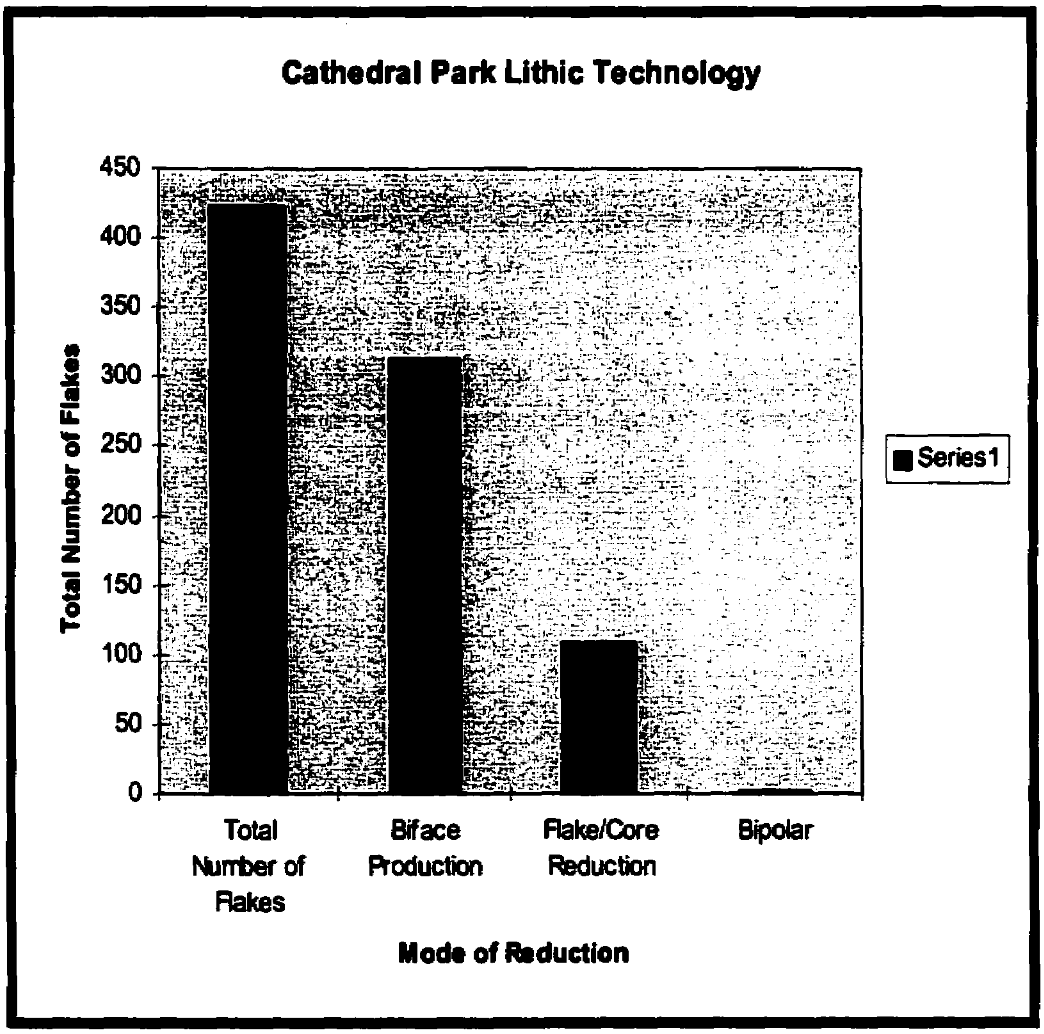

Figure 77. Cathedral Park Lithic Technology.

Kelly (1988:717-734) and Cowan (1999:593-608) suggest that the types of chipped stone tool production methods found in an assemblage indicate the amount of costs and benefits of the particular technology being utilized, as summarized in Table 19.

Table 19. Costs and Benefits of Technological Organization.

Cost and Benefits	Flake Tools from Cores	Bi-facial Tools
Production Cost	Low	High
Tool Use Life	Short	Long
Raw Material Consumption	High	Low
Multifunctional Utility	Low	High
Hafting Costs	High	Low
Portability	Low	High

Based on the results of this survey, and what is known archaeologically for the surrounding Similkameen Valley area, a preliminary model of changing settlement patterns over time, can be reconstructed (refer to Table 20 and sites discussed in Copp 1974; 1996:1-94; Mierendorf 1993; Reimer et al.1999:1-71; Teit 1930; Vivian 1989:17-38).

Table 20. Basic Settlement Patterns in the Similkameen/Cathedral Region.

Period	Functional Role	Mobility
Late (4,000-200 BP)	Seasonal Base Camps	High-Medium
Middle (7,500-4,000 BP)	Logistical Camp	High
Early (10,500-7,500 BP)	Logistical Camp	High

7.4.4 Raw Materials Present on Sites

Nearly all lithic artifacts from all sites are made from the local "Glacier Lake Chert" or CCS (cryptocrystaline silicate) outcrop (Reimer et al.1999:1-71; Vivian 1989:17-38). This source area is abundant with suitable material, with both a high quality and quantity (see Tables 21-22). Remaining materials are of Hozomeen chert, Crater Mountain petrified wood and quartz crystal. Hozomeen chert is widely available throughout the Cascade Mountain range (Copp 1996:1-94; Frank 2000:75-76; Mierendorf 1993), and is common in low land sites of the Similkameen River valley (Copp 1996:1-

94). The source of Crater Mountain petrified wood is located on the slopes of Crater Mountain, 15 kilometers to the Northeast (Dixon Terbasket personnel communication 1999). No known source for quartz crystal has yet been documented in the Cathedral/Similkameen region (Stan Copp personnel communication 2000).

Table 21. Raw Material Properties in the Cathedral Park Region.

Property	Glacier Lake Chert	Hozomeen Chert	Crater Mt. Petrified Wood	Quartz Crystal
Crystal Structure	crystal	crystal	fibrous	crystal
Texture	very fine grain	fine grain	medium grain	very fine grain
Cleavage	little	little	little	little to none
Fracture	conchoidal	conchoidal	conchoidal	conchoidal
Hardness	6	6-7	6	7
Color	10 YR 2/2	10 YR 6/8	gley 4/2	clear
Luster	glassy	glassy	earthy	glassy

Table 22. Distribution of Raw Materials in the Cathedral Park Sites.

Site	Glacier Lake Chert	Hozomeen Chert	Crater Mt. Petrified Wood	Quartz Crystal
Lakeview Rock Alignment 1	0	0	0	1
Scout Lake Lithic Scatter	2	1	0	1
Quinisco Trail	8	0	0	0
Lakeview Subalpine Lithic Scatter	120+	0	0	0
Diamond Lake 1	14	0	0	0
Diamond Lake 2	8	0	0	0
Diamond Isolated Find	0	0	1	0
DgRb1	50+	0	0	0
DgRb5	4	0	0	0
DgRb6	200+	0	0	0
DgRb8	13	0	0	0
DgRb10	1	0	0	0
DgRb11	1	0	0	0
Totals	421+	1	1	2

7.4.5 Lithic Design Considerations and Technological Organization

The types of tools and amounts of raw material available for manufacture of these tools can be related to the type of lithic technological organization (Table 23) (Andrefsky 1994:21-34).

Table 23. Raw Material Availability and Quality.

Lithic Abundance	Lithic Quality	
	High	**Low**
High	Formal and Informal Tool Production	Primarily Informal Tool Production
Low	Primarily Formal Tool Production	Primarily Informal Tool Production

All types of lithic material found throughout Cathedral Park can be classified as high quality (Table 21-23). The chert or CCS materials found in the Hozomeen Range and at the Glacier Lake source are good for manufacture of all types of tools found in local sites (Copp 1974,1996:1-94; Mierendorf 1993, 1998:1-7; Reimer et al. 1999:1-71; Vivian 1989:17-38). The abundance of these materials is high in subalpine and alpine locations, with numerous large outcrops. They contain abundant cobble to boulder-size angular and sub-angular nodules that are readily available (Frank 2000:75-76; Mierendorf 1993; Reimer et al.1999:1-71; Vivian 1989:17-38). Lowland valley settings have a lower relative abundance of good chert or CCS raw materials. Suitable raw material nodules do occur but they are smaller and more difficult to work.

