Archaeological Overview Assessment of a Portion of the Williams Lake Forest District

Final Report

Prepared for:

The Ministry of Forests, Williams Lake Forest District

and

Tsilhqot'in First Nations

and

Williams Lake Band

and

The Archaeology Branch

By:

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Management Summary

In January of 1997, Millennia Research Ltd. was contracted to conduct an Archaeological Overview Assessment (AOA) of the Williams Lake Forest District

Archaeological overview potential maps are tools, which can be used in the management of heritage resources. The maps produced during the course of this project are intended to be of use to First Nations, the Ministry of Forests, industry, government agencies and others. They shall be used in planning for development activities and the associated potential threat to the integrity of archaeological resources; they are especially helpful in operational planning. All heritage resources which pre-date 1846, and several other site types are automatically protected under the British Columbia *Heritage Conservation Act.*

Timberline Forest Inventory Consultants Ltd. helped develop and produce the potential model and maps in co-operation with Millennia Research Ltd. The following report summarises the background information used to build the model, the modelling development process, the final mapping process, overall final results, and final recommendations.

The end goal of the Williams Lake Forest District AOA was to develop a model that could be used to produce maps that show archaeological potential. The development of the archaeological potential model involved finding the relationship of various types of archaeological sites with sets of geographical, cultural, ecological, and geological variables. For example, habitation sites are most likely to be located close to large bodies of water. Document research and ethnographic interviews with present day First Nations were used to help in defining these relationships. All variables for the model were then loaded into the GIS and, using a variety of TRIM data, and other topographic and elevation information, the GIS produced maps which detail polygons of high, moderate to high, moderate and low potential for archaeological remains. The potential that is assigned to an area depends on the types and numbers of variables that are present in that region.

Our archaeological site potential model was then tested for accuracy. Using an existing database of archaeological sites in the study area, and site-specific ethnographic information, we ran tests to see if the model successfully predicted these. The results of these tests are given in this report.

The modelling was limited by gaps in the available data, especially the lack of archaeological survey in several areas. To address these data gaps, we recommend future Archaeological Inventory Surveys (AIS) be conducted to verify and refine the model, particularly in areas of low potential.

As a result of our findings we recommend that high and moderate to high potential areas be subjected to a full Archaeological Impact Assessment (AIA) prior to any development activities. Areas of moderate potential should be given a reconnaissance level survey (RECCE). First Nations and the MoF should determine the appropriate level of effort for further archaeological work in low potential areas.

The assessment of archaeological potential is limited to the material remains of past human activities. For this reason, issues concerning the extent of traditional use activities and aboriginal rights should not be inferred from these maps or this report. These issues should be

addressed through consultation with the Williams Lake Band, Esketemc Band, Yunesit'in Band and Tsilhqot'in National Government.

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The staff of Millennia Research Ltd. would like to thank the descendants of the original inhabitants of what is now called the Williams Lake Forest District. What we study and make decisions about ultimately belongs to them.

We would also like to thank the numerous people involved in the project including Irvine Johnson, and Karen Robbins of the Esketemc Band for sharing their knowledge of archaeological sites within their territory, and Beth Bedard and Sandra Sauer for their assistance in coordinating and overseeing the ground truthing sections of the fieldwork. Helpful assistance was also provided by Lynne Gilbert of the Williams Lake Band. From the Yunesit'in Band we would like to thank Tony Meyers, William Meyers, and Cecelia Quilt for sharing their knowledge of archaeological sites within their territory. Valuable assistance was given by Ronnie Quilt of the Yunesit'in Band for providing us with adequate maps and precise location descriptions during our fieldwork. From the Tsilhqot'in National Government office in Williams Lake we would like to thank Don Wise, and Lars Jensen for expressing their concerns about archaeological fieldwork and its implications on TNG territory as well as helping us arrange for First Nations assistants from the Yunesit'in Band.

We would also like to thank the principals of the Williams Lake Forest District office for initiating the project including Marian Diamond for her patience, help, and overseeing of the project. We would also like to thank the staff from I.R. Wilson Consulting Ltd as well as the staff from Arcas Consulting Archaeologists Ltd for sharing their information with us.

There are many other individuals at Millennia Research Ltd. that contributed in many ways - particularly Donna Eckert.

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Introduction

In January of 1997, The Ministry of Forests contracted Millennia Research to conduct an Archaeological Overview Assessment of portions of the Williams Lake Forest District (WLFD). Summaries of ethnographic and ethnohistoric knowledge, previous archaeological research, and environmental characteristics of the study area were commissioned as part of this project.

The purpose of an Archaeological Overview Assessment (AOA) is to develop a means through which the occurrence of cultural heritage resources within the Forest District can be predicted. Predictive modelling, as this is known, is a tool that can assist appropriate land use and development planning. Resources available for management of archaeological and heritage resources are finite. Predictive modeling focuses these limited management resources on locations that are believed to have the greatest potential for the recovery of archaeological information.

The primary objectives for an AOA are to:

- summarise existing, available information regarding site types and their distribution within a given study area
- develop a predictive model based on the collected information
- use the predictive model to delineate areas of archaeological potential, so that archaeological resource management can be incorporated into forestry planning processes
- identify where data for effective predictive modelling is lacking.

This report presents the results of the overview process for the WLFD. It includes a review of relevant literature (including previous archaeological studies, ethnographic studies, and other documentation of archaeological resources), the development and evaluation of a predictive model for portions of the WLFD, and the identification of data gaps within the project area.

Millennia Research is currently working in conjunction with a number of First Nations within whose traditional territory the project is situated. The information presented in the following report will be distributed to First Nations. For this Overview, an agreement on how to proceed was negotiated with the Tsilhqot'in National Governrnent, and an attempt was made to negotiate a similar agreement with the Alkali Band.

In the following report, discussions of traditional territory and culture groups will be undertaken with primary reference to the available literature. Millennia Research acknowledges that at present a significant degree of overlap exists between contemporary First Nations territorial claims. Addressing this issue is beyond the scope and mandate of this project.

Report Format

This document is the final report required by the terms of reference for the Williams Lake Forest District AOA. This report provides all information relevant to the currently contracted WLFD AOA.

Following this **Introduction,** the **Methodology** section provides a discussion of predictive modelling, including its role in cultural resource management and its specific application in this project.

The **Physical Setting** section presents a biophysical, paleogeographical, and paleoenvironmental summary of the study area. This section provides the physical context for model building.

The Ethnographic Context and Archaeological Land-Use Correlates section begins with a summary of literature and other information concerning the lifeways of First Nations within the Forest District. The ethnographic information provided is a summary of literature relevant to the AOA and does not necessarily reflect the manner in which contemporary First Nations peoples would describe their own lifeways or those of their ancestors. Following the ethnographic overview, ethnographic, archaeological, and geographic information are brought together to develop expectations concerning the types of archaeological sites produced by past and present First Nations groups and the environments in which these sites are expected to occur.

The section entitled **Previous Archaeological Research in the Study Area** provides a brief description of the major cultural sequences archaeologists have developed for the study area over the last several decades. These cultural sequences represent archaeological interpretations of culture histories for the interior of BC. This is followed by a description and evaluation of previous archaeological work within and adjacent to the project area.

The **Predictive Model Development and Application** section presents the predictive model developed for the Williams Lake Forest District. The model is described in straightforward terms, and the variables or factors included in the model are discussed. Following presentation of the model, results of field-testing of the model's predictions are provided.

The section on **Data Gaps** points out gaps in our knowledge – that is, areas where data are insufficient or of poor quality – in the study region. The affects these gaps have on predictive modelling in the study region are discussed.

The **Recommendations** section provides recommendations for further archaeological studies, justification for that work, and guidelines for in-field testing of the model. This is followed by a brief **Evaluation and Discussion of the Results** that draws together and evaluates the results of this AOA.

Project Team

Millennia Research Ltd.

Millennia Research is a firm specialising in archaeological and ethnographic consulting. Formed in 1984, the firm has provided professional expertise to First Nations, private forest and oil sector companies, Federal and Provincial government ministries, and smaller companies and developers. Our areas of expertise include archaeological overview assessments, archaeological impact assessments, culturally modified tree research, GIS applications, traditional use site inventories, and management of large-scale archaeological inventories. Millennia Research has recently been involved in a number of projects located within the Interior of B.C.

Timberline Forest Inventory Consultants Ltd.

Timberline Forest Inventory Consultants Ltd. is a Canadian-based forestry consulting firm specialising in forest resource inventories. The company began its operations in 1971 with an initial emphasis on providing high quality timber cruising data for valuation and planning purposes. Timberline has extensive practical experience with database design, digital mapping, and data analysis gained through the completion of short and long-term projects over the past ten years. Timberline currently employs a staff of approximately 100 computer professionals, foresters, forestry technicians, geographers, and photogrammetists.

Terminology

This report provides a detailed summary of the information used to formulate and apply an archaeological potential model for the Williams Lake Forest District. We have made every attempt to ensure that the following report is clear, easy to read, and understandable by individuals with diverse backgrounds. However, it is sometimes necessary to include technical terms that are specific to fields of study such as geomorphology, biology and archaeology. When included, these technical terms are defined in the Glossary provided in Appendix 1 of this report.

Relevant Legislation

Legislation exists protecting archaeological resources in British Columbia. The following section outlines information relevant to archaeological practice in the Province. For a copy of the statutes, contact the Archaeology Branch.

According to the *British Columbia Forest Practices Code Act* (1994) and the *Ministry of Small Business, Tourism and Culture and Ministry of Forests Protocol Agreement on the Management of Cultural Heritage Resources* (1994), cultural heritage resources are recognised as integral components of Provincial lands. The *Protocol Agreement* states that "cultural heritage resources will be managed so that their inherent values are protected, maintained, or enhanced according to the principles of integrated resource management" (Section 3.3). These statements comply with, and are subject to the *Heritage Conservation Act* (British Columbia 1994), section 6, which states:

- Archaeological sites within the province of British Columbia, whether on private or public lands, are protected by *the Heritage Conservation Act (the Act).*
- It is against the law to damage, desecrate or alter an archaeological site in British Columbia unless under a permit issued by the Archaeology Branch.
- Sites which date prior to 1846 are automatically protected under the *Act.*
- Certain sites such as burials and rock art are protected regardless of age.

Penalties under the Act

- **Individuals** who knowingly or unknowingly disturb an archaeological site are in contravention of the *Act* and are subject to a fine of not more than $50,000 or to imprisonment for a term of not more than 2 years or to both (the *Act* Section 3 1(3)(a) 1995:47).
- **Corporations** who knowingly or unknowingly disturb an archaeological site are subject to a fine of not more than $1,000,000 (the *Act* Section 31(3)(a),(b) 1995:47).
- Furthermore, the *Act* (section 3 1.(4) 1995: 47) states that if a corporation commits an offence under this Act, an **employee, officer, director or agent of the corporation** who authorised, permitted or acquiesced in the offence also commits the offence and is liable [to the penalties outlined above].

The Archaeology Branch, which is part of the B.C. Ministry of Small Business, Tourism and Culture is responsible for administering the *Act.* The Archaeology Branch is located in Victoria, B.C. and should be contacted for further information regarding the *Act.* The *Act* is also included *in the British Columbia Archaeological Impact Assessment Guidelines,* copies of that are available from the Branch upon request

Information Confidentiality

When gathering cultural heritage information for an Archaeological Overview Assessment, issues of confidentiality must be addressed. Knowledge concerning the location and nature of cultural heritage sites is considered very sensitive by many First Nations groups, and they may be reluctant to release it. However, the success of an AOA hinges on the amount of detailed information that is accessible, consultation with First Nations is both desirable and essential. To address First Nations concerns over the release of sensitive information, confidentiality clauses are established to ensure that information provided by First Nations is not inappropriately disseminated. In an effort to provide confidentiality, the location of sites on record at the Archaeology Branch and other types of traditional use information are contained on a map layer available for 'viewing-only' purposes at the Ministry of Forests office.

In some instances it is necessary for licensees and other developers to know the general location of archaeological sites in areas slated for development in order to avoid impact to those sites. However, they need not know site details. The district manager can access a copy of site locations (identified by Borden number) plotted on 1:20 000 map sheets. In this way, developers can be aware of the presence of archaeological sites in their development areas. If required, a table containing basic site descriptions cross-referenced with Borden numbers will be provided so that appropriate planning directives can be established. If developers wish to obtain more detailed information concerning the nature of a site, they will have to request that information through the Archaeology Branch or, in the case of sites not on record at the Branch, from the appropriate First Nation(s).

Methodology

Predictive Modelling

INTRODUCTION

First Nations have traditionally obtained the resources necessary for sustaining life from the surrounding natural environment. Enviromnents can vary considerably in the resources that they offer, and thus different environmental zones have been used for different purposes by First Nations groups. Identifying the relationships between the environment and past human activity is the key to developing models to predict where archaeological sites are likely to occur. It is necessary to bring together detailed information from (1) historic, ethnohistoric, and ethnographic sources, (2) previous archaeological research, and (3) biophysical characteristics of an environment to bring human-land relationships to light. A predictive model then uses these relationships to predict where and with what frequency archaeological resources are expected to occur in different environments.

Ethnographic information on land use and information obtained directly from First Nations peoples provide an important source of data for understanding how First Nations groups used of their local environment. This information allows accuracy in predictions, since it provides an understanding of cultural conceptions of the landscape and perceptions of the resources that were available in various areas at various times. Previous archaeological work is critical to predictive models, since this work provides a record of where in fact First Nations people chose to live and how they used their environment in the recent and distant past.

There are many direct correlations between specific ecological and geological contexts and the occurrence of certain site types (Alexander 1994b). In previous archaeological research involving predictive modelling, environmental characteristics such as elevation, slope, drainage, aspect, and availability of fauna1 and floral resources have been identified as factors influencing site location. These factors are useful in predictive models since they describe specific and consistent attributes of the locations where sites may occur. It is important that these characteristics be modelled as accurately as possible. In certain cases attempts have been made to apply models developed from the Fraser River and Thompson River areas to other regions (Richards and Rousseau 1987). However, in doing so, predictions may be inaccurate because of differences in the cultural and biophysical environments.

In combination, the sources of information described above provide a broad-based and powerful set of data on which to base predictions about the potential for archaeological or heritage sites to occur in a given area. The objective of predictive modelling is to bring together and use these types of data to develop models that may be used to accurately predict where sites occur. Reliable predictive will greatly assist appropriate land use and development planning.

THE ROLE OF PREDICTIVE MODELLING IN CULTURAL RESOURCE MANAGEMENT

The appropriate role of predictive modelling in cultural resource management has been debated in the archaeological community for a number of years, and many published papers discuss the merits and limitations of its application (DeBloois 1985, Kohler 1985). This debate stems, in part, from different interpretations of what a predictive model is, and what it can (and cannot) do. It is therefore necessary to be clear about its capabilities and limitations.

Predictive modelling does not necessarily imply the use of so-called "objective" statistical techniques to determine where archaeological sites will be found. In the simplest sense, a predictive model entails observing patterns of known archaeological sites across the landscape, and using that information to suggest where other sites may be found. The use of statistical methods in predictive modelling assists in the standardization of methodology, producing more consistent and replicable results.