Based on the above information it is expected that subalpine and alpine sites will exhibit both formal and informal modes of tool production. If people with a high degree of mobility interact with a high quality and abundant lithic source area, it is likely that a biface tool and core technological orientation will be employed (Kelley 1988:717-734; Andrefsky 1994:21-34).

In fact, assemblages of sites in the highland locations of the park are almost entirely orientated to bifacial technology, reflecting its energy efficiency in high elevation environments. The types of activities (high risk, high energy, hunting) commonly taking place in highland areas of the park needed a technological orientation towards bifaces. Only in more lowland settings (i.e. the upper montane forest) is flake tool core technology represented (the Quienesco to Lake of the Woods Lithic Scatter). The Diamond Lake Two Lithic Scatter is an exception to this, but it may be from the late time period when a slightly lower degree of mobility is assumed (Table 20 above).

Table 24. Material Variability and Site Function.

Site	Total Debitage	Raw Material Type Count	Debitage: Material Ratio	Material: Debitage Ratio
Lakeview Rock Alignment 1	1	1	1	1
Scout Lake Lithic Scatter	3	3	1	0.33
Quinisco Trail	5	1	3	3
Lakeview Subalpine Lithic Scatter	110+	1	110+	0.009
Diamond Lake 1	13	1	13	0.08
Diamond Lake 2	8	1	8	0.125
Diamond Isolated Find	1	1	1	1
DgRb1	50+	1	50+	0.02
DgRb5	4	1	4	0.25
DgRb6	200+	1	200+	.005
DgRb8	13	1	13	0.0789
DgRb10	1	1	1	1
DgRb11	1	1	1	1

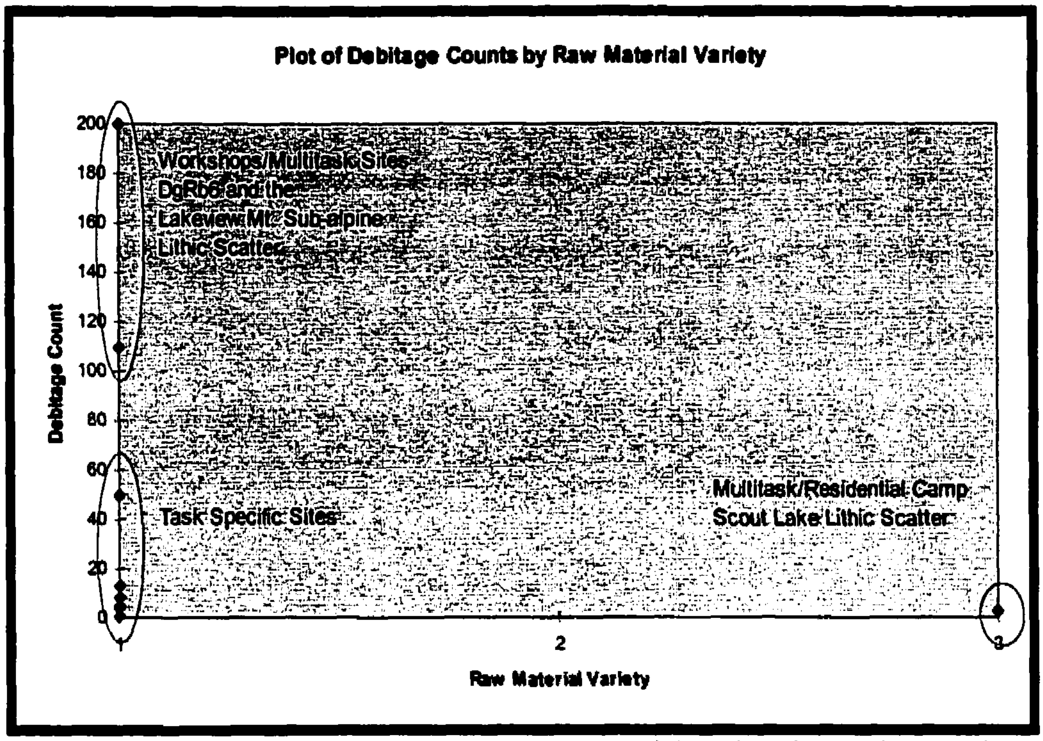

Figure 78. Plot of Debitage Counts by Raw Material Variety for the Cathedral Park Region.

The Lakeview subalpine lithic scatter, Scout Lake lithic scatter and DgRb6 represent multitask residential base camp sites (Table 24 and Figure 78). They have high numbers of debitage and tools, and/or diverse raw materials. The close proximity of the Lakeview subalpine lithic scatter and DgRb6 to the Glacier Lake chert source is the primary reason for their lack of diversity in raw material. However, their relatively large number of tools and debitage fits those sites into the multitask residential base camp category (Reimer et al.1999:1-71; Vivian 1989:17-38).

Three medium sized bifaces were recorded at the Lakeview lithic scatter, similar to those found at the Squamish/Garibaldi sites. The high quality and quantity of that Glacier Lake chert provided ideal raw material for biface manufacture. Due to their size and form, bifaces found at the Lakeview lithic scatter probably were multifunctional implements, used primarily as cores and tools to help in processing of game animals

(Kelly 1988:711-734; Reimer et.al.1999:1-71). Bifaces offer a high performance, low wear and low failure rates (Hayden et al.1996:9-50; Jones 1980:153-165). Flake tools and debitage suggest that local high quality raw materials were used for short term expedient and multifunctional uses at the site, probably related to plant and animal processing (Table 24 and Figure 78).

Quinisco Trial, Diamond Lake 2, the Diamond Lake isolated find, DgRb5, DgRb 8, DgRb10 and DgRb11 represent low use hunting locales and isolated finds (Table 24 and Figure 78). Very limited tasks are represented at these sites. Artifact form and use wear analysis suggest cutting/scraping activities related to ungulate hunting (Reimer et al.1999:1-71). However, the true extent and meaning of the isolated finds will be unknown until shovel testing can be conducted.

The Diamond Lake 2 lithic scatters represent task specific butchery locations, based on use wear analysis and site location. The occurrence of a single piece of quartz crystal debitage at the nearby Lakeview Rock Alignment 1 may indicate that material had some spiritual significance (Table 24 and Figure 78). Spiritual qualities for quartz crystal have been suggested in the Rocky Mountains by Hietzmann (2000: 1-8, n.d.:1-13) and for obsidian along the Northwest Coast by Carlson (1994:307-361), Fladmark suggests symbolic values for different colored obsidian from Mt. Edziza (1985:39), Pokotylo (1989:46-66) made similar observations for cryptocrystaline silicates in the sub-arctic, as did Reeves (1996:57-70) for several stone types used at high elevation rock alignments. The same arguments have been made in Europe by Gero (1989:92-105), Tacon in Australia (1991:191-207) and myself in the Squamish region (1999a: 1-33, and 1999b: 1-44).

Chapter 8 Conclusions: A Model for High Altitude Archaeology in the Pacific Northwest

When you reach the top of the mountain, keep climbing
- An old sherpa saying.

8.1 Brief Summary

A shown in previous chapters, archaeologists in the Pacific Northwest can no longer view subalpine and alpine areas as merely marginal to low land dominated cultural systems. This chapter will integrate methodological and theoretical ideas about the nature of high elevation archaeology presented in previous studies and chapters of this thesis. Discussion will focus mostly on the roles of such sites suggested in studies by Reimer (1998,1999a:1-33, 1999b:1-44, 1999 et al.1-71), but will also incorporate studies from other areas in the Northwest (see Chapter 2). Sites will be discussed in relation to landforms and lithic technology. This will aid in interpreting activities that took place at high elevation sites and gaining some temporal control, even with only a few chronologically sensitive artifacts and no radiocarbon dates.