The sophistication and accuracy of a predictive model is dependent on the quantity and quality of available data. Gaps exist in the archaeological record and in our knowledge of the past. Models must be developed in light of this, and efforts must be made to deal appropriately with the information that is available. Subsequent sampling and in-field "ground truthing" is required to test the hypotheses used to create the model, and to provide both positive and negative data that can help to refine it. This is particularly true for forested environments, where site visibility, poor preservation of organic materials, and a limited body of detailed archaeological and ethnographic data limit the capability of a model.

Models predict the potential for sites to be present in a given area, but field investigations are required to actually locate and record the sites. Site location modelling is a means of focusing limited archaeological management resources on locations that are believed to have the greatest cultural and archaeological significance. Modelling can be an effective resource management tool, and can help to ensure the protection of many archaeological sites. It is not, however, a substitution for field survey. No model can account for the locations of all sites or even all site types. To do so requires not only an understanding of the complex cultural activities that produce the sites, but also detailed knowledge of post-depositional processes that affect site preservation, the various site location methodologies used by different archaeologists, and different interpretations of existing site distribution data (Kohler 1985). Some archaeological sites will be missed by any sampling method, and some of them may be destroyed by development. This limitation is inherent in modelling and overview assessments, and it cannot be avoided without complete survey of all potential development zones — a goal that is not possible given the resources presently available.

Other factors necessary to consider in relation to the use of predictive modelling in overview assessments include:

1. Many of the inferences made about pre-contact aboriginal sites are based upon ethnographic documents that were produced by non-aboriginal ethnographers with a somewhat limited understanding of indigenous cultures.

2. Both the written and archaeological record of First Nations cultures represents only a fraction of the cultural systems they seek to describe and explain.

3. The time allotted for this study is insufficient to permit an exhaustive review of the literature or adequate First Nations consultation. This is a recurrent problem with cultural resource management work. Though the problem stems from practical limitations, the completeness of the product is nevertheless limited.

4. Archaeological overview assessments are open-ended studies that are subject to review and revision as new information becomes available.

5. Many of the data that are critical for predicting archaeological site potential (e.g., detailed paleoenvironmental syntheses, fish habitat data, and terrain maps) do not exist for large areas of the province.

6. There is no standard method for archaeological modelling in British Columbia. Several consulting firms are operating under similar but somewhat variable research designs. This has consequences for the compatibility of data and results.

7. Definitions and boundaries of what constitutes 'meaningful consultation' with First Nations groups are not clearly outlined at the outset of many AOA projects. Consequently, the consultation process in an archaeological project is often overshadowed by First Nations concerns regarding wider issues of information confidentiality, aboriginal rights, and Ministry of Forests-First Nations relations. These are issues which we, as archaeologists, cannot appropriately address.

The Present Study

The objective of the present study is to build upon previous knowledge and use available lines of evidence to predict, as accurately as possible, which areas of the Williams Lake Forest District are most likely to contain archaeological sites. This will allow appropriate investigations to be conducted in those areas prior to development. The following discussion provides information and background for the development of the predictive model for assessing site potential that is presented later in this report.

This assessment of site potential evaluates the Forest District in terms of the probability that archaeological sites would be *present, preserved, and could be located in the field*. The assessment focuses on **archaeological sites,** (that is, places with physical evidence of human occupation or use), and does include a traditional land use component (however, data from traditional land use studies undertaken in previous years is used).

Many aboriginal activities did not leave physical evidence, and much of the material culture that was left behind has not been preserved. Therefore, the material evidence that we may find in the archaeological record provides only a glimpse of the true nature of past cultural systems. A thorough ethnoarchaeological/traditional land use study could contribute greatly to our understanding of pre-contact occupation and use of the study area.

INCORPORATING EXISTING INVENTORY DATA INTO THE STUDY

A wide variety of site inventory information exists for the study area. The Archaeology Branch Annotated Bibliography (Ministry of Small Business 1995) was consulted to identify archaeological investigations that had been conducted previously within the Williams Lake Forest District. This information was sought in order to provide a substantial database on which to build the predictive model. Many of the archaeological inventory studies conducted in the study area were useful in this regard.

Most archaeological projects carried out in the WLFD relate to proposed forestry developments. Relevant data from these reports were compiled and evaluated. Inventories produced through probabilistic surveys and systematic, intensive surveys were included. Data from probabilistic surveys provided site inventories covering a greater variety of environmental zones, though few engaged in examining correlations between site location and environmental context. In reality, any projects that made detailed, systematic observations on environments and site locations were useful in some respect in the predictive modelling process.

In addition to the Archaeology Branch Bibliography, we obtained site information for the study area from the Canadian Heritage Inventory Network (CHIN). This information was reviewed to ensure that all relevant archaeological work was included. From the reports and information collected, a summary of previous archaeological investigations in the WLFD was produced (see 'Previous Archaeology' section).

OBJECTIVES FOR THE MODEL

In developing a methodology for the predictive model, we established a number of characteristics and objectives that we felt were essential for a useful predictive model. In doing so, we have attempted to incorporate and build upon aspects of previous models that were successful and re-think how to approach areas that were weak. The characteristics/objectives set for the WLFD predictive model include:

1. **Factors that affect where sites are located in the Forest District must be clearly identified.** Known sites should be used to identify the characteristics of known site locations. These characteristics should be assessed in terms of their relative importance in affecting site locations, since not all factors that can be identified as important are equally important. Ethnographic information needs to be a major factor in deciding the importance of these factors. The factors that affect site locations should be measured consistently,

and should consist primarily of characteristics of the natural environment that can be observed by survey teams when in the field.

2. **Factors that are thought to affect the location of sites should be more associated with sites than areas without sites.** Said another way, it will be difficult to predict where sites will occur if factors important in the location of sites occur as often with sites as with areas without sites. This means that we need, in addition to site location information, information about locations where sites are known not to occur, The model can then involve a comparison of these two datasets (site and non-site) to determine if the factors we have identified as important for site location are in fact good predictors of site locations exclusively.

3. **For factors that influence site locations, we need to determine exactly how close a location must be to an environmental feature in order for that factor to be considered important in affecting site location.** If a site is on a lakeshore, then it is reasonable to suggest that that lake was a draw for the occupants of the site. But, if that lake is 1500m away, is it still legitimate to say the lake is affecting the location of that site? Decisions about cut-off distances (buffers) need to be made for the model to work, since an area's local context forms the basis for assessing potential. These decisions should not be arbitrary, but should be made by considering the distances of all sites from a feature. The exact methodology of how buffers are developed will be discussed later.

4. **The predictive model must be useful for predicting the location of sites for the WLFD study area as a whole,** not just for the site locations and non-site locations known through survey. This requires having information about the environmental characteristic of the whole study region.

5. **A satisfying and consistent way to measure site potential needs to be part of the predictive model.** Since areas of the study region will differ in their potential for archaeological sites to occur, their relative potential must be characterized in a way that emphasizes the important factors determining site locations. This should be an easy, intuitive scale that is additive -- that is, if a location has a number of features that are likely to attract human habitation, it should be a higher potential location. There are no areas in the study region that have absolutely zero potential for sites to occur. Consequently, we should think of potential as something that exists inherently in every location, but that various factors may constrain the capability of any location to support human use. Some locations are, of course, better suited to human use than others.

6. **When site potential results are produced for various areas, we need to make management and protection of archaeological sites the ultimate objective. Areas** with high potential should contain the highest density of archaeological sites, and areas of lower potential should contain a lower

density of archaeological sites. This will offer the most protection to areas where the most information stand to be lost by alteration or development.

7. **The model must be able to be evaluated with actual 'in-field' investigations.** The correspondence between the model and the real world, that is, the quality of its predictions, should be testable. This will provide an overall sense of the model's ability to predict where, and with what relative frequency, various types of sites will occur in different environmental zones. Evaluation with field work can also serve as a means to refine the model.

8. **The model needs to be replicable.** Others should be able to apply the model to other areas of the province. Also, the results of the model should be easy to update when further information from the WLFD comes available.

These points spell out the underlying considerations in developing a predictive model for archaeological sites in the study region. These guiding concepts are incorporated into the model presented later in this report. The links between these concepts and the workings of the model are discussed in the Predictive Modelling section.

Physical Setting

Study Area

The Williams Lake Forest District falls within the south-central portion of the Interior Plateau in the Mid-Fraser River region. This plateau extends south to north from the Canada-US border up to the 57th parallel. It is bordered on the west by the Coast Mountains and on the east by the Columbia Mountains and Southern Rockies. It is characterized by subdued, gently rolling uplands cut by valleys providing limited relief (Hebda 1995). The boundaries of the Forest District do not coincide with any natural geographic features, having been arbitrarily set.

The study area includes only portions of the Williams Lake Forest District. Millennia Research was contracted to conduct an overview assessment for areas that fell outside of the traditional territory claims of the Cariboo Tribal Council (CTC). Boundaries to the study area were set on this basis. A map of the boundary was provided to us by the Williams Lake Ministry of Forests Office. Millennia Research recognizes that the CTC has interests in the portion of the study area which we have been contracted to assess.

Two geographically separate sections of the Forest District are included in the current study area. The northwest portion is bound by the Chilcotin and Quesnel Forest Districts and includes Rosita and Tautri Lakes. Portions of the traditional territories of both the Tsilhquot'in National Government (TNG) and the CCTC (Carrier-Chilcotin Tribal Council) are represented in this section. A second portion of the study area is located south of the city of Williams Lake, and includes the area east of the Fraser River in and around Chimney and Alkali Creeks. The traditional territory of the Alkali Lake Band is included in this portion of the study area. The area west of the Fraser River including the confluence of the Chilcotin and Fraser Rivers, Bambrick Creek, Big Creek, West Churn Creek, Gaspard Creek and Gaspard Lake are also within our study area. This area includes parts of the traditional territories of both the CTC and the TNG.

Millennia Research acknowledges that there is significant overlap between territorial claims by Bands and Tribal Councils, and that many of the interests of First Nations are not limited to the sections which we have been asked to assess. To research and present the interests of First Nations in this Archaeological Overview.project, representatives from the TNG, CCTC, and the Alkali Lake Band are working with Millennia Research, and the CTC is working with I.R. Wilson Consultants. This archaeological overview report is offered without prejudice to any land claims associated with the study area.

The study area includes a number of distinct biophysical zones with varied climate, vegetation, geography, and fauna (Krajina 1969). These characteristics and how they vary across a landscape influence, in both subtle and obvious ways, the land use strategies that a culture can employ. Therefore, it is important to describe the environmental conditions that existed during the history of known human occupation in

climate, and vegetation. Climate conditions in each zone allow and sustain the growth of certain species of plants and animals. Descriptions of these bioneoclimatic zones the study area. Ethnographic and archaeological investigations conducted in the study area suggest the suite of resources that were used by First Nations, and the way they organized themselves on a varied landscape.

Modern Environment

The Williams Lake Forest District falls within the Cordilleran Canada climate region (CC). In this region the winters are cold and the summers are warm to hot. Upper elevations are moister than the southern valleys. Climatic conditions in the northern part of the CC are influenced by cold dry Arctic air.

The province has been divided into a number of areas of similar geography, climate, and vegetation. Climate conditions in each zone allow and sustain the growth of certain species of plants and animals. Descriptions of these biogeoclimatic zones presented below draw heavily upon the work of Meidinger and Pojar (1991). Three biogeoclimatic zones dominate the study area: the Sub-Boreal Pine-Spruce Zone (SBPS), the Sub-Boreal Spruce Zone (SBS), and the southern limits fall within the Interior Douglas-Fir Zone (IDF).

The **Sub Boreal Spruce** (SBS) zone dominates the central interior of British Columbia. It is found in the gently rolling terrain of the Nechako and Fraser Plateau. The climate of this zone is characterized by seasonal extremes in temperature, having extremely cold, long, snowy winters and hot, short, moist summers. The SBS is considered transitional between the "true montane forests of Douglas-fir to the south; the drier, colder pine-spruce forests to the southwest; boreal forests to the north, and subalpine forests at higher elevations" (Meidinger and Pojar 1991:2 10). White spruce and subalpine fir species are the most abundant trees when the vegetation in the SBS has reached a state of equilibrium. Pioneer species (those that grow after an environmental disturbance) include lodgepole pine and trembling aspen. Natural grassland and shrubs are uncommon (Meidinger and Poj ar 199 1:2 12).

The **Sub-Boreal Pine Spruce** (SBPS) zone occurs on the high plateaus in the west central interior of British Columbia (Meidinger and Pojar 1991: 196). It is located south and west of the SBS. It is found on the gently rolling landscape of the Fraser Plateau and the southernmost portions of the Nechako Plateau. It occurs between elevations of 850 to 1500m asl. Like the SBS, the climate is continental with cold, dry winters and cool, dry summers. The most common tree species is the lodgepole pine. White spruce and trembling aspen are common as well. White spruce is often found encircling the perimeter of non-forested wet lands. Douglas-fir, subalpine fir, black spruce, and black cottonwood are also found in this zone. The understory is composed primarily of dwarf shrubs, grasses, lichens, and mosses (Meidinger and Pojar 1991: 198). Small, natural grasslands do occur in this zone.

The flat open expanses of the Interior Plateau fall within the **Interior Douglas-Fir** biogeoclimatic zone (IDF). It is prevalent in the low- to mid-elevation landscape of the south-central interior of British Columbia. It falls between 350 and 1450 m in elevation at its extremes (Meidinger and Pojar 1991: 154). In the north, the zone is surrounded by SBS and Sub-boreal Pine zones. This zone is also characterized by a continental climate with warm, dry summers, a long growing season, and cool winters (Meidinger and Pojar 1991: 154). Open to closed forests of Douglas-fir are the most common forest type. Ponderosa pine occurs at lower elevations. Western red cedar sometimes occurs in wetter areas and at higher elevations. Hemlock, trembling Aspen, Grand Fir, and paper birch are also present in this zone but in lower numbers. Grassland communities are common. Understory species include soapberry, kinnikinnick, bearberry, and pinegrass.

In addition to these three prominent zones, four other biophysical zones are represented to a lesser degree in the study area. These include the Bunchgrass (BG), Alpine Tundra (AT), Engelmann Spruce - Subalpine Fir (ESSF), and Montane Spruce (MS) zones.

The **Bunchgrass** (BG) zone occurs mainly in river valleys of interior southern British Columbia, including the mid-Fraser and lower Chilcotin River valleys. It is found from the valley bottoms up to elevations of 700 to 1000 metres, where IDF often begins. The prevailing ecological condition is aridity; the bunchgrass zone includes most of the hottest and driest parts of the province. Precipitation is low overall, with minimal winter snowfalls. Temperatures are quite hot in summer, and winters are moderately cold. A moisture deficit coupled with hot summer temperatures provides conditions suitable only to grasses. Trees (primarily trembling Aspen) and shrub species are limited to localized areas of greater moisture, such as the wetlands common throughout the bunchgrass zone. Bunchgrass areas provide good habitat for herbivores, as evident in the modern use of these areas for cattle grazing land.

The **Alpine Tundra** (AT) zone occurs at the highest elevations in all areas of the province. The lowest extent of Alpine areas varies. It extends down to lower elevations in the north (where temperatures overall are colder) than in the south. In the study area, Alpine Tundra is found as low as 1500m. Conditions are cold and harsh, with the average temperature remaining below freezing for 7 - 11 months of the year. Most precipitation falls as snow, and frosts can occur at any time of the year. As the label tundra implies, this is an area mostly devoid of tree species and characterized by rock, ice, and snow. Stunted examples of tree species common to subalpine areas may occur at its lowest elevations. Common flora of Alpine areas includes grasses, shrubs, herbs, and lichens. The growing season is short and characterized by low temperatures. Many large fauna frequent Alpine Tundra areas.

The **Engelmann Spruce - Subalpine Fir** (ESSF) zone is a zone of high elevation forest that occurs immediately below Alpine Tundras in the southern interior of the Province. The extremes of elevation at which it occurs are 900m and 2300. The ESSF is found predominantly in mountainous terrain, but may also occur on high-elevation plateaus in the study area. Its climate is cold, with long winters (temperatures average below freezing for five to seven months of the year) and most of the variable precipitation falling as snow. In the summer, temperatures exceed 10 degrees Celsius for two months at most, Engelmann Spruce and Subalpine Fir predominate the tree species, with spruce more common in mature forests. Lodgepole Pine will establish rapidly after fire, and may predominate in drier areas of this zone. Others pines, firs, and even hemlock or cedar may be found in minimal numbers. Open meadows occur in sheltered areas and host a variety of herbs and flowers.

The **Montane Spruce** (MS) zone is a middle elevation forest found on the Fraser Plateau as far north as 53°. It extends southward to and into the USA. Elevations at which it occurs range from 1100m to 1700m. It is often found above tracts of IDF or SBPS and below the ESSF, and is thus transitional between the lower elevation forests and subalpine and alpine floral regimes. It is characterized by a cool, continental climate, with cold winters and warm summers. Precipitation is variable, and in warmer and drier portions of this zone moisture deficits can occur. It contains trees common to both the ESSF (spruce and subalpine fir), IDF (Douglas fir), and SBPS (white spruce) zones. Lodgepole pine quickly reclaims areas cleared by wildfires. Prominent understory species include black huckleberry, pinegrass, falsebox, Utah honeysuckle, and grouseberry. Grasslands occur only on southern exposures in drier areas, and wetlands are uncommon.

Paleogeography and Paleoenvironment

In addition to information on the modem biogeoclimatic characteristics of regions, archaeologists use paleoenvironmental data to model past human adaptations. The paleoenvironment of the study area is discussed below.

Prior to 11 000 years ago, most of the interior of British Columbia was buried beneath thick deposits of glacial ice. It was not until the end of the Fraser Glaciation (approximately 11 000 BP) that the extensive Cordilleran Ice Sheet thinned. Radiocarbon dates suggest that an area to the east of the Fraser Plateau, the Rocky Mountain Trench, was without glacial ice as early as 12 200 years ago (Clague 198 1: 17). Glacial melting in areas of low and moderate relief allowed the uplands to poke through the ice sheet. This created a series of 'tongues' of ice in many interior valleys. Active glaciers became restricted to upper levels of major mountain systems (Clague 1981: 17). Radiocarbon dates from the bottom of bogs in the interior indicate that deglaciation occurred later in the west than in the east.

When the glaciers melted, many of the river valleys carved by these glaciers were filled with meltwater. Water terracing can be seen on the hillsides today. This post-glacial period was one of massive deposition and accumulation of sediments in lower elevations to form fans, deltas, and floodplains. The bulk of these deposits were probably laid down within a few hundred years of deglaciation (Clague 1981: 19).

Slowing of the massive accumulation and slope stabilization allowed vegetation to establish in the region. Lake and river levels fluctuated at this time as indicated by the deep channels cut by rivers. The Fraser and Thompson River beds are cut up to 300m into the late glacial sediment surfaces (Ryder 1971). There is evidence of moose and mountain sheep in the area by 11 000 BP.

Between 10 000 and 9500 years ago the plateaus and valleys of the interior were completely deglaciated. The climate became warmer and drier than the climate of today. Glacial lakes shrunk in the warmer conditions leaving behind rivers and streams in their place (Fladmark 1986:18). At this time plant communities, mainly grasses, began to flourish.

A study of the pollen sequence from Pantage Lake near Quesnel provides the Holocene (the last 10,000 years) climate history for the area (Hebda 1995:69). The sequence from this lake begins approximately 9200 years BP. Pine pollen dominates the sequence from its beginning but fluctuations in spruce (Picea) and grass (Poaceae) pollen are indicators of some climate change. Between 9200 and 7000 BP the sequence shows a high grass pollen content. At 8000 BP the climate was still warmer and drier than at present but slightly cooler than in the early Holocene. Decreased temperatures and increased moisture levels meant small water bodies extended their boundaries. In response to the cooler and wetter conditions, pine and spruce extended their habitat to lower elevations (Fladmark 1986:41). After 7000 BP, grass pollen counts drop to zero and spruce pollen rises. By approximately 5000 BP spruce is quite common (Hebda 1995:69). These species indicate that the climate had become moister between 8000 and 5000 BP and that a shift from SBPS conditions to those of the SBS occurred.

Between 8000 and 4500 BP wind-blown sand accumulated along river valleys creating terrace-edge dunes. These were prime settlement locations for past human populations (Fladmark 1986:41). The eruption of Mt. Mazama in Oregon at 6800 BP affected climatic conditions, but the extent of its effect on past human populations is not known.

By 4500 years ago the modern climate had been established. Minor fluctuations have occurred during this period, including a series of brief, slightly warmer periods set against the backdrop of an overall slight cooling trend (Fladmark 1986:121). This cooling has led to occasional, minor glacial re-advances -- a severe but short-term re-advance in the mountains occurred just before European contact.

From the modem and paleoenvironmental data available, it is reasonable, particularly when considering human adaptations, to speak of a relatively stable environment as having existed over the last 4500 years. This is certainly true relative to the major changes in climate, vegetation, fauna, and geography that took place in the few millennia immediately following the end of the last major glaciation.

Ethnographic Context and Archaeological Land Use Correlates

Ethnographic observations are critical to the development of predictive models since they can identify factors relevant to predicting the location of archaeological sites. Three First Nations groups traditionally occupied the WLFD -- the Carrier, Tsilhqot'in, and Secwepemc. The following discussion first provides the general situation in the study area, and subsequently separately examines the cultural practices of Carrier, Tsilhqot'in, and Shuswap.

The information presented is directed towards demonstrating patterns of resource utilization and settlement. Fauna1 and floral resources commonly used, seasonal settlement patterns, and overall land-use patterns are stressed. This information is emphasized in order to highlight practices that may be preserved in the archaeological record. However, they represent only one dimension of the varied and rich lifeways of First Nations groups. The implications of ethnographic information for predicting site location are presented in the section half of this section, which develops archaeological correlates for identified land-use patterns.

In presenting the ethnographic information that follows, the past tense has been used since much of the discussion refers to cultural practices as they were recorded at or shortly after contact with Europeans. Many of these traditional practices continue to be integral to the present day lifeways of the First Nations discussed here. (Teit 1975 [1900]).

Ethnographic Context of the Williams Lake Forest District

The WLFD is located within the traditional territory of three ethnolinguistic groups, the Shuswap (Secwepemc), Chilcotin ***(Tsilhqot'in)*** and Carrier (***'uda ukelh*** or ***Yinka*** Dene). The Secwepemc are members of the Interior Salish language family, and the Tsilhqot'in and Carrier belong to the Athapaskan language family. Each of these ethnolinguistic groups represents a culture group with shared language and history (Alexander 1994a, 1996a, Duff 1969, Teit 1909).

The Carrier and the Tsilhqot'in are two of the 23 Athapaskan languages represented in the Northern Athapaskan language family of the Subarctic interior of Alaska and Western Canada (Krauss and Golla 1981:67). Most of the Northern Athapaskan languages are still spoken. Athapaskan culture groups have never been completely isolated for long periods of time. As a result, the language represents many dialects with considerable linguistic overlap (Krauss and Golla 1981).

Secwepemc is one of four linguistic subdivisions of the Interior Salish division of the Salish Language family. At the time of European contact (in the early 18th century) the Secwepemc were further sub-divided into seven subgroups which were both linguistically and geographically distinct (Duff 1969). Subdivisions were interrelated through social relationships of trade and marriage.

Settlement and subsistence patterns among the Interior Salish Secwepemc and Athapaskan Carrier and Tsilhqot'in Bands show many parallels, however variation in seasonal rounds and settlement are noted in ethnohistoric literature. Among Athapaskan culture groups, bands generally dispersed during winter months into small camps. Leadership was informal and each household was guided by a spokesperson (Morice 1906). Interior Salish cultures such as the Secwepemc tended to spend winter months in large villages (Alexander 1996a, Teit 1906).

CARRIER

Carrier peoples have traditionally occupied an area within the central portion of the province of British Columbia, between 120-128 degrees west and 53-55 degrees north (Duff 1964). Carrier is a linguistic classification that includes all Athapaskan dialects of central British Columbia, ranging from the Bulkley River area to Quesnel. Three distinctive dialects are recognized within the Carrier language family: Northern (also referred to as Babine), Central or Upper, and Lower or Southern.

The largest of these was the Lower or Southern Carrier. Five Southern Carrier Bands were identified during the 19th century: ***Nazkot 'en, Lhkatko 'en, 'Ulkatchot'en, Lhoosk'uzt'en*** and a Bowron Lakes area band (Alexander 1996a, Furniss 1993b). This last band is unnamed; it was destroyed by disease during the mid 1800s (Alexander 1996a). The modern communities of Prince George, Cheslatta, Stellaquo, Fraser Lake, Stoney Creek, Kluskus, Nazko, Quesnel, Ulkatcho and Anahim Lake are members of the Southern Carrier language group (Krauss and Golla 1981).

The Carrier have used a number of names to identify themselves in the past. The narne *dakelh*, a shortened version of ***'uda ukelh*** meaning "people who travel by boat on water in the morning", was commonly used (Furniss 1993b:3). Contemporary Carrier peoples identify themselves by various names. The name Carrier is still used by many, however others prefer Dene, which in Athapaskan means "the people", or Yinka Dene, meaning "people of the land". In the northern end of Carrier territory, some bands refer to themselves as members of the Wet'suwet'en Nation (Furniss 1993b:4).

Morice (1905:4) wrote that Carrier peoples had villages from Stuart Lake and associated tributaries down through to the Alexandria area on the Fraser River. Today, the Carrier Indians occupy the north-central section of the province of British Columbia. Their traditional territory extends west from the Coast Mountains to the Rocky Mountains in the east, and 300 km south from Takla Lake to the Chilcotin Plateau (Fumiss 1993b: 1).

The social systems of Carrier peoples were varied, resulting in their division into numerous subtribes (Duff 195 1, Tobey 1981:413). Among the Western and Central Carrier peoples, bands were divided on the basis of matrilineal clan associations (Goldman 1953). The most common kin group was the domestic family, which often included all members of the extended family. This group was referred to ***as sadekoo*** by the Algatcho (Furniss 1993b, Montgomery 1978). People within a clan who held hereditary names and privileges were the ***netsi*** or crest group. Both of these entities were bilateral kin groups (Goldman 1953:58-59). Morice (Morice 1893) noted that Carrier peoples were matriarchal in relation to political succession and property inheritance. Hereditary noblemen known as "toenaza" owned hunting grounds, and were political leaders of clans (Morice 1905: 5). It is suggested however, that most kinship reckoning remained bilateral (Kew 1974). A great deal of flexibility was maintained in social group membership. Following marriage, new couples could choose to reside with either partner's family (Kew 1974).

In reference to band political structure, Morice (1906: 199) observed that prior to contact with European traders and missionaries, there was no single "official" band leader or chief. Men were appointed by Europeans, notably the Hudson's Bay Company, to hold specific offices to act as liaisons in social and economic relations. This was done by Europeans for the benefit and interests of both missionaries and traders, since in interactions they preferred to deal with a single or small number of 'chiefs' (Kew 1974). Prior to this, leadership within Carrier groups was considerably more informal. Leaders were recognized on the basis of their skills in decision making and leadership. Many bands were directed by a number of individuals who had demonstrated leadership and ability through time. The nature of leadership was thus affected by interactions with European settlers and traders.

Post-Contact History

The first European outsider to enter Carrier territory was Alexander Mackenzie in 1793. Early historic accounts of Carrier peoples are found in his journals. As well, brief notes on the Carrier exist in the journals of Simon Fraser and Harmon (Lamb 1970). Fraser established the first trading post west of the Rocky Mountains at Fort McLeod in 1805. This was followed by outposts at Stuart Lake and Fraser Lake in 1806 and Alexandria in 1821 (Tobey 1981). Most of the information available regarding the early historic cultural practices of Carrier peoples comes from the writings of Father Morice (1890, 1892, 1905, 1906, 1910, 1930) a Catholic missionary who spent a considerable amount of time with the Stuart Lake Carrier. Limited ethnographic accounts have been provided by Jenness (1929, 1934, 1943) on the Bulkley River Carrier, by Ray (1939, 1942) based on information from one Fort Alexandria individual, and by Steward (1955, 1960) in his Stuart Lake Carrier research. Goldman (1941, 1953) has provided extensive information about Southern Carrier social systems, with particular emphasis on the Ulkatcho. Fumiss (1993a, b) collected information from many Southern Carrier people in conjunction with an education-focused project. Kinship studies of select Carrier groups were carried out by Duff (1952) and Hudson (1972).

At the time of European contact, it is estimated that the Carrier numbered approximately 8,500 of an estimated total of over 80,000 Native people in the province of British Columbia (Furniss 1993a: 1). This is the highest population of any Athapaskan culture groups at that time (Tobey 1981). In the nineteenth century, thousands of Europeans entered the area as traders and workers in the Cariboo Gold fields. Increased contact between cultures had devastating results for many Native communities as Native peoples became exposed to smallpox and measles, to which they had no resistance (Kew 1974). The first epidemics at Fort Alexandria were recorded in trader's journals in 1838 and 1839, during which the number of registered Native inhabitants at the fort dropped from 747 to 150 (Morice 1906: 195-6). Today, it is estimated that the Carrier Nation has a population of approximately 9,000 people (Furniss 1993b: 1).

Two Southern Carrier Bands used areas within the WLFD -- the Nazkot'en or Nazko and the Lhtakot'en – and are treated here in further detail. Southern Carrier peoples believe that they have lived in their traditional territory since the beginning of time (Furniss 1993b). Historically, peoples of the Southern Carrier lived in bands, distinct social and political units. At the time of contact, band size was highly varied, in some areas up to 200, in other areas maintaining 20-30 members (Furniss 1993b:5). Currently, the southern Carrier include four bands: Red Bluff, Nazko, Kluskus and Ulkatcho.

The traditional territory of the Nazkot'en people (the "people of the Nazko River", or Nazko) extended along the Nazko River through to the lower Blackwater, Quesnel, and Fraser Rivers. Nazko territory also included an area northeast of the Fraser River up into the Cariboo Mountains (Furniss 1993b:6). This territory did not hold the same kinds of incentives for European traders and settlers as other adjacent areas where mining took place. This left Kluskus and Nazko territory relatively free from Europeans (Kew 1974). Brief visits to the area by Catholic Missionaries and Oblates of Mary Immaculate began in the late 1880s, and a Catholic Church was established at Kluskus shortly thereafter.