8.2 Squamish/Garibaldi

Lithic scatters are the most common site type (Table 25). DkRr1, labeled a quarry/workshop, also could be included in the lithic scatter category. The lack of rock shelters in the high altitude areas in Squamish/Garibaldi is likely due to a lack of rock that erodes into shelter like overhangs. The unstable rock slopes of the Coast Range also account for the lack of long lasting rock shelter sites. That rock shelters do occur at mid and low elevations is probably due to more stable landforms in those settings. Only one site with a cultural depression is currently known in the Squamish/Garibaldi sample. The berry drying trench at DlRs3 is the most northerly recorded feature of its type (Frank 2000; Mack 1989:49-58; Reimer 1999b:1-44). One cairn feature coexists with a lithic scatter at DkRr2. Again, it was test excavated by ARCAS in 1992 and no visible cultural material was found within it. It may be that this cairn marked a certain spot that people accessing this area recognized it and could also have been used for navigational or spiritual purposes. Due to the dense plant cover at subalpine elevations and the high geological exposure at alpine elevations, isolated finds were not made. The lack of post-contact sites in this region can be attributed to the formation of Garibaldi Provincial Park in 1926 and the ruggedness of the terrain. Game drive systems also were not noticed, but it is probable that EaRt1-5 along the Squamish/Cheakumus divide represents a game drive location (Howe 1997; Reimer 1998, 1999b:1-44).

Table 25. Site Types in the Squamish/Garibaldi Region.

Site Type	Number	Percent
Lithic Scatter	6	55%
Camp	2	18%
Quarry/Workshop	1	9%
Rock shelter	0	0%
Cultural Depression	1	9%
Cairn/ Petro-form	1	9%
Isolated Find	0	0%
Historic	0	0%
Game Drive	0	0%
Totals	11	100%

Sites in the Squamish/Garibaldi region are most commonly found in the subalpine vegetation zone, many just above the upper montane forest zone, in areas with water, wood and shelter from the elements in close walking or hiking distances (i.e. less than 500 meters).

Table 26. Sites by Vegetation Zone in the Squamish/Garibaldi Region.

Vegetation Zone	Number	Percent
Alpine	3	27%
Subalpine	8	73%
Totals	11	100%

As expected, the overall average site elevation indicates a strong association with subalpine environments (Table 26). Sites at high elevations tend to be small in comparison to lower elevation sites. Thus, the numbers presented in Table 27 below are inflated due to one site (EaRt2) being located around the shores of a mid sized tarn. The size of this site is stated as larger than the actual cultural area, but it was recorded in this fashion for management purposes.

Table 27. Attributes of Elevation and Site Size in the Squamish/Garibaldi Region.

Attribute Range	Mean
Elevation 1460m-1850m	1641.36m
Site Size 50m-40,000	7572m2
Sample Size	11

Sites DkRr1-4 are located near Elfin Lakes in Garibaldi Provincial Park (Figure 15), near Lone, Garibaldi and Lava glaciers. The extent of previous Holocene advances of those glaciers in this area can be readily seen today. DlRs3 is located near Helm glacier (Figure 24). This ice mass recently has receded substantially, but in the past it may have been much closer to this site. EaRr4 is located near Overlord glacier (Figure 25). A large lateral moraine from a previous advance of the glacier is very close to this site. Sites EaRt1-5 are also close to a number of unnamed glaciers along the Squamish/Cheakamus divide (Figure 28). As indicated above, these sites, like many other subalpine and alpine areas have been affected by fluctuating snow pack and ice advances. J.B. Benedict has recently synthesized data from the Colorado Front Range that suggests that during colder periods in mountainous areas overall biological productivity dramatically decreases (Benedict 1999:1-15).Thus, it is very likely that during Neoglacial ice advances (as discussed in Chapter 4) many high elevation habitats in the Squamish/Garibaldi region became inhospitable to human, animal and plant life. At those times use of lower elevation resources may have been intensified. During early to middle periods (ca. 10,000-5,550 BP) mobile populations in the region probably utilized high elevation habitats on a regular basis. With the emergence of mainly collector type subsistence strategies (5,500-200 BP) (cf Ames and Maschner 1999), high elevation habitats became less utilized, especially during times of Neoglacial ice advances, 6,000-5,000 BP, 3,300-1,900 BP and 300-100 BP (Porter and Danton 1967:186; Mathews 1951:357-380; Ryder and Thomson 1986: 273-287; Ryder 1989:74-76) (Chapter 4). Nevertheless, it is likely that high elevation habitats still were used during those time periods, but on a more sporadic basis (Table 28). This suggests that the technology found at more recently occupied sites in the Squamish/ Garibaldi region was already well adapted to use at high elevations. Indeed, early inhabitants of the Northwest Coast possessed a technology that could support a wide range of resource acquisition.

Table 28. Sites by Landform/Biogeoclimatic zone and Predicted Paleo-environmental Prediction, for sites in the Squamish/Garibaldi Region.

Site	Landform	Current Zone	Little Ice Age	Tiedemann Advance	Garibaldi Advance	Hypsithermal
DkRr1	ridge	subalpine	subalpine/ alpine	subalpine/ alpine	subalpine/ alpine	montane forest
DkRr2	ridge	subalpine	subalpine/ alpine	subalpine/ alpine	subalpine/ alpine	montane forest
DkRr3	ridge	subalpine	subalpine/ alpine	subalpine/ alpine	subalpine/ alpine	montane forest
DkRr4	ridge	alpine	alpine	alpine	alpine	alpine
DlRs3	ridge	subalpine	subalpine/ alpine	subalpine	subalpine	montane forest/subalpin e
EaRr4	moraine/lake	alpine	alpine	alpine	alpine	subalpine
EaRt1	cirque/tarn	subalpine	alpine	alpine	alpine	subalpine
EaRt2	cirque/tarn	subalpine	alpine	alpine	alpine	montane forest/ subalpine
EaRt3	cirque/tarn	alpine	alpine	alpine	alpine	subalpine
EaRt4	cirque/tarn	subalpine	alpine	alpine	alpine	montane forest/ subalpine
EaRt5	moraine/bench	subalpine	alpine	alpine	alpine	montane forest/ subalpine

Sites in high country areas are associated with a number of different landforms (Table 28) reflecting varying activities. Thus, five sites are located on top of ridgelines, four in cirque basins/tarns, and two on moraine/bench lands. Both ridge tops and cirque basin locations offer good places to conduct a number of activities such as camping, and resource processing, on relatively flat, dry and sheltered locations. Ridgeline and moraine bench lands offer good views of the surrounding region, but also provide relief from swarming insect pests.

8.2.1 Temporal Resolution of sites in the Squamish/Garibaldi Region

The limited data recovered from high elevation sites in the Squamish/Garibaldi region offers only very coarse temporal resolution, based on limited diagnostic artifacts, lithic technology, and land form data. The age estimations in Table 29 assumes that artifact typologies from low land settings have application to high elevation sites and that pre-contact inhabitants of the region preferred to use subalpine locations to provide access to a greater diversity of resources (see Chapters 3,5, and 6). Hence they would have used various sites as they became suitable for habitation (i.e. during Holocene warm periods or not during cold Neoglacial periods). Similar models of temporal use of high elevations have been suggested elsewhere (e.g. Benedict 1992a:1-16, 1999:1-15; Fladmark 1984:139-156, 1985: 54-70; Frank 2000:83-89; McClure 1989:65-68; Reimer 1998, 1999a: 1-33; 1999: Reimer b:1-44, Reimer et al.1999: 1-71).

Table 29. Age Estimation for Sites in the Squamish/Garibaldi Region.

Site	Lithic Technology	Landform	Age Estimate
DkRr1	Middle Period	Subalpine	5,000-3,500, 2,000-500 BP
DkRr2	Middle Period	Subalpine	5,000-3,500, 2,000-500 BP
DkRr3	Middle Period	Subalpine	5,000-3,500, 2,000-500 BP
DkRr4	Early to Middle Periods	Alpine	7,000-3,500 BP
DlRs3	Late Period	Subalpine	1,500-300 BP
EaRr4	Early Period	Subalpine	5,500-3,500 BP
EaRt1	Early to Middle Period	Subalpine	7,500-4,500 BP
EaRt2	Early to Middle Period	Subalpine	7,500-4,500 BP
EaRt3	Early to Middle Period	Subalpine	8,500-4,500 BP
EaRt4	Early to Middle Period	Subalpine	7,500-4,500 BP

EaRt5	Early to Middle Period	Subalpine	7,500-4,500 BP

Furthermore, the study of resources from high country areas found in lowland sites can be used to support the age estimates presented above. The most readily available local high country resource manifested in low sites is Garibaldi obsidian. Thus, an overview of excavated contexts in the Strait of Georgia region was conducted to find sites with this material.

8.2.2 Garibaldi Obsidian XRF Analysis, Spatial and Temporal Distribution

Garibaldi obsidian is a natural volcanic glass resulting from the rapid cooling of viscous granitic magma. Since flows of magma are usually separate events, different flows should therefore be distinct from one another in their trace element distributions. X-ray florescence (XRF) is a useful non-destructive technique that has long been in used in archaeology (Nelson 1975: 91-95; Nelson et al.1975:85-97; James and D'Auria 1996:93-122). Analysis of obsidian with XRF identifies specific concentrations of trace elements found within a sample. These trace elements provide a "finger print" with which samples from other sites (both geologically and archaeologically) can be compared (Nelson 1975:91-95; Nelson et al.1975:85-97; James and D'Auria 1996: 93-122). Distinctive traits in XRF analysis are the height of elements along the spectrum. Figure 79, shows a typical Garibaldi Obsidian XRF graph (ARCAS 1999). This graph can be compared to other obsidian types which will have different heights of elements along the spectrum. Garibaldi Obsidian has particularly distinctive peaks of iron (Fe), Strontium and Zirconium (Zr).

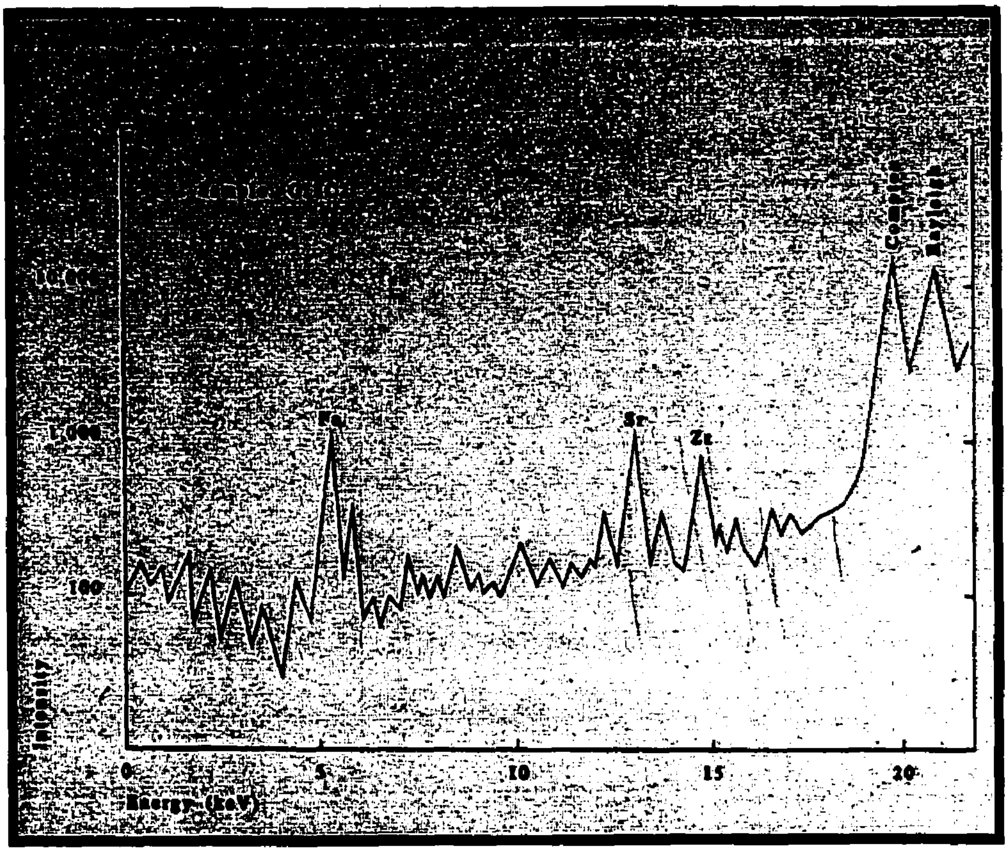

Figure 79. Garibaldi Obsidian XRF Graph, from ARCAS 1999.

Below are tables 30-34 summarizing site information. Each table has sites from different time periods and both high and low altitude areas. It is apparent that after Pleistocene de-glaciation in the Squamish/Mamquam valley (see Chapter 4) alpine areas began to be utilized by people. During this period bedrock would have been very exposed on a sparsely vegetated landscape. Use of alpine habitats continued over time, although likely due to the limited geographic extent of the obsidian source area, it was known to only a few people in the Squamish region. The small size of the source area, and the overall increase in sedentary settlements, and the increased complexity of local social and political institutions after ca. 4,500 BP (Ames and Maschner 1999:147-176; Carlson 1994:307-361, 1999:39-46) contributed to continued restricted access to the source area of this material, to only a few individuals of family groups. To test this hypothesis, an analysis of the occurrence of Garibaldi obsidian over time and space was done. I plotted the percent of Garibaldi obsidian in a site's flaked stone assemblage, against its linear distance from that source (Figure 80). This may also aid in determining the differences between direct access to the source and trade.

Table 30. Sites with Garibaldi Obsidian dated or attributed to the Old Cordilleran/Pebble Tool Tradition (10,000-5,500 BP).

Borden #	Name	Flaked Stone Ass.	% Garibaldi Obsidian	Distance to Source	C14 Dates	Reference
DiRu5	Coquitlam Lake	230/100%	180/78%	51km	none	Wright 1996
DkRr4	Mamquam Ridge	50/100%	50/100%	2.5km	none	Reimer 1998;1999
EaRt5	Tricouni Mountain	21/100%	1/4.7%	32km	none	ARCAS 1999
EaRr5	Russet Lake	25/100%	1/ 4%	27km	none	Reimer 1998; 1999

Flaked Stone Ass. = Number of Garibaldi Flaked Stone (N)/(%) in a site's assemblage. %Garibaldi Obsidian the Percentage of Garibaldi Obsidian in the site assemblage, Distance to source = Linear Distance to the source area in km.

Table 31. Sites with Garibaldi Obsidian dated or attributed to the Charles Culture (5,500-3,500 BP).

Borden #	Name	Flaked Stone Ass.	% Garibaldi Obsidian	Distance to Source	C14 Dates	Reference
DiRn2	Stave Lake	2/100%	1/50%	75km	none	Millennia 1998a-d
DhRn17	Stave Lake	14/100%	6/42.8%	76km	none	Millennia 1998a-d
DiRn1	Stave Lake	3/100%	1/33%	71km	none	Millennia 1998a-d
DhRo17	Stave Lake	4/100%	1/25%	76km	none	Millennia 1998a-d
DgRx5	Duke Point	1388/100%	107/7.7%	92km	4,130±100 to 680±90 BP	Murray 1982
DhRq22	Park Farm	1388/100%	107/7.5%	72km	4,170±120 to 300±50 BP	Spurgeon 1994
DhRn14	Stave Lake	67/100%	1/1.5%	76km	none	Millennia

						1998a-d
DkRs6	Stamis (workshop)	7694/100%	116/1.5%	17km	4,000±60 BP	ARCAS 1999
DkRu8	Helen Point	2580/100%	2/0.08%	109km	4,000-3,000 BP	Carlson 1970; 1994
DgRr2	St. Mungo	9540/100%	6/0.06%	72km	4,375±105 to 3,000±60BP	Ham et al 1984
DgRs1	Beach Grove	1026/100%	2/0.01%	82km	3,900±60 to 3,900±50BP	ARCAS 1996

Flaked Stone Ass. = Number of Garibaldi Flaked Stone (N)/(%) in a site's assemblage. %Garibaldi Obsidian the Percentage of Garibaldi Obsidian in the site assemblage, Distance to source = Linear Distance to the source area in km.