Federal reserves were not established in Kluskus or Nazko territory until the end of the 19th century. The Nazko Band was granted four reserves in the Blackwater River area and one reserve in the Nazko River area. The Kluskus Band was allotted four reserves in the Kluskus Lake area (Furniss 1993b). This was only a small proportion of the territories that they had previously used, and peoples from both Kluskus and Nazko Bands requested additional reserve territories. Traditionally, the Nazkot'en maintained hunting territories on both the east and west sides of the Fraser River. Members of the Nazkot'en who primarily used the area west of the Fraser are now known as the Nazko. Nazkot'en peoples who hunted in the east are now represented by the Red Bluff Indian Band (Alexander 1996a, Furniss 1993b).

Lhtokot'en bands occupied an area between Quesnel and Alexandria on the Fraser River (Alexander 1996a, Furniss 1993b, Teit 1909). Most of the Lhtakot'en were killed during the smallpox epidemics of the 19th century. Remaining members were joined by members of the Secwepemc and Anahim Flat Tsilhqot'in to form what is now the Alexandria Band. This band is considered to be Tsilhqot'in (Alexander 1996a, Teit 1909). Alexandria, Nazko and Red Bluff all claim traditional territory within the north-east border of the WLFD (Alexander 1996a)

Southern Carrier Seasonal Rounds

Subsistence and settlement patterns of the Southern Carrier were influenced by resource availability over the course of a year (Harmon 1816, Kew 1974, Morice 1893, 1906). Certain patterns of seasonal movement structured Carrier peoples' distribution throughout the territory. Many sites were re-visited seasonally when plant and animal resource became available (Kew 1974, Montgomery 1978). If resource conditions were favourable, many families would camp together at certain sites. Groups would remain in smaller, often family-based groups of four or five members when seasonal resources were less abundant (Kew 1974). During the spring and summer salmon runs, families camped together at traditional fishing sites. In the winter months, families came together once again at winter camp sites located along lakes (Montgomery 1978). Kew (1974) suggested that flexibility in settlement patterns was a key element of Carrier resource use.

Spring

During the spring, families gathered at established fishing camps located on lakeshores and streams (Harmon 1816, Morice 1893). Furniss (1993b) reports that in earlier times Carrier peoples traveled to the Quesnel, Cottonwood and Willow rivers (east of the Fraser) as well as the Quesnel and Bowron Lakes area to fish. Primary fish species taken during this time were trout, carp, whitefish and suckers (Harmon 1816). Fishing methods in these involved the use of nets, basket traps, fences, leisters and hooks (Furniss 1993b:25, Morice 1893).

Root plants such as wild parsnips were collected and roasted during the spring. Pine trees were bark stripped for their sap which was scraped and eaten (Furniss 1993b, Morice 1893).

A number of species of animals were hunted and trapped during this season, but many animals tended to be thin and scattered throughout the territory after the lean winter months (Morice 1893). Snares were used to catch squirrels, beavers, muskrats, marten, otter, wolverine fox, coyote, mink and waterfowl (Furniss 1993b, Morice 1893).

Summer

During the summer months, families moved to and aggregated at major river banks to catch large numbers of salmon. Salmon was fished extensively from late June through to the end of September or early October. One run of salmon began in late June, a second larger run reached Carrier territory by the middle of July. The Fraser River was the location of the most abundant salmon run (Goldman 1953: 258). Salmon runs have also been recorded for tributaries of the Fraser River, including Antler Creek, Cottonwood, Swift River, Willow River, and Quesnel River. Salmon fishing locations are recorded on a number of small lakes and streams below Bowron Lake (also *Sustut,* or "black bear water").

Some fish were eaten fresh, but the majority was dried on platforms or in cache pits lined with spruce bark. Salmon were also hung summer houses and cured with smoke from cooking tires (Furniss 1993b).

Other fish species were also taken during this period, particularly lake trout and suckers. Among Nazko and Kluskus peoples, fishing for these species at lakes and streams was often more intense than efforts to catch salmon. Salmon fishing was poorer on the Fraser River within the Quesnel area because waters were fast running and shores were muddy (Kew 1974). In addition to fishing, Carrier peoples also traveled and hunted land animals throughout the highlands (Morice 1893).

In the summer, a large number of plant species were collected and many were processed and stored for later use, Berries such as blueberries, strawberries, saskatoons, chokecherries and soapberries were eaten fresh or were dried into small cakes. A variety of root species were gathered and were either boiled or roasted in underground pits (Furniss 1993b, Kew 1974).

Fall and Winter

Hunting was a primary subsistence activity in the fall and winter months. Terrain in Carrier territory ranges from flat to gently rolling hills. The Blackwater, Dean, and Fraser Rivers are major water systems within the area and support a wide number of fauna1 species. Throughout the area, a number of large ungulates ranged, notably cariboo, which was once the most important species hunted. Moose became common in southern Carrier territory only during the past century, and has displaced cariboo as the main focus of hunting. Morice (1893) notes that fall was one of the best times of year to hunt. Meat from moose, cariboo, deer, elk, mountain goat and beaver was eaten fresh and stored (Morice 1893). Large game such as cariboo were hunted extensively in the late fall and winter. Animals were driven along fences into corrals where they were killed, or were hunted in their grazing areas at the base of mountains. All parts of the cariboo were utilized, either fresh or as a dried product. Antlers were used for making tools and skins were used for clothing and shelter construction (Furniss 1993b: 27).

Carrier peoples moved up into lake areas and camped along their shores before snow accumulated in the late fall (Tobey 1981). These locations were chosen for their abundance for wood and for the fishing opportunities they offered (Morice 1906: 21). In the latter part of winter, large game animals became scarce and people trapped and snared small mammals, including rabbits and squirrels. Families owned snaring grounds, and a number of snaring tools were designed. The diet was supplemented by dried meat and fish and stored roots (Kew 1974).

During the winter months, ice fishing camps were established. Camps along lakeshores were occupied by several families. The areas chosen offered predictable resources and were near an ample supply of wood (Morice 1893).

Carrier Resource Use and Technologies

Collection and Use of Plant Resources

A wide variety of plants were used as a food base throughout the year. Large numbers of tubers and roots were collected in the spring, including parsnips and tiger lily bulbs. Many of these roots were roasted in pits and were stored for later use (Kew 1974). During the summer months, blueberries, soapberries, and strawberries were collected and were dried in the sun or smoked. A wooden frame covered in leaves served as the drying rack for thick clusters of berries, which produced berry cakes. Thin layers of mashed berries were also dried and produced 'fruit leather'. Jams were made from berries by mixing mashed berries together with fish oil. Mosses and lichens from the lower branches of pine trees were eaten, particularly during periods of food shortage. Rocks were heated in fires and used to boil water to make teas and cook food in bark basket containers.

Various plant species were collected by Southern Carrier people for use as medicines. C*hundoo* ***dzeh,*** a common medicine, was made from the pitch of lodgepole pine trees combined with fat. This ointment was used extensively for treatment of rashes, infections, and to ease the pain of broken bones. A preparation of Alder tree bark was used to soothe burns; the bark was boiled and the liquid applied to the skin. Rashes were treated with pitch from Douglas-fir. Medicinal teas and tonics taken internally were made to treat a variety of ailments. Willow bark tea was used for fevers (called *k'idlih* in Southern Carrier), while black birch tea was used to treat colds. Boiled juniper branches and berry plants were used to treat colds, bladder infections and other kinds of infections (Fumiss 1993b: 39).

Hunting and Use of Animal Resources

Among the southern Carrier bows were used extensively in hunting. Bows were made from a bent green wood, strengthened by layers of sinew which were fastened to the back side of the bow with pine gum. A variety of projectile points were manufactured from a diverse array of raw materials including basalt, quartz, and obsidian. Harpoon tips were also manufactured by Carrier peoples and were used for hunting beaver. These tips were attached to sinew lines which allowed hunters to recover them for re-use (Furniss 1993b).

Small animals were caught using traps made from carefully balanced weights connected to a trigger line, Weights were usually made from stones or heavy trees, and animals were lured to the deadfall with bait. Deadfall traps were used primarily for catching fur-bearing animals, since this method of capturing them did not damage their fur (Furniss 1993b).

Carrier people have used a wide variety of snares to trap birds and a broad range of animals ranging from squirrels and beaver to bear and cariboo. These tools are generally very simple in design and are easily transported. Traditionally, traps were made from sinew and hide. Today, these traps are made from wire (Furniss 1993b:3 1).

Carrier people built fences or surrounds that were used for hunting cariboo. These structures were made from long sticks tied together with willow bark. Fences varied in length but could extend for up to several kilometers. Cariboo were herded along these fences to either to a dead end or into a fenced corral, where they were either shot with a bow and arrow or speared (Fumiss 1993b).

Hides were used in the construction of both temporary shelters and more permanent winter dwellings, primarily as roof covers. A number of specific tools were developed to assist in the process of defleshing and preparation of skins once they had been softened by soaking. Scrapers were used to remove fat and blood as well as the outer skin of animals.

Fishing and Use of Fish Resources

A wide number of fishing traps were designed by Carrier peoples, and were specific to the type of fishing (river or lake), species, and season. Hook and line fishing was frequently practiced, however, more elaborate fishing traps were also utilized. Fishing traps and tools were made from various resources. Fishing lines were constructed from inner tree bark (commonly alder and willow) and fiber from plants such as nettles. Bone was used to manufacture hooks and tridents that were hafted to wooden poles and used to spear fish.

Weirs made of sticks were constructed and placed across creeks, streams and narrow portions of rivers to block fish. At an opening along the weir, a fish trap was set. These traps allowed fish to easily swim in, but were not large enough openings for fish to turn around and get out. In the summer months along the Fraser River, weirs were placed at shallow and slower parts of the river where more salmon preferred to swim. Basket traps were placed along weirs for salmon. These were up to 6 meters in length and 1 1/2 meters in width, and could capture up to several hundred fish. Furniss (1993b:35) notes that Carrier peoples had an understanding with other groups along the river to leave salmon weirs open at times so that salmon could reach people living further up the river. This way, some salmon would also reach spawning grounds, ensuring salmon survival.

Fish were dried and stored for future use on drying racks and poles set near to fires or out in the sun. Large amounts of fish, particularly salmon, were gutted and cleaned, the fins and backbones removed. They were split open and dried evenly on each side, being turned often during the drying process (Morice 1906:189). In historic and times and prior, dried fish were stored in cache pits (called *k'unsai* by Carrier peoples). These depressions were lined with spruce boughs, filled with fish, and then the surface was dried by lighting a fire over top of the pit. This technique prevented the fish from spoiling. An alternative method of fish storage was to dry and bind stacks of fish. The bundles were placed in elevated caches in trees (Furniss 1993b:38).

A *variety* of nets (*lhoombilh)* were made and used for hunting and fishing by Carrier peoples. Some fishing nets were often weighted with sinking stones tied to the edges of the net. Sticks were also attached to nets with sinew, serving as floats. During the winter, lake fish such as trout were caught using nets placed under the ice. One kind of net, the ***tsambilh,*** was used specifically for hunting beaver. Nets were placed under the ice in front of entrances to beaver lodges. The beavers were scared out the lodge by hunters (with spears) and were caught and killed. Netting was made from plant bark and hide (usually of cariboo)(Furniss 1993b).

Carrier Houses and Structures

Records of early expeditions into Carrier territory by Mackenzie (1970 [1793]) and Harmon (18 16) make mention of underground dwellings. Montgomery (1978) argues that pithouse-type dwellings were characteristic of Southern Carrier groups influenced by Secwepemc neighbours. Montgomery (1978) notes that the Southern Carrier traditionally used different house types in different seasons. In the winter months two types of houses were built. One was a multifamily wooden house with separate storage areas for each family group within the household. Mackenzie (1970 [1793]:309) describes houses in the Blackwater drainage area (Southern Carrier) as rectangular, measuring 20 feet in length, 30 feet in width, and approximately five feet in height. Walls were constructed from spruce logs held together with upright poles. A ridge pole supported the ceiling, and extended approximately 10 feet from the ground. Walls were insulated with pine boughs (Furniss 1993b). A second house type was the subterranean pithouse (Morice 1893). Underground pithouses dwellings called *tsaken* ('beaver' house) or *yenyoh koo* ('under the ground' house) varied in size, but were up to seven meters in diameter and one-two meters in depth. Posts supported the ceiling. The ceiling rafter system was constructed from logs and covered in hides and dirt (Furniss 1993b). Houses were usually large enough in size to provide shelter for a number of families (Morice 1893).

In the summer, Southern Carrier built a number of house types. Morice (1893: 185-189) described three kinds of summer dwellings -- large ceremonial lodges, small summer dwellings built from logs, and salmon fishing lodges.

Burial Customs

After death, bodies were regularly burned by Carrier peoples. Children were usually not cremated, but rather were buried in baskets. In some cases, particularly for prestigious band members, bodies were placed on platforms out of reach of animals, or were placed in the hollow of a tree (Morice 1905). Morice (1906) observed that that the Carrier commonly buried their dead along the shores of large lakes.

Widows of deceased warriors used to collect their bones from the ashes of funeral pyres and would carry them on their backs in a leather satchel until the clansmen of the deceased were able to hold a potlatch ceremony (Morice 1905). Early traders and missionaries believed that the name Carrier, an English translation of the French term "Porteurs", was based upon this tradition of widows. However, as Furniss (1993b:3) notes, some Carrier people believe that

> the name Carrier came from the fact that unlike the Sekani, the early Carrier had no horses to carry their goods. Instead, they packed their goods on their backs or in canoes.

The association of name Carrier with a funeral right may have been invented by earlier Carrier peoples who were asked by missionaries and traders about the origins of the name (see Hall 1992:4, in Furniss 1993b:3).

TSILHQOT'IN

The Tsilhqot'in people share cultural affinities with culture groups of the plateau and neighboring sub-arctic cultural groups, particularly the Carrier (Lane 1981).

Tsilhqot'in is a language quite distinct from other Athapaskan languages, including the dialects spoken by neighboring Carrier groups. Tsilhqot'in is spoken along the Chilco and Chilcotin Rivers, through to Alexandria in the north, and in a number of communities in the Williams Lake vicinity including Alexis Creek, Anaham, Nemiah Valley, Stone, and Toosey (Krauss and Golla 1981: 83). The Tsilhqot'in people or "the people of the Chilko River" are the most southern members of the Athapaskan language family. Teit (1909:759) noted that the Tsilhqot'in were named the "dentalia people" by the Secwepemc and other interior Salish groups, this being a reference to their trade in dentalium shell with the Tsilhqot'in.

The Tsilhqot'in do not recall a geographic source of origin. However, many Elders suggest that Tsilhqot'in peoples formerly occupied areas both north and west of their current territory (Tyhurst 1994). Historically, Tsilhqot'in peoples have occupied the area in and around the Chilcotin River and the more northerly Dean and Homalco River drainages. Prior to European contact, Tsilhqot'in territory was concentrated to the west of these areas. According to Lane (1981:402), many Tsilhqot'in elders reported knowledge of earlier Tsilhqot'in peoples using territory around the Chilco and upper Nazko Rivers.

Until as late as the mid-1850s, the majority of Tsilhqot'in peoples lived in the northern portion of the Coast Range valley east of Bella Coola territory. This includes the area from Chilco Lake to Salmon River (Teit 1909). Apparently, the Big Creek area was not traditionally occupied by Tsilhqot'in peoples during the winter months. Of the Tsilhqot'in groups, the Stone Tsilhqot'in wintered the furthest to the south and west.

At the start of the 20th century, Tsilhqot'in peoples were divided into four divisions -- the people of Nacoontloon Lake, people from Puntzee and Chezikut Lake, people south of Chilcotin River, and people living near to Tatla Lake. Teit (1909:760) writes that Europeans classified Tsilhqot'in peoples into three primary groups, the Lower Tsilhqot'in, Stone Tsilhqot'in, and the Stick or Upper Tsilhqot'in. The Lower Tsilhqot'in encompassed peoples from the Nacoontloon Lake area. Today, descendants include members of the Anaham Band on the north side of the Chilcotin River at Anahim Flat, the Toosey Band located on Riske Creek, and the Alexandria Band located at Alexandria (Alexander 1996a). The Stone Tsilhqot'in were identified as a band that wintered on the south side of the Chilcotin River. Their descendants are known as the Stone Band. The Stick or Upper Tsilhqot'in included a number of nomadic bands that traditionally occupied lake areas throughout the territory. Today, this group includes the Nemiah Valley band, who are descendants of a number of bands from around Tatla and Chilco Lakes, and the Alexis Creek band, who are descended from bands of the Alexis Creek, Redstone Flats, and Tatla Lake areas (Alexander 1996a, Teit 1909).

Tsilhqot'in people frequently traded and interacted with both coastal and interior culture groups, including the coastal Bella Coola and interior groups including the Canyon Secwepemc, Carrier, and to a limited degree, the Lillooet. Marriage between Tsilhqot'in and Bella Coola and Tsilhqot'in and Secwepemc peoples was common (Teit 1909:762-63). In historic times, Tsilhqot'in peoples often wintered with both the Bella Coola and the Canyon Secwepemc (Tyhurst 1994:55). Prior to smallpox epidemics, considerable intermarriage occurred between two Secwepemc Bands who inhabited an area along the Chilcotin River. The Secwepemc Canyon Division was considered approximately half Tsilhqot'in, and many North Canyon Divisions spoke Tsilhqot'in (Ehrhart-English 1994:53). A Secwepemc Band once lived at Riske Creek, however they were virtually decimated during the 1862 smallpox epidemic. Most remaining members went to live with relatives in the Alkali Lake Band. Sometime after this, Tsilhqot'in peoples moved south into the Riske Creek area (Ehrhart-English 1994:53).

It was suggested by Morice (1905:5) that Tsilhqot'in society was patriarchal, and that both political succession and heredity was decided on the basis of paternity. However, Teit (1909) writes that a "child belonged to both the father's and the mother's families". Tsilhqot'in society was divided into three classes, nobles, common people and slaves, a system similar to that of coastal peoples (Teit 1909).

Very few early accounts of Tsilhqot'in peoples exist. The first recorded accounts follow Simon Fraser's journey down the Fraser River in 1808 (see Fraser 1960:69). Farrand (1899, 1910) documented basket making and Tsilhqot'in mythologies and identified a number of sub-groups of Tsilhqot'in, including the Alexandria, Anaham, Riske Creek and Stone. Teit (1909) reported in detail on Tsilhqot'in basketry techniques, among other topics, and remains the best early account of Tsilhqot'in peoples. The Tsilhqot'in are occasionally mentioned, albeit briefly, in Morice's writings from the end of the 19th century.

In his work on Plateau cultures, Ray (1939) collected information on a variety of Tsilhqot'in economic activities and social relations. However, like his work with both the Carrier and Secwepemc, his reports are based on interviews with a very small number of people. Lane's (1953) research among the Tsilhqot'in conducted between 1948-195 1 provides detailed descriptions of social relationships between the Tsilhqot'in and neighboring interior culture groups. Subsequent work by Lane (1981) focused on settlement and resource use by Tsilhqot'in peoples.

Tyhurst has produced a number of ethnographic accounts of Tsilhqot'in peoples based upon his work with the Nemiah and Stone Bands in the late 1970s. Unfortunately, most of these reports are not easily accessible. Tyhurst has contributed research regarding both historic and contemporary Tsilhqot'in society to projects by Magne and Matson (1982, 1984), Magne and Tyhurst (1984), Magne (1984, 1985a, 1985b), Burnard-Hogarth (1983, 1984, 1987), Alexander(1996a, 1996b) and Alexander *et* al. (1985). In addition to these works, Glavin (1992) has collected oral histories in the Nemiah valley.

Post-Contact History

In the early nineteenth century, fur trading activities in Tsilhqot'in territory increased the level of contact between Native peoples and Europeans. Tsilhqot'in "middle men" relayed furs between the coast and the interior. Two posts were established in 1821, one at Fort Alexandria in Carrier territory and a second smaller post at Fort Chilcotin on the Chilcotin River. Historic records suggest that conflicts between Carrier and Tsilhqot'in peoples resulted from European intervention in regional trading. A number of severe attacks on Carrier groups were made by the Tsilhqot'in in the region during the period immediately following the establishment of these Forts (Lane 1981:411).

In the mid-nineteenth century, contact between Tsilhqot'in and Europeans was also marked by conflict. Disease and poor treatment by Europeans contributed to Tsilhqot'in resistance to the European presence in their territory. Subsequent contact between Tsilhqot'in peoples and Euro-Canadians in the 1870s and 1880s was a product of missionary efforts. Roman Catholic priests encouraged the development of permanent village communities (which subsequently formed the basis for reserves) and a more European-style political structure (Lane 198 1). Another change to traditional Tsilhqot'in settlement and subsistence patterns occurred as a result of the establishment of ranches within their territory. Many Tsilhqot'in peoples became involved in large-scale ranches that developed within the region (Lane 1981).

The first mission school was established in 1914. Intensified efforts by missionaries to register Tsilhqot'in children in schools occurred in the 1950s. Nonetheless, many indigenous traditional hunting and fishing methods and settlement were maintained. Movement through the area involved a greater use of horses and wagons (Lane 1981). Increased encroachment by non-Native peoples forced many Tsilhqot'in to move on to reserve lands in the late 1960s and 1970s. However, they continued to use their traditional territories for subsistence related activities (Lane 1981:412).

Tsilhqot'in Seasonal Rounds

Tsilhqot'in people followed a cycle of seasonal movement in response to available resources within their territory. Alexander *et al.* (1985:39) observe that:

> Traditionally, the Chilcotin's resource base and seasonal movements were strongly influenced by two environmental features: the complex of lakes and rivers which cover their land and the mountainous terrain which takes up the southern portion of their territory.

Large camps were established throughout the year in response to particular subsistence related activities, particularly the harvesting of fish and plants (Yip and Choquette 1996). During the spring months, people dispersed from the winter camps located along the shores of large lakes to collected plant resources and hunt and fish at both higher and lower elevations. By the late summer months most families had moved to mountainous areas to collect roots, hunt, and trap. In the late summer months, Tsilhqot'in peoples moved back down to areas along major salmon rivers and fished in large groups. By the late fall, people moved back to winter camps and resided in large multi-family households (1996a, Alexander, et al. 1985, Lane 1981).

Spring

Towards the end of the winter (February to March) stores became depleted. The diet was supplemented by fishing and hunting, though usually by early spring game was rare and available species were in poor condition (Lane 1981). In late spring people could move to lake shores to fish, or to lower elevations in search of plant resources.

Often, women would remain at fishing camps and men would go out on hunting and trapping excursions. Game moving upland from valleys to highlands was followed on trails and intercepted (Lane 198 1:406).

Summer

During summer months, Tsilhqot'in people moved to Alpine areas within the territory. Some travelled further to areas such as the Itcha Mountain range and Rainbow Mountains (Lane 1981). The mountains at the southern edge of the territory were heavily used during summer.

> In late June as fish runs declined, people would move gradually toward the mountains, hunting and berrying. By July most people were in the mountains in the south. The women dug roots for food and for baskets and lines. The men trapped marmots. The marmots were at their prime in August and September...These trips to the mountains were made in large groups for there was danger from strangers in the mountains (Lane 1981:407).

In the latter part of the summer (July and August) people returned to lower elevations and camped along major rivers and streams such as the Chilcotin and the Chilko to fish salmon (Lane 1981). These camps were usually quite large, many families would camp and fish together. Large numbers of salmon was taken at this time, the majority of which was dried and stored in preparation for winter months. When salmon runs were not as heavy, some Tsilhqot'in families would camp with the Canyon Secwepemc at Far-well Canyon, or with the Lhtakot'en Carrier around Alexandria (Lane 1953).

Fall and Winter

At the end of summer, people left major river and stream fishing camps. Some moved in small groups back to lake areas where kokanee fish were abundant. Others moved to higher elevations to trap, hunt, and collect plant resources. At lake camps many prepared for the coming winter by making traps and other kinds of tools (Lane 1981). By late fall, groups who had gone up into highland areas returned to lakes and large winter camps were established. Throughout the winter, small mammals were hunted and people fished on the ice. Occasionally, small hunting parties left winter camps in search of larger game. The diet was supplemented by dried fish, meat, berries and roots collected during the summer months (Lane 1981). Occasionally, some Tsilhqot'in families wintered on the coast with the Bella Coola or around the mouth of the Chilcotin River (Lane 1953, Teit 1909).

Tsilhqot'in Resource Use and Technologies

Much of the available information about past land use and technologies in Tsilhqot'in territory comes from early ethnographic reports from the late 1800s and early 1900s. Additional information was produced through ethnoarchaeological projects in the 1970s and 1980s.

Collection and Use of Plant Resources

A wide variety of plant resources were collected by Tsilhqot'in peoples. Numerous berries and roots were gathered in the spring and summer months and were eaten fresh, or were dried and stored for later use during the winter months (Lane 1981, Tyhurst 1994). Soapberries and serviceberries were a key resource. Other berries gathered included varieties of blueberries, raspberries, strawberries, bear berries, wild cherries and cranberries, kinnikinnick, crowberry, and huckleberry (Tyhurst 1994). Roots commonly collected included yellow avalanche lily, spring beauty, hog-fennel, wild onion, fern-root, Indian rice, tiger lily bulb, and silverweed. Tubers and roots were dug and cooked in underground pits (Teit 1909:780, Tyhurst 1994) Shoots were also gathered seasonally, Cow-parsnip, willow-herb and fireweed were peeled and eaten (Teit 1909). Lodgepole pine cambium was an important resource. Lichens, particularly black lichen, were also eaten. White bark pine cones yielded nuts, which were cooked and eaten (Teit 1909:781, Tyhurst 1994:7). A number of plants were used in medicines, including subalpine fir, aspen, cottonwood, raspberry, Indian hellebore and Labrador tea (Tyhurst 1994).

Various barks and plant parts were used in Tsilhqot'in basketry. Pine and spruce bark were used extensively as a raw material in basket construction. Occasionally, cedar was obtained through trade with coastal peoples (Tyhurst 1994). Teit (1909) observed numerous large bark-baskets measuring 80-100 cm by 80-100 cm. These were used to soak animal skins. A wide variety of other bark basket types were constructed, most commonly from birch bark. These were often decorated with woven cherry bark, bird quills and ornamental stitching. Coiled baskets were woven from spruce roots, and intricate patterns and ornamentation were interwoven to create elaborate patterns (Teit 1909:764-65). Baskets were generally used in berry and root collection (Teit 1909:780).

Teit (1909:774) describes small mats, made from bulrushes, elaeagnus-bark, and cedar bark used as mats to eat on or as covers for rectangular house roofs. Mats used as house floor coverings or roofing material were woven from long grasses (Tyhurst 1994:7). Birch bark was also used to make cups and trays for fish and berry collection. Other trays were made from wood, as were a variety of spoons (spoons were also made from mountain sheep horns) (Teit 1909:777-780). A number of different types of bark was used to make twine and thread. Nettles, hemp (obtained from Secwepemc and Lillooet peoples), and elaeagnus-bark were also used for this purpose. Twine was used to make fishing nets (Teit 1909:775). Other plants used in yarns and nets include silver-berry and spreading dogbane.

Hunting and Use of Animal Resources

A wide variety of hunting and trapping methods were used by the Tsilhqot'in. These included animal drives, snares, and hunting on foot with the assistance of dogs, horses, and snowshoes. The most common large animals hunted were elk, mule deer, cariboo, bear, mountain sheep and mountain goat. Many of these species were taken primarily in the fall and winter months. Moose became common in the area only in the twentieth century, and rapidly became an important hunted species (Lane 1981). Small mammals such as marmots, rabbits, beavers, muskrats, and squirrels were also hunted extensively (Teit 1909, Tyhurst 1994).

Bows were used in hunting and were made from juniper wood and strung with sinew. Arrows were tipped with stone and antler points and typically constructed from service-berry wood. In some cases, tips were barbed and attached to sinew lines, detaching upon impact for recovery (Teit 1909).

Animals were often ambushed by hunters who would wait in hidden pits along game routes. Fences were frequently built along game routes, and animals were driven towards traps. Dogs were also used to track and chase game animals, particularly in the winter (Lane 198 1, Teit 1909). During winter months, bears were often driven from their hibernation dens into barricades where they were killed by hunters waiting with clubs (Lane 198 1:405).

Trapping was practiced to various degrees by Tsilhqot'in peoples (Lane 1981). Women were primarily involved in trapping animals such as beaver, rabbit and muskrat (Teit 1909:782). Some trap types, particularly tethers, tossing poles, snares and pit falls (often with upright stakes placed on the bottom) were used to catch large mammals such as deer and bear. Snare designs were particular to certain animal species. Teit (1909) who notes, for example, that at least three types of snares were used to trap rabbits.

Hair from animals, particularly goats, was used as a raw material for blanket weaving (Teit 1909). A variety of tools were made from animal materials. Bone and antler tools were manufactured, including antler chisels (used to fell trees) and hide scrapers (Teit 1909:764). Root digger handles were commonly manufactured from cariboo-antler (Teit 1909:780), as were bark peelers and sap-scrapers (Teit 1909:781). Awls were made from deer, cariboo and bear long bones (particularly from the ulnae and fibulae) (Teit 1909:775). Sinew from elk, deer and cariboo was used for fishing lines and bows (Teit 1909).

Animal hides were processed for use in clothing and structures. Smoking of hides was an important part of their preparation. Wooden hide smoking frames described by Bumard-Hogarth (1983) consisted of five or six thin, peeled willow poles assembled in a small teepee like structure. Hides were placed over top of these poles above a small, smoldering tire set underneath the structure. The size of the frame varied depending on the size and weight of hides being processed.

Earrings, nose ornaments, and necklaces of were worn by both men and women, Many of these items were made of copper, abalone, and dentalia, which were particularly valuable materials for Tsilhqot'in peoples. Bear and beaver claws and the teeth of wolves were also highly valued (Lane 1981, Teit 1909).