Table 32. Sites with Garibaldi Obsidian dated or attributed to the Locarno Beach Phase (3,500-2,500 BP).

Borden #	Name	Flaked Stone Ass.	% Garibaldi Obsidian	Distance to Source	C14 Dates	Reference
DkRr1	Columnar Peak	4218/100%	4218/100%	1.5km	2850±40 BP	ARCAS 1999; Reimer 1998;1999
DhRq21	Pitt River	194/100%	1/0.05%	61km	4390±90 to 220±80 BP	Patenaude 1985
DiRu15	Hopkins Landing	686/100%	2/0.02%	55km	2690±70 BP	ARCAS 1999

Flaked Stone Ass. = Number of Garibaldi Flaked Stone (N)/(%) in a site's assemblage. %Garibaldi Obsidian the Percentage of Garibaldi Obsidian in the site assemblage, Distance to source = Linear Distance to the source area in km.

Table 33. Sites with Garibaldi Obsidian dated or attributed to the Marpole Phase (2,500-1,500 BP).

Borden #	Name	Flaked Stone Ass.	% Garibaldi Obsidian	Distance to Source	C14 Dates	Reference
DkRr3	Lave Creek	23/100%	23/100%	1km	none	Reimer 1998;1999
DkRr2	Gargoyles	19/100%	18/94.7%	1.5km	none	ARCAS 1999; Reimer 1998;1999
DhRs1	Marpole	2208/100%	1466/66.4%	69km	2,900±170 to 1950±90 BP	ARCAS 1989; Burley 1980
DgRx36	Duke Point	17/100%	7/41%	72km	2580±60 BP	Murray 1982
?	Yorkson Creek	30/100%	4/13.3%	72km	none	Spurgeon per. comm. 2000

DgRw199	Gabriola Island	56/100%	5/8.5%	96km	2460±60 to 1720±60 BP	Curtin 1998
DhRx16	Departure Bay	61/100%	5/8%	95km	2130+30 to 1330+80 BP	ARCAS 1994
DiRu56	Gambier Island	287/100%	12/4.2%	48km	none	ARCAS 1998
DhRt6	Locarno Beach	1423/100%	35/2.5%	61km	1630±80 BP	ARCAS 1993
DgRv3	Dioniso Point	1272/100%	31/2.4%	98km	1770±70 to 1570±70 BP	Grier 1999a and b
DgRw204	Gabriola Island	45/100%	1/ 2.2%	96km	2320±70 to 2150±70 BP	Curtin 1998
DgRw4	False Narrows	414/1005	8/1.5%	96km	1710±90 BP	Burley 1989
DhRr8	Cates Park	?/100%	5/?	56km	none	Charlton 1971
DiRu60	Gambier Island	346/100%	3/0.09%	50km	none	ARCAS 1998
DiRu19	Plumper Cove	501/100%	3/0.06%	57km	2050±90 BP	ARCAS 1999
DiRo26	Stave Lake	454/100%	1/0.02%	76km	none	Millennia 1998a-d
EaRu5	Elaho Rock Shelter	550/100%	1/0.02%	51km	none	ARCAS n.d.

Flaked Stone Ass. = Number of Garibaldi Flaked Stone (N)/(%) in a site's assemblage. %Garibaldi Obsidian the Percentage of Garibaldi Obsidian in the site assemblage, Distance to source = Linear Distance to the source area in km.

Table 34. Sites with Garibaldi Obsidian dated or attributed to the Late Period (1,500-200 BP).

Borden #	Name	Flaked Stone Ass.	% Garibaldi Obsidian	Distance to Source	C14 Dates	Reference
DhRs6	Belcarra	280/100%	5/1.8%	55km	1620±90 BP to 1070±90 BP	Charlton 1980
DiRt11	Hallket Bay	270/100%	1/0.04%	48km	1190±120 BP	ARCAS 1999
DkRs6	Stamis (House)	6264/100%	14/0.02%	17km	1360±90 to 240±90 BP	ARCAS 1999

Flaked Stone Ass. = Number of Garibaldi Flaked Stone (N)/(%) in a site's assemblage. %Garibaldi Obsidian the Percentage of Garibaldi Obsidian in the site assemblage, Distance to source = Linear Distance to the source area in km.

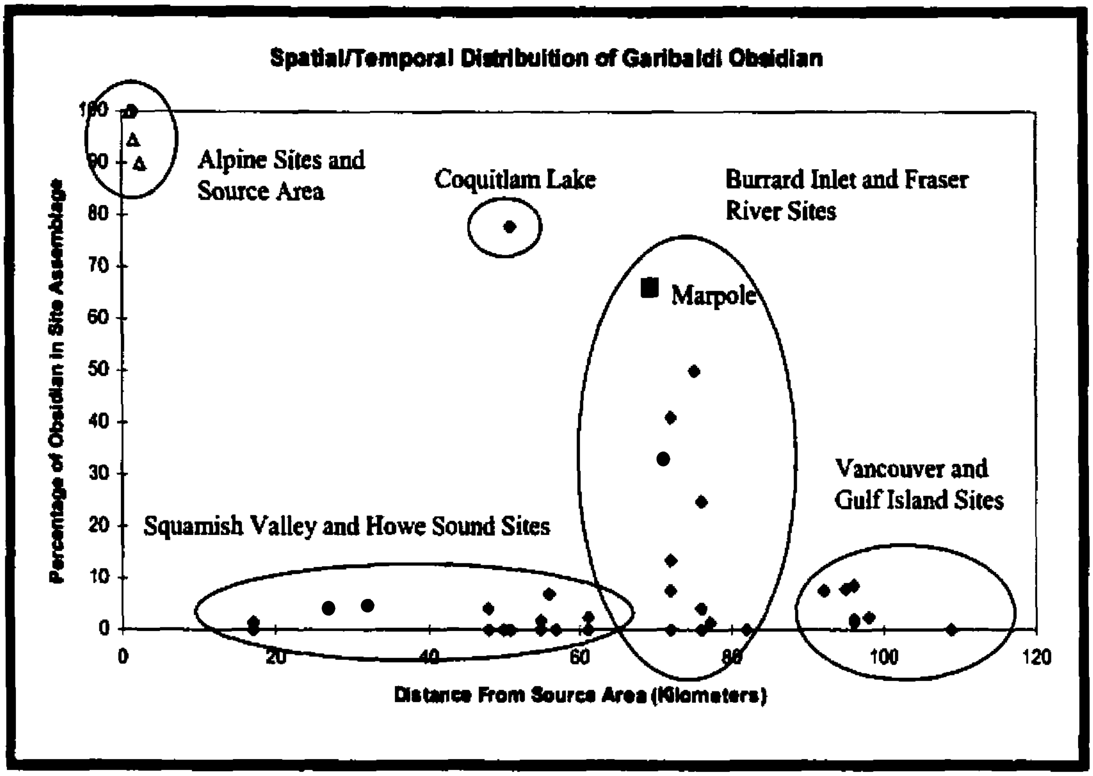

Figure 80. Plot of the Spatial and Temporal Distribution of Garibaldi Obsidian.