Fishing and Use of Fish Resources

Fish were the primary source of subsistence for the Tsilhqot'in until the mid-1950s (Tyhurst 1994). A variety of fish species were taken, including salmon, trout, whitefish, Dolly Varden, and suckers. These were found in the major rivers of the interior -- the Tsilhqot'in, Chilco, and Taseko -- as well as in the Homathko, Southgate and Bella Coola, which run through to the Pacific coast (Tyhurst 1994). Most fish were available during the spring and summer spawning months. Two primary methods of fishing were used by the Tsilhqot'in. Fish were taken individually, as with a hook and line or spear methods, or were trapped with nets or fish traps (Teit 1909). Traps made of willow twigs (*binlagh)* were set along stream beds, lakes, creeks and streams. Often these cylindrical traps were used in conjunction with fish weirs. Two or three pronged spears were made from bone, antler or even copper.

At productive river fishing locations, platforms were built that extended out over the stream or river. These provided a better location for fishing. In general, thick poles or logs were hammered up to three metres into a river bottom. These poles supported a number of beams and a planked platform(Burnard-Hogarth 1983: 13).

These platforms were particularly important in salmon fishing. Because of their abundance, salmon were a primary subsistence resource. Salmon were used for food and non-food purposes. Salmon skins were used as containers to store oils. These oils were obtained by boiling salmon heads. Salmon oil was used as a condiment, in medicines, and animal skin processing (Tyhurst 1994). Salmon were dried for storage by smoking or wind drying on drying racks. The fish were split open and tied to drying racks very much like those used to dry skins or meat. Often the flesh was scored to allow for even drying; small twigs and branches were used to hold fish open during smoking (Tyhurst 1994). When taken in the winter, salmon were stored in underground caches until needed.

During the fall and winter months, gill nets were used both from canoes or rafts on open water and for ice-fishing. Lane (1981:405) reports that some older Tsilhqot'in peoples did not believe that gill nets were traditionally Tsilhqot'in, suggesting instead that these nets were adopted Secwepemc technology. Trout was the most common fish type taken in the winter months. Holes were cut through the ice (which could measure up to three feet thick) and nets, spears, and line and hook tackle were used to catch fish (Tyhurst 1994). Bait and lures (in the shape of fish) were also used for winter fishing (Lane 1981, Teit 1909). Rectangular shaped twig traps were set at waterfalls to catch trout (Tyhurst 1994:6).

Tsilhqot'in Houses and Structures

Tsilhqot'in peoples built three kinds of houses – above ground houses, pithouses, and tents. Ethnological work in the early 1980s by Burnard-Hogarth (1983) documented a number of commonly used Tsilhqot'in dwelling types. The type of structures employed varied with settlement type or activity. The most common were square or rectangular above ground houses with gabled roofs (Lane 1981). Roofs were covered with earth, filled with bark, and layered over with mats or hides (Teit 1909:776).

There are discrepancies in the literature concerning the extent to which subterranean dwellings were used by Tsilhqot'in peoples. Teit (1909) writes that in the east, Tsilbqot'in people built and used pithouses similar to those of the Interior Salish during the winter. These lodges were large enough to house one family throughout the winter (Teit 1909:775). Lane (1981) argues that pithouses were a recent introduction to the Tsilhqot'in from the Secwepemc. Tyhurst (1994:8) contends that Tsilhqot'in peoples had a long tradition of building underground pithouses and that Lane is "contradicted by both the statements of Tsilhqot'in Elders, and by the archaeological evidence". Among the Tsilhqot'in, pithouses were *known* as ***lhizqun***, or "dirt/dust house" by Chilcotin peoples. Archaeological evidence suggests that Tyhurst in correct. Matson *et al.* (1980) identified a house pit measuring 9.3 m in diameter near the Chilco River. Artifacts recovered from excavations at this site were of a Tsilhqot'in Athapaskan origin, and dated to approximately A.D. 1600. Underground pithouses do not appear to have been built by Tsilhqot'in peoples after the middle 1800s (Lane 198 1, Teit 1909)

Among some Tsilhqot'in groups, summer dwellings of bark were constructed. Alternatively, simple open shelters made from bark or brush were used during summer months, particularly on short-term hunting trips (Teit 1909:776). At fishing camps, canvas tents with evergreen bough floors were common. Teit (1909: 776) identified fir and balsam branches in addition to grasses and bulrushes as common floor covers. Apparently, the tent covers were transported to new camping sites while the stakes, ridge poles, and anchoring stones were left behind (Burnard-Hogarth 1983). It is likely that in earlier times Native peoples also travelled with tents, probably constructed from hides rather than canvas.

Sweat lodges structures were built from unpeeled willow poles secured in the ground and weighted with stones. Burnard-Hogarth (1983) observed a sweat lodge structure near the Chilco River. It was covered in canvas, with a floor mat of willow leaves and clover.

Hearths

Different kinds of hearths were used by the Tsilhqot'in. Kitchen hearths were used to prepare food at campsites. During field research Burnard-Hogarth (1983: 15) identified 13 kitchen hearths, 12 of which were enclosed by a ring of large stones. Kitchen hearths varied in size, from 1 to 2.5 m^2. Pine was the only fuel source recognizable in these features. Pine tends to burn fast and hot. A second hearth type was associated with drying racks. These were smaller than kitchen hearths and contained significantly less fire-cracked rock (FCR). A total of 53 drying racks were recorded, 14 of which exhibited a complete or partial stone-lined perimeter. Tsilhqot'in research assistants noted that green woods or rotten woods were most commonly used in drying activities. This fuel type would burn slowly and create considerable smoke, which is advantageous for drying.

Pits and Caches

Various other non-dwelling features have been recorded in Tsilhqot'in territory. Burnard-Hogarth (1983) identified three pits associated with sweat lodges. These measured approximately 60 cm by 60 cm with their depths extending to between 32 and 23 cm below the surface. These depressions contained numerous fire-cracked basalt boulders and cobbles, but no traces of charcoal. A second type of cultural depression was associated with hide smoking. These pits were smaller but deeper than those linked to sweat lodges, measuring approximately 40 cm by 45 cm and extending 40-45 cm below the surface. Deposits inside these features consisted of burnt pine cones (Burnard-Hogarth 1983: 13). Tyhurst (1994) noted that in some cases small rectangular log structures were built as caches to store salmon.

Rock Art and Tree Carvings

Teit (1909:788) observed that carvings and drawings by Tsilhqot'in people were stylistically distinct from Secwepemc. Rock paintings are relatively rare, but carvings on the bark of a living tree are quite common. Two sketches of tree carvings, both of human-like figures, are included in Teit's (1909:788) report. These measured 160 cm high by 60 cm wide.

Burial Customs

Among the Tsilhqot'in, bodies were usually buried, often with belongings of the deceased. Small fences were constructed around graves, and occasionally wooden boxes or small wood huts were built on top of graves (Morice 1905, Teit 1909). During winter, bodies were buried in the snow and covered over with brush (Teit 1909:788). Nobles within Tsilhqot'in society received more elaborate burial treatment accompanied by large funeral feasts. Teit (1909:788) writes that mortuary poles were erected over the graves of nobles. These often were carved with representations of the deceased's clan. The tradition of burying people together in a cemetery appears to be relatively recent (Teit 1909).

SECWEPEMC

Secwepemc people are an Interior Salish division of the Salish Language Family. Secwepemc bands followed generally similar subsistence and settlement patterns, However, variation between bands exists due to different local availability of certain resources (Alexander 1994a:7). Secwepemc peoples traditionally occupied the southern interior of the province of British Columbia, from Big Bar Creek west of the Fraser River to the Rocky Mountains and along the Fraser River from High Bar to the area just north of Alexandria (Teit 1909).

A short description of Secwepemc peoples was published by Dawson in 1892 based on observations made during his geological work in the area in the 1870s. The first ethnographic study of Secwepemc peoples was initiated by Boas in the late 1800s (see Boas 1890). Most of his work was centered on bands in the Kamloops area. Curtis published a brief ethnography of Secwepemc peoples in 1911 (in Alexander 1996a). The first intensive account of Secwepemc peoples was put together by James Teit, who collected information about Thompson (Teit 1900) and Lillooet (Teit 1906) peoples during the early portion of the twentieth century.

Ray (1939, 1942) has added to the ethnohistory of Secwepemc peoples, focusing on the Soda Creek Band. Palmer (1975a, 1975b) published two analyses on Secwepemc cultural ecology and ethnobotany. A number of Secwepemc stories were collected by Bouchard and Kennedy (1979) in the 1970s. Kennedy (1987) has published an ethnographic study pertaining to the *Sahhaltkum*, and Bouchard has discussed aspects of the Squilax lifeways(Bouchard and Kennedy 1990). Alexander (1994a) compiled an extensive ethnographic section in an overview study of the traditional territory of the central portion of the Alkali Lake Band.

The Secwepemc were sub-divided into seven tribal groups. These communities were further divided into a number of small bands, largely based on territory (Boas 1890:80, Teit 1909). Secwepemc are a band society based on closely related families, with larger social units linked to each other by frequent interaction and marriage (Lane 1981:407, Teit 1909). Their level of social and political complexity, which included inherited chiefs and clan ownership of vital resources, was greater than most band societies (Hayden, et al. 1985). Within each tribe, a chief directed decision making. Chiefs were hereditary, being succeeded by sons or brothers. People within a band were generally divided into nobility and ordinary people. Ordinary people could obtain considerable status and high rank over time, however they could not enter into the nobility (Boas 1890). Boas (1890) described kinship within Secwepemc as being paternal.

During the early portion of the 19th century, twelve Secwepemc bands were identified within what is now the WLFD. These included the Empire Valley Band, the Alkali Lake Band, the South Canyon Band, the North Canyon Band, the Chilcotin Mouth Band, the Riske Creek Band, the Dog Creek Band, the Canoe Creek Band, the Soda Creek Band, and the Williams Lake (also called Sugar-cane) Band. Two bands existed adjacent to the WLFD -- the High Bar Band and the Big Bar Band (Alexander 1996a:12-13).

The area was split between two divisions of the Secwepemc, the Fraser River (or *SLemxu':lExamux*) and the Canyon. The Fraser River division included all bands that claimed territory on either side of the Fraser River for 30 miles, including Big Creek, Bridge Creek and all other streams that ran into the Fraser River up to Chum Creek. The Canyon Division included bands located to the west of the Fraser River from north of Riske Creek to Chum Creek. Most of the Canyon Division bands were located near the Chilcotin River. Some overlap between Canyon and Fraser hunting territories was noted in the Big Creek and Chilcotin River areas (Teit 1909:453). Territories of Secwepemc bands were flexible and determined in large part by the areas used by a particular band (Alexander 1994a, Teit 1909).

The Alkali Lake Band is located within the Fraser River Division of the Secwepemc, which also includes the Dog Creek, Williams Lake, Soda Creek and Buckskin bands (Teit 1909:452). The traditional territorial boundaries of the Alkali Lake Band were flexible. In the early part of the century close social ties were noted between the Alkali Lake Band and the Williams Lake Band, and to numerous north Secwepemc bands. Both Alkali Lake and Williams Lake Band members wintered along and within the general vicinity of Chimney Creek (Teit 1909:458). The closest ties, however, appear to have been with the Canyon Division Bands located on the west side of the Fraser River between Riske Creek and Churn Creek. The Canyon Division included the Riske Creek, North Canyon, South Canyon and the Chilcotin Mouth bands (Teit 1909).

Post Contact History

Approximately seven hundred members of Canyon Division Bands were killed in a smallpox epidemic in 1862 and 1863. The remainder of the population joined the Alkali Lake Band or various Tsilhqot'in communities. Prior to the smallpox epidemic, the Alkali Lake Band was estimated at 175 members. A large number of the Alkali also died in this smallpox epidemic, but amalgamation with Canyon groups boosted the Alkali population back to its pre-smallpox levels (Teit 1909). Because of the amalgamation, Alkali Lake territory was considered in 1909 to extend west of the Fraser River, and to include the former territory of the Canyon Bands.

All Secwepemc peoples were devastated by the major smallpox epidemics in 1855 and 1862-63 (Furniss 1993a). The latter epidemic was traced to infected blankets from the Thompson area (Jenness 1943).

Secwepemc Seasonal Rounds

Secwepemc peoples traveled throughout their territory in small family groups during the spring and summer months, regularly banding together at major salmon fishing sites. They wintered at larger camps, usually located along river terraces where sunlight was the greatest (Teit 1909).

Spring

In April, winter village groups disbanded into smaller family-sized units and moved to higher elevations to hunt and collect plant resources (Teit 1900). Roots were dug, and were dried or cooked in roasting pits (earth ovens). Cambium was also dried and stored (Ray 1939). During the spring salmon began to run and short trips were made to fish and process fish (Alexander 1992: 160). Dwellings were built above ground (in contrast to subterranean winter dwellings). These were circular mat lodges, often roofed with bark (Ray 1939).

Summer

The summer months were dominated by resource acquisition at the large salmon runs along the Fraser (Kennedy and Bouchard 1992) and Chilcotin Rivers (Teit 1909). Families moved from higher elevations down to the shores of major salmon streams and rivers to fish. In some areas, certain streams or fishing sites were owned by specific families (Teit 1900, 1909). Large fishing camps were established on the banks of rivers, particularly during the later portions of the summer when salmon runs were most abundant. Many families would camp and work together during this time, fishing and processing salmon. Salmon was eaten raw or was smoked and dried for storage for the winter. Roe was also prepared for eating and fish oil was collected and stored. A wide variety of social activities took place at fishing camps, including visiting, dancing, and gambling. Trading and marriage arrangements were also negotiated and renewed during the summer (Alexander 1992: 161).

In addition to fishing, Secwepemc peoples supplemented their summer diet with a number of collected plant resources, including wild onion and berries (Weinberger 1996).

Fall and Winter

In the fall, family groups moved from river terraces up to higher elevations to collect berries and hunt. Towards late fall or early winter, Secwepemc peoples came together once again at large winter villages. The maximum Secwepemc local/social group aggregated at winter village sites. Subsistence during these months was based primarily stored roots, dried meat, and dried salmon. Diets were supplemented by hunting and ice fishing (Dawson 1892; Teit 1909). Many social activities occurred during winter months, including gatherings, religious ceremonies, and dances. Basket weaving, cloth making, and tanning were also pursued.

Secwepemc Resources and Technologies

Collection and Use of Plant Resources

An important portion of the Secwepemc diet was based upon the collection of berries, roots, and shoots. Plants were either eaten fresh, processed, or were dried and stored for winter months. Serviceberry, soapberry, raspberry, blueberry, gooseberry, and blackberry were commonly collected. Shoots such as fireweed, willow-herb and cow-parsnip were peeled and eaten. Black lichens and the cambium layer of lodgepole pine were also eaten (Teit 1909).

Both berries and roots were dried, preserved and stored for future use. Often berries were dried on mats or were boiled in spruce baskets and shaped into cakes. Roots were tied on to a cord and either dried in the open air, on mats, or were cooked in underground earth ovens.

Plant foods were cooked in baskets filled with water brought to boil by adding stones heated in a fire (Boas 1890). Another method of cooking involved placing food items inside underground ovens or roasting pits. Women prepared food and placed it in these pits early in the day, since it took many hours to cook. Roots in particular were prepared in roasting pits. A number of plant species were used in the construction of cooking tools. Spruce bark and birch bark was commonly used to make baskets in which berries and roots were boiled or steamed. Other basket types were made from spruce and poplar bark. Containers for carrying water were almost always made from birch bark. Willow was often used as reinforcement for baby cradles made from birch bark (Teit 1909).

Secwepemc traveled extensively on the open lakes and rivers in their territory. Spruce-bark or white-pine bark canoes were constructed for transport on rivers. Bark was taken from trees in large strips, which often killed the tree. Bark canoes were sewn together with willow strips and spruce and pine roots. Ends of the canoe were caulked with pitch and moss, and the whole exterior was covered in gum (Teit 1909532). 'Dugout' canoes were also made from cottonwood trees.

Lodgepole pine, balsam, spruce, and cedar were used in the construction of summer dwellings. Bark was cut and placed in a slightly overlapping manner over cross poles with the "sap side out" (Teit 1909: 493).

Many plant parts were used for dyes for both personal decoration and the decoration of tools and household objects. The bark from alder and cherry trees and wolf moss in the most common dyes. Berries were not often used to make dyes (Teit 1909).

Hunting and Use of Animal Resources

A variety of hunting and snaring techniques were used by the Secwepemc. Teit (1909) notes that trapping increased in importance with the onset of trading forts in the early 19th century.

A common hunting tool was the bow and arrow. Juniper and yew wood (obtained by trade with the Lillooet) were used to make bows. Bow-strings were made from reinforced sinew rubbed with fish glue. Arrows were made from service-berry wood and rosewood, and in many cases had detachable foreshafts (Teit 1909: 5 19). Arrows were tipped with leaf-shaped and notched arrow points made from stone, bone, horn or beaver teeth.

Deer were hunted with the use of deer-fences, corrals, and snares. Deer were driven by hunters and dogs to areas where other hunters waited with their canoes (Boas 1890:85). The hunting dogs used by Secwepemc might be interbred with the coyote or timber wolf (Teit 1909). Hunters would drive deer into mountainous areas, trapped by fences, and shot with arrows. During the fall months corrals were placed along the edges of lakes, with wing fences into the water. Animals often entered lakes during seasonal migrations. Fences set in the water would direct deer into corrals where they were caught and shot (Teit 1909:521-523). Deer meat could be dried for storage using open air platforms similar in design to those used for salmon. Meat could be dried in sweathouses, particularly if it needed to be dried quickly. Dried meat was stored in underground cache pits or small sheds resting approximately six feet above ground on poles (Boas 1890; Teit 1909). Deer skin was used to make clothing.

Elk, cariboo, and deer antler was used to make chisels and wedges for cutting trees. Knives, daggers, and adzes were manufactured from bone and antler. Beaver teeth made good knives. Needles and awls were made from bone. Both antler and bone was often soaked or boiled prior to modification; this softened materials and made them easier to work with (Teit 1909:474-475).

Bears (particularly the grizzly) were trapped using deadfalls and noose snares set in places where bear came to eat salmon. Beaver, marmots, foxes, and lynx were also commonly snared. Teit (1909:524) notes that many traps were similar in construction to those used by Carrier peoples. Animals were lured to the trap with bait attached to a triggered weight of rocks or logs. The animals were crushed when they tried to obtain the bait. Spears with detachable points were used to hunt beaver. Nets were used to trap muskrat, otter, and beaver (Teit 1909).

Fishing and Use of F&&sources

Fishing for salmon and lake trout was a large-scale and organized effort. Salmon was the most important food resource of both the Fraser River and Canyon Secwepemc. Several kinds of salmon were obtained, as well as trout, sturgeon, and white-fish. Single-pronged spears, weirs, dip-nets, and hooks and lines were common fishing tools.

For spring and summer fishing, wooden platforms were built over rivers, facilitating the harpooning and netting of salmon. Fishers would stand on the platforms and lower bag nets into the water (Boas 1890; Kennedy and Bouchard 1992). Dip nets and set nets were used along narrow stretches of the river with steep river banks. In these areas, fish swam close to the shore, and were easier to catch (Alexander 1994). Alexander notes that narrow stretches of river, such as at Alkali, were probably used repeatedly. The main method of Secwepemc fishing involved the use of bag-nets drawn by two to four canoes (Boas 1890, Teit 1909). Teit (1909) reported nets measuring 50 m in length by 7 m in width and depth.

Weirs were set in areas to intercept fish going up-stream. When fishing from the shore, people routed the fish into:

> . . .round stone or brush corrals made for the purpose... when fish were not plentiful, deep, semicircular basins of stones were made below the ends of the weir. Fish coming up found progress barred at the weir, which they followed along to the end, and, entering the basin, were scooped out. Platforms like those used on the large rivers were erected above the basins (Teit 1909530).

Weirs with funnel-shaped basket traps were set along fast moving streams and at the outlet of lakes. Funnel traps were cylindrical in shape, becoming increasingly narrow so that a fish could pass into the trap abut not turn around and escape. These traps varied in size, measuring up to 3 m in length. Other kinds of fish traps included rectangular traps set with twig springs. Again, fish could swim into the trap, but could not swim back out (Teit 1909).

During the winter months, fish were caught using hooks and bait through holes in the ice of lakes and rivers (Teit 1909: 530).

Salmon and other fish were prepared for consumption by steaming them in birch-bark baskets. Salmon roe was wrapped in bark and stored underground and salmon oil was kept in fish skin flasks (Teit 1909: 5 17). Fish were preserved by drying them in the sun and wind. They were also smoked in lodges or sweathouses. Fish were dried on platforms which were built on the steep banks of the river (Boas 1890: 82-3).

Secwepemc Houses and Structures

Boas (1890:81) noted that the characteristic dwelling of the Secwepemc was the subterranean lodge, which used by all Salish tribes of the interior. Teit (1909) suggests that all Secwepemc bands except the Lake Division and the Empire Valley band used winter pithouse dwellings. These lodges or pithouses were predominantly used in winter. Boas (1890) identified pithouses along the Fraser River as far north as the Harrison River. He described these as consisting of a circular depression 4 to 4.5 m in diameter and approximately 1.5 m in depth. Four posts, measuring 6-7 ft in height were placed in a square at the base of this depression, supporting a conical roof.

Summer houses were structurally similar to teepees (Boas 1890), and were composed of three or four converging poles connected by wicker and covered over with woven bulrush mats (Boas 1890:83). These above ground dwellings were also circular in shape. Bark lodges were more common in northern and eastern portions of Secwepemc territory. These were generally square or oblong in shape and made from black pine, balsam, spruce or cedar bark (Teit: 1909:493). Where large groups gathered at fishing camps along rivers and lakes, long lodges were built. Roofs were covered with mats made from woven long grasses.

During hunting and trapping expeditions, smaller dwellings were easily constructed by interlocking loose logs and filling the gaps between them with mosses. Some "half-lodges" were made of black pine placed in an elliptical or conical structure (Teit 1909:493).

Secwepemc sweathouses were similar in design but smaller than summer houses. They were built along the banks of creeks, usually from "two stout willow branches crossing each other, both ends being planted in the ground" (Boas 1890:83). Sweathouses were used for ceremonial cleansing.

Another type of structure was built for girls entering puberty. At a girl's first menses, she moved to a small conical hut slightly removed from the rest of the village. These structures were referred to as seclusion lodges. These lodges varied in size, but usually were built to house one person or perhaps two. They were primarily made of fir, and were covered in bark and mats. Girls could only leave the dwellings at dawn and at dusk to collect roots, bathe and exercise. Teit (1909587). notes that "[w}hile out at night, girls practised running, climbing, carrying burdens, digging trenches, the last so that in after years they might be expert at root-digging". During the day they practiced sewing and other arts. Girls resided in these dwellings on the outskirts of villages for up to a year. If constructed in the winter, these dwellings were sub-terranean, and were very similar in form to the larger pithouses of the main village (Teit 1909:495).

Rock Art

Details of the location, meaning, and significance of rock art are scarce. Some rock art is thought to be associated with puberty rites of both girls and boys. Teit (1909: 590) suggests that rock paintings were done primarily by adolescents at the end of their training period. Teit (cited in Kennedy and Bouchard 1985: 117) recorded that "these depictions were said to be found in lonely and secluded places". Pictographs occur in caves or on open rock faces (Kennedy and Bouchard 1985). These panels are thought to depict images from dreams. Some pictographs are believed to have mythological origins. Many rock paintings have been identified near major fishing camps along the Fraser River.

Burial Customs

After death, the Secwepemc buried (Morice 1905) or burned (Teit 1900) the bodies. The dead were buried near to villages, on the edges of terraces, and on sandy knolls. Very poor or old people were not always buried, but were carried away from the village and covered with mats and rocks or were left on scaffolds. When warriors died in conflict, their bodies were burned (Teit 1900, 1909).

Buried bodies were usually tied in a sitting position and placed in a shallow circular depression (Teit 1900). Boas (1890) noted that graves were rubbed with thorn bushes previous to the body being interred. Grave goods were frequently included in burials included ornaments and tools. At a burial or burning of high status individuals, dogs, horses and occasionally slaves owned by the deceased were killed and buried or burnt along with the body (Teit 1900:328). After a body was buried, poles were raised over the grave in the shape of a small conical hut (Boas 1890:91). Dawson (1892:9) noted almost one hundred burials at a single location near a winter village site in Secwepemc territory. When an individual died away from home (for example, on a hunting or fishing expedition), the body was burnt and the charred bones were brought home to be buried in the village. According to Boas (1890), burnt bones were often washed before burial.. Certain dietary restrictions were placed upon the relatives of the deceased for a year after death (Boas 1890). During this period they were not allowed to eat salmon, berries, or deer. After the mourning period was over, a huge feast was held (Boas 1890: 91).

IMPLICATIONS FOR THE POTENTIAL MODEL:

The ethnographic observations presented above provide important information that can be incorporated into our understanding of land use and site location in the Williams Lake Forest District. A number of points can be extracted from this information that are important for understanding land-use by the three peoples and overall within the WLFD. These include:

For the Carrier:

- **Hunting was conducted on the east and west sides of the Fraser River.**
- **The Southern Carrier spent their winters on lakeshores, here they collected wood, fished, and trapped.**
- **Summers were spent at fishing sites.**
- **Stands of lodgepole pine, spruce, cedar, and birch may contain CMTs, since all of these species were used for various purposes by the Carrier.**
- **Burials were often placed along lake shores.**

For the Tsilhqot'in

- Tsilhqot'in movements are strongly influenced by the complex of rivers and lakes covering their territory,
- Trails are known to exist from Graveyard Creek over Tyax Pass to Tyahton Creek, Relay Creek to Big Creek, Gun Creek to Warner, and Taylor Passes to Taseko River.
- Environments abundant in soapberries, service berries, raspberries, strawberries, bear berries, wild cherries, cranberries, kinnikinnick, crowberry and huckleberry may have been gathering areas; Roots used by the Tsilhqot'in include spring beauty, yellow avalanche lily, hog fennel, wild onion, fern root, indian rice, tiger lily bulb, and silverweed.
- Stands of lodgepole pine, spruce, cedar, and birch may contain CMTs, since all of these species were used for various purposes by the Tsilhqot'in.
- Fences for catching game were placed along game trails.

For the Secwepemc:

- The Secwepemc wintered on river terraces where the sunlight was greatest.
- In the fall berries and roots were collected at higher elevations; service-berry, soapberry, raspberry, blueberry, gooseberry, and blackberry were obtained; roots collected include fireweed, willow-herb, and cowparsnip (Teit 1909).
- Stands of spruce, birch, poplar, lodgepole pine, balsam, fir, and cedar may contain CMTs, since these trees were used for a variety of purposes (Teit 1909).
- Areas with steep river banks were used for fishing (Alexander 1994); fast moving streams and the outlets of lakes were also common fishing locations (Teit 1909).
- Corrals were placed along the edges of lakes to trap animals (Teit 1909522-23).
- Pictographs were placed in secluded areas, in caves, and on open rock faces (Kennedy and Bouchard 1985); rock art is also associated with major fishing camps (Alexander 1996a).
- Burials are associated with villages, the edges of terraces, and sandy knolls (Teit 1900, 1909).

In addition to these implications obtained from an examination of published literature, Millennia Research carried out interviews and consultation with members of the Stone Tsilhqot'in Band. This produced a variety of information directly applicable to understanding the use of the land. This information is summarized here:

- People camped all along creeks everywhere. Creeks were travel corridors, and they all contained fish. Netting of fish was common on all creeks, streams, and rivers.
- When people trapped animals, they trapped anything and everything, including squirrel, martin, fox, coyote, and lynx.
- Settlements and cabins did not always need to be located near water. Often, snow was obtained and the meltwater used.
- Open grasslands were important resource areas.
- Meeting places may have existed 'in the hills'. Before entering into war, large groups of people would meet at these places and various rituals were conducted to determine how successful they would be.
- Hunting platforms were erected in trees.
- Petroglyphs were common in Farwell Canyon, and at the confluence of the Chilcotin and Fraser Rivers.
- Areas with graves are avoided (this is the case with two graves at the north end of Fletcher Lake), and people are reluctant to stay overnight at these places.

Ethnographic Land Use and Archaeological Correlates

From the previous ethnographic section, it is apparent that First Nations peoples in the WLFD used different parts of their environment for different purposes, since different environments offered different resources. Building ***archaeological correlates*** involves developing relationships between how First Nations peoples used the land in different environmental zones and where archaeological sites likely occur. Knowledge of these relationships will allow more accurate prediction about where archaeological sites will occur in the W'LFD.

The following discussion summarizes land-use by First Nations groups in the Williams Lake Forest District and the types that of archaeological sites that are expected to occur in various areas of the study region. This information is extremely useful for predicting the location of unknown archaeological sites.

For the purpose of developing archaeological correlates, the environmental classification scheme used here divides the project area into seven units: River Valley, River Terrace, Intermediate Lake, Intermediate Grassland, Montane Forest, Montane Parkland and Alpine areas. This follows the work of Bussey and Alexander (1992) for the Cariboo Forest Region. These units overlap significantly with, and in various respects parallel the biogeoclimatic zones (Meidenger and Pojar 1991) described in the 'Physical Setting' section. While any classification scheme has strengths and drawbacks, the overall objective when modelling environmental zones is to make zone distinctions consistent and meaningful in terms of how First Nations used the landscape. As with the biogeoclimatic scheme of Meidinger and Pojar (1991), Bussey and Alexander (1992:25) recognized climate as the overall controlling factor determining forest cover, vegetation, and faunal. However, based on the ethnographic information provided above, Bussey and Alexander's scheme makes the most sense in terms of describing important and essential patterns of First Nations land-use. These include land-use and habitation centered on water sources, prevalent fauna1 and floral reources, and local landform characteristics. These are all factors that are incorporated in the predictive model presented in this report. A drawback to using Bussey and Alexander's scheme, however, is that detailed maps of the extent of each zone do not exist for most of the province. Because of this, the predictive model makes use of biogeoclimatic zones, which are well-mapped. The two schemes are extensively cross-referenced in the following descriptions of environmental units.