Data in Tables 30-34 and Figure 80 is from ARCAS 1989, 1994, 1996, 1998, 1999, n.d.; Baker 1974; Burley 1980; 1989; Carlson 1970, 1994; Charlton 1971, 1980; Curtin 1998; Grier 1999a and b; Ham et al.1984; Howe 1997; James and D'Auria 1996; Millennia 1998a-d; Murray 1982; Nelson et al.1975; Patenaude 1985; Reimer 1998, 1999a, 1999b, Spurgeon 1984,1992,1994, 1996 and Wright 1996.

Several areas in Figure 80 indicate the general pattern of long term use and the nature of procurement, production and trade of Garibaldi obsidian. First, a source production area is indicated by those sites with high percentages and short distances from the source area (marked by white triangles on the graph). At these, (Chapters 6-7), lithic raw material was reduced into useful forms, and then moved to low land areas to be further utilized and or traded. Since the source area is limited both in availability and size, it likely was controlled by a single family group, and access probably was restricted. People from outside the local area probably would not know of the exact location of the source, which otherwise would be very difficult to find.

Trade overland is indicated by those sites ranging from 20km to 30km away from the source, all located in the Squamish River drainage (Figure 80). This trade probably occurred mainly between villages and family groups in Squamish Territory. Such local trade, both overland and by water, is indicated by sites with high percentages of Garibaldi obsidian ranging in distance from 35km to 85km from the source (Figure 80). These sites are located in Howe Sound, Burrard Inlet and the Fraser Valley. This trade probably was between villages and family groups in Squamish Territory and Sto:lo Fraser River family groups, likely as part of kinship ties between those groups (e.g. Burley 1980, 1981:397-410). In fact, Garibaldi obsidian trade may have aided in gaining access to resources outside of Squamish Territory (i.e. the Fraser River fishery, Pitt River/Lake wapito harvesting etc).

Trade of obsidian between more distant groups is also indicated by sites away from the source area (Figure 80). The long distances and low percentages of Garibaldi obsidian in these site assemblages suggest the effects of kinship ties and alliances between groups in the Straight of Georgia region. The occurrence of Garibaldi obsidian in Marpole Phase aged burial contexts (Burley 1989:23, 51-64; Curtin 1998: 70-308) suggests that this material also may have held some ideological value. While obsidian bifaces and microblades can be viewed as utilitarian items, the rarity and ideological quality of the material was likely a powerful symbol to groups throughout the region. Mountainous alpine areas also are powerful areas, not only filled with different flora and fauna, but often seen as the home of powerful spiritual beings, like the Thunderbird. It is by far the most powerful being in Salish mythology and local peoples believed it lived atop Black Tusk Mountain (Bouchard and Kennedy 1976a and b). Lithic materials from such powerful places may have been seen as having special qualities. Similar associations with lithic material have been suggested elsewhere (Gero 1989:92-105; Tacon 1991:191-207).

Most obsidian sources in the Northwest are located at high elevations. Mt. Edziza, Anahim Peak, MacKenzie Pass, Ilgachuz, Central Coast A and B (probably My Silverthrone), Mt. Garibaldi, Elk Pass, Three Sisters, Burns Butte, Squaw Butte, and Cougar Mountain are all located in high elevation subalpine or alpine area (Apland 1977:1-21; Carlson 1994:307-361; Fladmark 1984:139-156,1985; McClure 1989: 59-70; Mierendorf 1999:1-24; Nelson and Will 1971:151-154; Reimer 1998,1999a:1-33 and b:1-44). It is therefore likely that obsidian held some ideological qualities and hence was widely sought after for that purpose, as well as its practical utility (Carlson 1994:307-361; Fladmark 1984,1985:139-156; Reimer 1998,1999a: 1-33 and b:1-44).

Evidence for use of Anahim Peak obsidian can be found in 9,500 BP levels at Namu (ElSx1) (Carlson 1994:313-315). Use of Mt. Edziza obsidian is dated to the 9,500 BP component at the Hidden Falls and Ground Hog Bay sites (Carlson 1994:313-315; Fladmark 1984:139-156,1985). The earliest use of Central Coast A and B (Mt. Silverthrone) occurs at Farquharson Island site (EdSn35) ca. 6,000 BP (Carlson 1994: 318). An overall decrease in the use of obsidian in many areas of British Columbia happens after 1,500 BP. That may be due to: 1) broad changes in technology, including chipped to ground stone, the disappearance of microblades, and the replacement of the atlatl with the bow and arrow; 2) increasingly sedentary populations, with a greater focus on low land areas and; 3) a later proto-contact population decline (Ames and Maschner 1999:87-112; Carlson 1983b, 1990, 1994:319-323; Fladmark 1982a:95-156 ; Mitchell 1990:340-358; Suttles 1990). However, the degree and intensity of use of this particular material should not obscure the value of high elevation areas for other uses, such as plant food collection and spiritual reasons. Nevertheless, the fluctuation in use of lithic materials may serve as a rough approximation of the length and intensity of high elevation landscape use.

8.3 Cathedral Park

As expected, lithic scatters form the largest number of sites in the sample from this area (Table 35). The abundant plant and animal resources in the park also make the pursuit of subsistence activities apparent in the archaeological record. However, no game drive complexes were found on the survey, possibly due to native use of natural terrain features rather that stone cairns, to direct game in a particular direction. A single culturally modified tree (CMT), found in association with a lithic scatter, is included as part of the lithic category. For more detailed description of lithic scatters see Chapters 5-7.

Several modern trails were used to access areas during the survey. However, they are likely pre-contact in origin, since several sites are in close proximity. Examination of old maps and interviews with elders in the Native and Euro-Canadian community would help in resolving the age of these features.

No cultural depressions were found in this area, although a house pit depression is reported to have been located on the shore of Quinesco Lake (Vivian 1989:17-38). A single isolated find was located and it is probable that numerous other isolated artifacts are scattered about the park area.

Two rock alignment features were located on this survey and it is likely that others exist in the area. These features are most likely related to spiritual activities, but their age is uncertain. The exact age of these features does not really matter since the local Similkameen people still make traditional use of the area, confirming the continuity of native culture and presence in the area. A single stone cairn also was found. This feature is probably related to cooking and processing plant foods and may contain charcoal that would prove useful for determining the age of this feature and its possible association with other sites in the immediate vicinity.

Table 35. Site Types in Cathedral Park.

Site Type	Number	Percent
Lithic Scatter	9	64%
Camp	2	12%
Quarry/Workshop	0	0%
Rock shelter	0	0%
Cultural Depression	1	6%
Cairn/ Petroform	3	6%
Isolated Find	1	6%
Historic	1	6%
Game Drive	0	0%
Totals	17	100%

The number of sites found in the alpine zone reflects the focus of the survey, (Table 36) and should not be taken as truely representation of the total patterning of sites within and around the entire Cathedral Park area (Table 36-37). A large amount of further survey will be needed to obtain a clear representation of sites (cf. Copp 1974, 1996:1-94; Reimer et al.1999:1-71; Vivian 1989:17-38).

Table 36. Sites by Vegetation Zone in Cathedral Park.

Vegetation Zone	Number	Percent
Alpine	9	53%
Subalpine	8	47%
Totals	17	100%

Table 37. Site Attributes in Cathedral Park.

Attribute Range	Mean
Elevation 1960m-2380m	2152.5m
Site Size 1m-122,500	128861m2 or 593.59m2
Sample Size (N) =17	

Most sites found on this survey occur within 500m of readily available natural resources, the exceptions being the two stone alignments on Lakeview Mountain. If further surveying is conducted in the area a more intensive investigation of areas with nearby water sources nearby is recommended, which may reveal more sites related to subsistence/camping activities. It also is suggested that further surveying take place away from water sources, since that may result in the discovery of sites unrelated to subsistence activities, like spiritual sites (e.g. Reeves 1996; Reimer et al.1999:1-71). Sites in the Cathedral region occur in all environmental zones and range greatly in size. The two largest are the Lakeview Stone Alignments; without these the mean size of sites would be small.

The paleoenvironmental record in the Cathedral region is not as well established as in coastal areas of B.C. However, an early Holocene warming and a Little Ice Age cooling event are known to have occurred. Evidence for mid-Holocene Neoglaciation is lacking and likely did not occur in this region due to a lack of high alpine glaciers. Nevertheless, varied temperature conditions in the past would have affected human use of the high country areas of the Cathedral region. During the Little Ice Age high elevation habitats were likely adversely affected, resulting in a decline of overall human use of such environments. However, the technology available to pre contact people(s) in the region would have been well suited for many environmental zones and situations (Chapter 7).

Table 38 illustrates the dynamic nature of high elevation site topographic locations over time.

Table 38. Sites by Landform/Biogeoclimatic zone and Predicted Paleo-environmental Prediction, for sites in the Cathedral Park.

Site	Landform	Current Zone	Little Ice Age	Hypsithermal
Glacier Lake Rock Cairn	Cirque Basin/ Lake	Subalpine	Alpine	Subalpine
Lakeview Rock Alignment 1	Ridge	Alpine	Alpine	Alpine
Lakeview Rock Alignment 2	Ridge	Alpine	Alpine	Alpine
Scout Lake Lithic Scatter	Cirque Basin/Lake	Subalpine	Alpine	Subalpine
Quinesco Trail	Pass	Subalpine	Subalpine	Montane Forest
Lakeview Subalpine Lithic Scatter	Cirque Basin	Subalpine	Alpine	Montane Forest/ Subalpine
Diamond Lake 1	Lake	Alpine	Alpine	Alpine
Diamond Lake 2	Lake	Alpine	Alpine	Alpine
Diamond Isolated Find	Lake	Alpine	Alpine	Alpine
Diamond Lake Historic Camp Site	Lake	Alpine	n/a	n/a
DgRb1	Lake	Subalpine	Subalpine	Montane Forest/ Subalpine
DgRb5	Lake	Subalpine	Alpine	Montane Forest/ Subalpine
DgRb6	Ridge	Alpine	Alpine	Subalpine
DgRb7	Avalanche Fan	Alpine	Alpine	Alpine
DgRb8	Cirque Basin/Lake	Alpine	Alpine	Subalpine
DgRb10	Lake	Subalpine	Subalpine	Montane Forest
DgRb11	Lake	Subalpine	Subalpine	Montane Forest

8.3.1 Temporal Resolution of sites in the Cathedral Region

Like other regions the limited data recovered from high elevation sites offers only a very coarse temporal resolution, based on diagnostic artifacts, lithic technology, and land forms as presented in previous chapters. The basis for the age estimations summarized in Table 39 assumes that: 1) artifact typologies from lowland settings have application at high elevations; 2) pre-contact inhabitants of the region preferred to use subalpine locations because of greater diversity of resources (Chapters 3,5, and 6) and hence; 3) they would have used various sites when they were most suitable for habitation (i.e. during the "Hypsithermal" and not during the Little Ice Age). Again, similar models of temporal use of high elevations have been suggested by Benedict 1992a:1-16, 1999:1-15; Fladmark 1984:139-156,1985; Frank 2000:83-89; Godfrey-Smith 1985; McClure 1989:50-79; Reimer 1998,1999a:1-33; b:1-44; Reimer et al.1999:1-71)

Table 39. Age Estimation for Sites in the Cathedral Park Region.

Site	Lithic Technology	Landform	Age Estimate
Lakeview Rock Alignment 1	n/a	Ridge	500-20 BP
Lakeview Rock Alignment 2	n/a	Ridge	500-20 BP
Scout Lake Lithic Scatter	Middle to Late	Cirque Basin/Lake	6,000-100 BP
Quinesco Trail	Middle to Late	Pass	5,000-500 BP
Lakeview Subalpine Lithic Scatter	Middle	Cirque Basin	6,000-2,000 BP
Diamond Lake 1	Middle	Lake	6,000-2,000 BP
Diamond Lake 2	Middle	Lake	6,000-2,000 BP
Diamond Isolated Find	Middle to Middle	Lake	6,000-2,000 BP
DgRb1	Middle to Late	Lake	5,000-500 BP
DgRb5	Middle to Late	Lake	5,000-1,000 BP
DgRb6	Middle to Late	Ridge	5,000-1,000 BP

DgRb7	Middle to Late	Avalanche Cone	6,000-1,000 BP
DgRb8	Middle to Late	Cirque Basin/Lake	5,000-1,000 BP
DgRb10	Middle to Late	Lake	5,000-1,000 BP
DgRb11	Middle to Late	Lake	5,000-1,000 BP

8.3.2 High Elevation Resources in Low Land Settings

Another attribute that may help in interpreting sites at high elevations is the discovery of items or materials available only in those environments, in better known lowland settings. Alpine resources found from low land sites can be used as an indicator of the relative intensity of high elevation resource use. Table 40 below illustrates the occurrence of faunal remains that may have been hunted at high elevations and brought to low elevation sites for consumption, or for use as industrial raw materials (cf. Rahematulla and Hodgetts n.d: 1-15). Data in Table 40 drawn from Copp's (1996:1-94) excavations at the Sterling Creek site (DiRa 9), Similkameen valley and Ewonus' (1999) study of fauna from that site.

Table 40. Fauna from The Sterling Creek Site (DiRa 9), (Adapted from Ewonus 1999:88).

Level	Deer	Sheep Goat	Total Artiodactyl	Rodent
1	5	1	10	0
2	0	0	1	0
3	0	8	13	2
4	1	0	6	1
5	0	0	4	0
6	0	6	7	2
7	0	1	3	1
8	1	5	13	3
9	0	1	7	0
10	0	0	2	0

Based on radiocarbon dates from DiRa9; 1810±90 BP (NUTA 4687), 6920±100 BP (NUTA 4644) and 7400±90 BP (NUTA 4645) (Copp 1997:13), diagnostic artifact types and stratigraphy, three cultural components were delineated by Copp (1996:1-94). Component 1 (levels 8-10) dates ca. 7,500-6,000 BP, component 2 (levels 2-5) ranges in age between ca. 6,000 and 2,500/2,000 BP and component 3 (levels 1-2) dates ca. 1,500-200 BP. As is apparent, use of high elevation faunal resources occurred through the entire sequence of occupations at Sterling Creek. Further evidence of a long term use of high elevations can be found at sites in the Cornwall Hills and other Interior Plateau localities (e.g. Rousseau 1987 a:1-38 and b:6-9,1989,1993:140-183).

8.4 Site Information for other areas in the Northwest

For comparative purposes sites found on surveys in the Squamish/Garibaldi area in 1998-1999, are listed in Table 41 below, along with those of other coastal ranges. Some information is incomplete due to the nature of the reporting of sites. (For further details consult references given in Chapter 2).

8.4.1 Northwest Coast and Sub-Arctic Mountain Ranges

Examination of well recorded and reported site data from mountain ranges in coastal regions of the Pacific Northwest indicate several consistent patterns (see Table 41). The number of sites in subalpine and alpine areas is almost equal, 47% in the alpine, 53% in the subalpine, although the number of alpine sites is inflated by sites found in Fladmark's (1984:139-156,1985) Mt. Edziza study. If Mt. Edziza is removed from the sample, subalpine sites are more common. Favored landforms where sites are located include ridges, passes, and cirque basins/lake-tarns. The most common site types found at high elevations are lithic scatters, camps and quarry/workshops with obsidian and cryptocrystaline silicates the most common lithic raw materials. High elevation sites (sub-alpine and alpine) elevation ranges from a low of 1205 meters on Vancouver Island, to 2952 meters on Mt. Rainer. This range simply indicates that a wide variety of regional boundaries of high elevation (subalpine and alpine) environments exist and must be taken into account when surveying for sites. Site sizes range from as small as 1 meter square to 40,000 square meters, reflecting the varied nature of human resource utilization at high elevations. See Chapter 2 for summaries of this site information and references.

Table 41. Northwest Coast and Sub-Arctic Mountain Range Site Information.

Coast Range	Alpine Site	Data					
Vegetation Zone	**Squamish**	**Van. Island**	**CAN Cascades**	**USA Cascades**	**Mt. Rainier**	**Mt. Edziza**	**Yukon/N.W.T.**
Alpine	3	4	6	4	4	77	1
Subalpine	8	0	2	33	29	38	2
Total	**11**	**4**	**8**	**37**	**33**	**115**	**3**
Site by Landform							
Ridges	5		5	19	2	17	3
Moraine/Bench	1			8		25	
Pass				4	8	50	
Cirque basin/or lake	5		3	3	20	22	
Steep Slope				2	3		
Avalanche fan or cone		4		1		1	
Total	**11**	**4**	**8**	**37**	**33**	**115**	**3**
Site Type							
Lithic Scatter	8		2	24	28	91	
Camps	2		2		3	16	
Quarry/Workshop	1		1	7	2	5	2
Rock shelter		4		2			
Cultural Depression				2			
Cairn/ Petro-form				2		1	
Isolated Find			3			1	
Historic						1	
Game Drive							1
Total	**11**	**4**	**8**	**37**	**33**	**115**	**3**
Dominant Lithic Type							
Obsidian	4			6		115	
C.C.S.			8		33		2
Quartz Crystal				1			
Basalt/Dacite	7	1					1
Other							
Total	**11**	**1**	**8**	**7**	**33**	**115**	**3**
Elevation Range	1460m-1850m	1205m-1420m	1600m-1982m		1791m-2952m	1350m-2090m	1830m-2300m
Average Elevation	1641.36m	1266.25m	1761.75m	1671m	2158m	1482m	2143.3m
Site Size Range	50m-40,000m	3.5m-12m	1m-1000m				
Site Size Average	7527m2	49.65m2	331.625m2	1667m2	1052m2		

8.4.2 Interior Ranges

Examination of the well reported and recorded sites in the interior mountain ranges of the Northwest indicate several patterns (see Table 42). First, subalpine elevation sites slightly dominate the sample at 63%, with the remainder 37% found in the alpine zone. Landforms favored for site selection include ridges, moraine/benches and cirque basins/tarn-lakes. Lithic scatters, cultural depressions and quarry workshop sites are the most common site types found at high elevations in interior regions of the Pacific Northwest. Common lithic types include, obsidian, cryptocrystaline silicates and basalt/dacite. Alpine sites range in elevation from 1402 meters to 2441 meters, reflecting the wide range of local high elevation (subalpine and alpine) environments and varied foci of study by different archaeologists. Sites range in size from 1 meter square to 122,500 square meters. This reflects the number of activities done by pre-contact populations of the interior region. See Chapter 2 for further site information summaries and references.

Table 42. Interior Mountain Ranges Site Information.

Interior Range	Site Data			
Vegetation Zone	**Cathedral Park**	**Lillooet Region**	**Potato Mt.**	**Rainbow Mts.**
Alpine	9	9		3
Subalpine	8	29	956* 16	20
Total	17	38	965	23
Site by Landform				
Ridges	3	19	965	20
Moraine/Bench		12		
Pass	1	1		
Cirque basin/or lake	12	2		3
Steep Slope				
Avalanche fan or cone	1	4		
Total	17	38	965	23
Site Type				
Lithic Scatter	11	24		3
Camps			16	
Quarry/Workshop	1			20
Rock shelter				
Cultural Depression		9	965	
Cairn /Petro-form	3	4		
Isolated Find	1	1		
Historic	1			
Game Drive				
Total	17	38	965	23
Dominant Lithic Type				
Obsidian			2	23
C.C.S.	16			
Quartz Crystal	1			
Basalt/Dacite		38	47	
Other				
Total	17	38	49	23
Elevation Range	1960m-2380m	1402-2316m	1763m-1915m	1615m-2441m
Average Elevation	2152.5m	1958.78m		1837m
Site Size Range	1m-122500m	1m-12600m	478m-4342.5m	4m2-10000m2
Site Size Average	128861m2	994.47m2	0.5m-4.5m	623m2
	593.59m2			

- indicates the number of cultural depressions found in a total of 16 sites.

8.5 Conclusions

To conclude, this thesis presented a base of archaeological, ethnographic, modern environmental and paleoenvironmental data designed to formulate a survey methodology and series of theoretically proposed archaeological site types for high elevation areas in the Northwest. It was found that a wide range of past human activities took place at high elevation environments, mainly related to ungulate hunting and lithic raw material procurement. Other activities included plant gathering and processing, and ritual ceremonies. Sites at high elevations in the Northwest occur mostly in the subalpine environmental setting in cirque basins/tarns and along ridge tops. Selection of such locales seems to have been primarily based on their proximity to a wide range of resource patches. Based on types of resources, the use of high elevation habitats in the Northwest probably increased during the early Holocene warm interval (10,000-6,000 BP). Timberlines rose as much as 60-120 meters at that time, which would have enhanced plant and animal habitat and improved food resource availability for people using high elevation environments. The overall intensity of use of high elevation habitats seems to have declined during parts of the mid-Holocene (6,000-5,000 BP and 3,300-1,900 BP) and late Holocene (900-200 BP). The onset of Neoglacial conditions also may have had a general affect on the development of cultures of the Northwest. Between 6,000-3,000 BP many groups shifted their economic strategies from being "foragers" to "collectors." It is probable that the drastic change in the utility of high elevation environments was a contributing factor to such cultural change. Access to valuable high elevation lithic raw materials, and plant and animal resources would have been adversely affected, hence cultures with rising populations began to focus on other forms of technology and lowland resources. When high elevations were not adversely affected by harsh environmental conditions, a "collector" form of alpine resource procurement use could have been employed during times of lowland resource stress.

Sites do occur at high elevations and archaeologists must include information about such sites in order to better understand full regional cultural patterns in the Cordillera and other mountainous areas. It is hoped that this study can serve as a message to all archaeologists to pay more attention to high elevation seasonal adaptations and sites when considering entire past cultural systems. Peoples who inhabited the Northwest in the past had a great understanding all of its environments, ranging from sea level to mountain peaks. Archaeologists should attempt to develop an equivalent understanding if complete interpretations of past cultures are to be made.

Thus, in order for archaeologists to develop well-rounded perspectives of past cultures, they require information from sites and data in every environment. That includes more accurate lithic source studies, fine grained identification of flora and faunal materials, and radiocarbon dates from high elevation sites. Normally, at lower elevations, such data would require major research projects aimed at investigating one or more multi-component sites, containing suitable organic and other materials. However, the extreme environments of high elevation sites make the recovery of such data difficult, since organic material does not preserve well, unless contained in permafrost, frozen glacial margins or hearth contexts.

Recent data from other areas of the Northwest are evidence of this. In the last year human remains found melting out of a glacier in Tatsenshini Park were dated to approximately 500 BP (Kuehn 1999:78-81). Named "Kwaday Dan Sinchi" or "Long Ago Person", and with the blessing of local Champagne-Aishihik native groups, this person's remains will offer data related to late prehistoric human use of high elevations. In addition, faunal remains and hunting gear dated to 2450±50 BP (TO-6871) and 4360±50 BP (TO-6870) from the Thandlat locale of the southern Yukon will provide other information about pre-contact technology, hunting strategies and caribou herd distributions (Kuzyk et al 1999:214-219).

Further south, well preserved basketry dated to approximately 2900 BP found along the edges of melting glaciers in Olympic National Park, will potentially offer information related to past plant gathering activities (Mierendorf 1999 personnel communication).

Such finds from melting snow packs and glaciers may become increasingly common and will provide important information about pre-contact mountaineers of the Northwest. That will lead to a fuller understanding of the overall human past of this incredible beautiful and dynamic mountainous region.

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