ENVIRONMENTAL UNITS

River Valley

The River Valley zone is defined as areas less than 500 m from large salmon running streams and less 60 m above river banks. River Valley areas are characterised by rough and rugged ground, many portions of which are quite steep. Most river valleys fall within the Bunchgrass biogeoclimatic zone described by Meidinger and Pojar (1991).

Archaeologically, concentrations of fishing, hunting, and processing or butchering sites are expected in River Valleys. Salmon fishing camps were located along river valley areas (Alexander 1994: 12), and these camps are the most likely kind of traditional use site to occur within this environmental zone (Alexander 19966: 44). Many fishing camp sites were used repeatedly by First Nations peoples, particularly those locations along narrow sections of rivers with steep river banks. Thus, high artifact densities are expected at fishing camps.

Habitations in river valleys varied in size, and thus habitation sites of various sizes will exist in these areas. At larger camps, substantial rectangular dwellings would have been built to accommodate the many families aggregated there. Because of the proximity to rivers and the importance of fishing, evidence of fish drying racks is expected, as well as hearth features. Salmon remains, if preserved, would be common.

In the vicinity of fishing camps, underground cache and roasting pits and elevated caches are anticipated. Evidence of small dwellings likely exists.

In addition to fish, many ungulates and other foraging mammals were drawn to riverine areas. Trails leading from river terrace areas through to river valleys would have been followed by both animals and people. Thus, hunting sites should be identified in these locations. However, hunting and butchering sites often contain low artifact densities (Alexander 1992). Fauna1 remains, if present, would also occur in low densities. Trails, lithic scatters and small, temporary base camps are common to these areas.

The importance of river valleys is represented in our predictive model by the incorporation of 'distance to salmon steams' as a variable influencing site location.

River Terraces

River Terrace units are defined as terraces bordering salmon spawning rivers. Most fall within three kilometres of river banks and are within the Bunchgrass zone, In the WLFD, this unit includes large portions of the Fraser and Chilcotin Rivers. The River Terrace unit is very similar to the River Valley unit in climate, vegetation, and ecology. The most significant difference between these two units is that River Terraces contain more wetland and forested areas (Alexander 1996a).

Archaeologically, winter villages are the largest kind of traditional use site expected within river terrace environments, particularly for those with good southern exposures close to lakes (see Dawson 1892, Alexander 1994: 13). Chilcotin and Carrier groups often wintered in areas near to large lakes (Intermediate Lakes Unit) and Shuswap commonly wintered along major rivers such as the Fraser (Alexander 1996a: 32). These habitations are marked by large, circular cultural depressions or by shallow rectangular house depressions. It is anticipated that few base camps would be located within close distance of winter camping sites in river terrace environments. Other kinds of archaeological site types expected include drying racks, cache pits, elevated storage boxes, and women's seclusion huts (Alexander 1996a).

The importance of river terrace areas is reflected in the incorporation of 'bunchgrass' as a variable into the predictive model

Intermediate Lakes

The Intermediate Lakes unit includes areas near to lakes and associated stream and creek outlets and inlets at elevations lower than 1500 m. The Intermediate Lakes are found in a number of biogeoclimatic zones within the WLFD, including the IDF, MS and SBPS. Intermediate Lakes within the project area include Chimney Lake, Felker Lake, Alkali Lake, Gaspard Lake, and Mons Lake.

Lakes support a wide variety of birds and mammals which were trapped or snared. In addition to substantial villages, lakes environments were used throughout the year for short-term resource collecting. People could make day trips or short camping trips into lakes areas to hunt deer, fish, and collect plant foods.

Archaeologically, large cultural depressions representative of pithouse dwellings, small cultural depressions associated with cache pits, and roasting pits occur in lakes areas. Areas close to intermediate lakes are optimal locations for large winter villages; the suite of floral and fauna1 resources that lakes offer were a strong draw on habitation. Large habitation sites are often found in this environment, which supports the trees necessary for house construction and fuel. Villages are typically located within 1500 m of lakes (Alexander 1994: 14).

Base camps associated with plant gathering, hunting, and fishing are likely to occur within this kind of environment. In both cases, features such as cache pits, roasting pits, fish drying racks, and smaller shelters are characteristic of these kinds of sites (Alexander 1994).

The importance of lakes is reflected in our model primarily by the incorporation of variables describing the proximity of archaeological sites to various size class lakes.

Intermediate Grasslands

Intermediate Grasslands are often located within the Interior Douglas Fir biogeoclimatic zone, and along the edges of the Bunchgrass zone. In the study area large tracts of grasslands are found south of Williams Lake and adjacent to River Terraces along the Fraser River. These include areas from Lone Cabin Creek to Ward Creek and the area north of the Chilcotin River to Chimney Creek. Smaller sections of Intermediate Grasslands occur throughout the WLFD, including areas around Churn, Gaspard and Farwell Creeks (Alexander 1996a: 37).

Grasslands areas are used for both hunting and plant collecting activities; Alexander (1996) suggests that they were likely used heavily in the spring and fall. Grasslands areas are situated close to villages (located in River Terrace environments) and were visited for short-term berry collecting during the spring and summer months (primarily April through July). Hunting camps or base camps may have been established in Grasslands areas during movements to and from Alpine areas. As Arcas (1994a) notes, there is a very little discussion at present of the use of Grassland areas.

Known archaeological site density in Grasslands environments is generally low due to (1) the short-term nature of subsistence activities (hunting and berry picking) and (2) the lack of substantial habitation sites in these areas. Short-term activities leave few remains in the archaeological record. The most common sites found in this environment are lithic scatters, which are found in association with spring and winter hunting/resource collecting activities (Apland 198 1). Other anticipated site types include roasting pits, cache pits, and sites related to hide preparation and meat drying (Alexander 1996b:50).

The importance of montane grasslands is reflected in the inclusion of an 'open range' variable in the predictive model.

Montane Forests

Montane forest areas in the WLFD contain abundant lodgepole and whitebark pine and most of the continuous Engelmann Spruce-Subalpine fir, Montane Spruce, and Interior Douglas-fir canopy forests.

As with Grasslands, Montane Forests were probably not used for long-term habitation. Rather, short-term or casual use appears likely (Alexander 1996a:39, 1996b:51). Archaeological sites in this type of environment are associated with resource procurement, particularly hunting and butchering, marked by small camping sites, hearths, and meat drying racks.

Plant gathering locations are expected involving the use of roasting pits for processing. These activities leave cultural depressions within the Montane Forests. Temporary shelters used in conjunction with these activities would not generally be preserved. However, archaeological evidence of dwellings and elevated caches may be identified in the case of larger camps (Alexander 1996a:40). Along frequently used trails within Montane Forests, site densities should be considerably higher than areas in which trails are not present (Arcas 1994).

The variable 'whitebark pine' reflects the most salient aspect of Montane Forest areas in the predictive model.

Montane Parkland

Montane Parkland environments include open meadows and isolated stands of trees, Montane Parkland is found within the subalpine parkland zone of Meideinger and Pojar's (1991) Engelmann Spruce-Subalpine Fir biogeoclimatic zone. The Montane Parkland unit is transitional between Englemann Spruce subalpine forests and alpine meadows of the Subalpine Fir zone. Montane Parkland parallels the Alpine unit in a number of ways, though the climate of Montane Parklands is milder in terms of temperature range and wind intensity. Forest cover includes Engelmann spruce, whitebark pine, lodgepole pine and subalpine fir. Within the WLFD, Montane Parkland areas are identified in the Chilcotin Ranges located south of Dog Creek and the Black Dome area.

Although large streams and some lakes occur in this environment, these generally do not contain large fish species or shellfish. Sites relating to fishing should therefore not be present in large numbers. Ethnographically, small base camps for hunting and collecting were established throughout these areas (Alexander 1996a, Turner 1992, Romanoff 1992). Alexander (1992) noted that if Parkland areas existed near villages, small groups would make frequent day trips into these areas to collect specific resources. Thus, most archaeological sites will be those resulting from short-term and resource-specific collecting and hunting activities. Many of these activities will not be well preserved in the archaeological record (expected low site densities were addressed in the predictive model by narrowing buffers in Montane Spruce areas).

Montane Parkland areas also feature three site types which are not related to food resource acquisition -- rock art sites, quarries, and burial sites. The location and occurrence of rock art sites in this zone are difficult to predict. Rock art has been associated with fishing sites, secluded places (e.g., caves) and large rock overhangs (Alexander 1994).

Many lithic materials used by First Nations can be traced to quarries within the area. Obsidian quarries are located primarily in Tsilhqot'in territories. This obsidian was likely traded by Tsilhqot'in peoples to the Canyon Shuswap and the Alkali Shuswap (see Teit 1909: 763-4, Lane 1953: 77, Goldman 1953: 157). A largest basalt quarry is located in the Arrowstone Range near Bonaparte River. Cherts were obtained from quarries near to Punzi Lake (Alexander 1994). Quarry sites are appear as large scatters of stone tool production debris. However, they may also be archaeologically invisible if raw materials were transported out of the quarry without modification.

Our model emphasized both nearness to whitebark pine and lodgepole pine forest cover as important variables. Quarries locations were also modelled.

Alpine Tundra

The Alpine Tundra unit considered here is identical to the Meideinger and Pojar's (1991) Alpine Tundra biogeoclimatic zone (Bussey and Alexander 1992). It remains one of the least explored environmental zones.

Very few areas within the WLFD are located within the Alpine Unit. Areas south of Gaspard Creek contain Alpine Tundra. Ethnographically, these areas saw limited use with the exception of quarrying activity and hunting excursion base-camps. The archaeological correlates of these behaviours will be of low density and marked by a limited range of material culture. Visibility of archaeological materials in Alpine Tundra can be quite poor due to slide activity.

Alexander (1987a) investigated Alpine areas south-east of the WLFD (1987a). Four archaeological sites were identified, consisting of hunting blinds and burial cairns. In an ethnoarchaeological study by Alexander (1987b) near Pavilion, three lithic scatter sites were recorded in the alpine proper, and four sites were identified in a valley in the alpine/subalpine zone. The alpine sites were located close to a traditional deer drive and the valley sites were located in an area traditionally used to camp during hunting expeditions.

Summary

This discussion of the archaeological correlates of resource use across environmental zones highlights a few general trends in the actual and expected occurrence of archaeological sites within the WLFD. First, all environmental zones were used by First Nations peoples. Lower elevations saw more intensive use of resources and were favoured for habitation sites. Upper elevation zones are characterized by more species- and activity-specific resource use and much less substantial (in both duration of use and investment in architecture) habitation sites. Overall, archaeological sites may be less common at higher elevations.

Previous Archaeological Research in the Study Area

Few archaeological excavations have occurred in the Williams Lake Forest District and the Cariboo Forest Region, but some of the best intensive archaeological survey in the province has occurred in these areas. Much of the early survey was academic in origin, with research designs geared towards examining the relationships between site locations and environmental variables. This is precisely the data needed for predictive modelling. This data has recently been supplemented by large-scale impact assessment work.

This section briefly describes the archaeological sequence for the area (built mostly on the results of excavations outside the region), then describes the various archaeological projects that have been conducted in and adjacent to the study area. Results of these projects and their conclusions are assessed with particular reference to their strengths, limitations, and implications for predictive modelling.

A thorough summary of previous work was prepared by Bussey and Alexander (1992) as part of their overview assessment study of the Cariboo Forest Region. Bussey and Alexander (1992) should be consulted for more detailed information about specific projects.

Regional Cultural Sequence

The following discussion is based largely on Stryd and Rousseau's (1996) "Early Prehistory of the Mid Fraser-Thompson River Area". This is the most current and comprehensive synthesis of interior prehistory to date. Cultural sequences for prehistory do not inherently address questions of cultural ethnicity or biological ancestry. Rather, culture-history is an analytical approach in which groups (or types) of archaeological assemblages are identified and ordered in time on the basis of shared traits in material culture.

Initially, Sanger (1970: 106) divided the archaeological deposits from the southern interior into two archaeological units: the Nesikep Tradition and the Lochnore Complex. Stryd and Rousseau (1996) have updated Sanger's sequence using current archaeological data from the mid Fraser-Thompson drainage area. The mid Fraser-Thompson drainage cultural sequence boundary only catches the southern half of the WLFD, but could probably be safely extended farther north. Extending the sequence further west into areas where Athapaskan languages were spoken historically is more problematic. However, there are no well-established cultural sequences for this western area. General similarities to the mid-Fraser-Thompson River area may be expected.

Stryd and Rousseau's three period scheme is presented below.

EARLY PERIOD (12,000/11,000 TO 7000 BP)

This period begins at the end of the last glaciation and continues to the end of the hypsithermal (a period of significant global warming) at 7000 years before present. The Early Period is known archaeologically through only three sites that date to the latter half of the period. Surface finds of stone tools provide the bulk of information on the earlier part of the period.

Stone tools (primarily projectile points) found as surface finds represent several technological traditions: the Western Fluted Point Tradition, the Intermontane Stemmed Point

Tradition, the Plano Tradition, the Early Coast Microblade Complex, and the Old Cordilleran Tradition (Stryd and Rousseau 1996: 180- 184).

No conclusive evidence for the Western Fluted Point Tradition has been found in the Mid Fraser-Thompson drainage area according to Stryd and Rousseau (1996: 180). They do describe one stone point found at Secwepemc Lake which is very similar to Clovis fluted points but lacks some of their characteristics.

The stemmed points of the Stemmed Point Tradition were likely introduced to the study area by 10 000 years BP from the Columbia Plateau. There are two theories as to their origin, Bryan (1980) and Choquette (1987) suggest that this tradition may predate the fluted point tradition and originated in the Great Basin circa 14,000 BP and subsequently spread northward. Carlson (1991, cited in Stryd and Rousseau 1996) and Musil (1988, cited in Stryd and Rousseau 1996) suggest that stemmed points naturally evolved out of the process of fluting. Stemmed points have been dated to between 10 500 and 8000 BP.

The Plano Tradition is defined by lanceolate, stemmed, and foliate projectile points. Points have been found in the mid Fraser-Thompson area and to the north, near Vanderhoof, that resemble Plano points. Grabert (1974, cited in Stryd and Rousseau 1996) has hypothesized that people migrating northward from the Columbia Plateau brought with them knowledge of Plano technology.

Two early period sites in the mid Fraser-Thompson area -- the Landels Site near Ashcroft and the Drynoch Slide site near Spences Bridge -- have microblades in their assemblages. These assemblages have been dated to ca. 8400 and 7500 BP. Microblade technology probably originated from the north where this it appears fairly early. Microblades have been dated to 11,000 BP in Alaska (Carlson 1983:20) and 9000 in Haida Gwaii (Fedje et *al. 1996).* Microblades are found in archaeological assemblages early on in northern BC sites, and occur consistently later as one moves south.

The Old Cordilleran, also called the Protowestem Tradition and Pebble Tool Tradition by some, is represented in the mid Fraser-Thompson area. Its origins are unknown. Sanger suggests that the Lochnore Complex is a late manifestation of the Old Cordilleran Tradition (Sanger 1969). The artifact assemblage from this period consists of stone tools, since organic materials have probably not been preserved. Foliate points and abundant pebble tools characterize this tradition. Fladmark (1986) suggests that dwellings were probably "light and portable, possible conical or A-frame tents and huts covered with skins, bark or woven mats". No specialized wood working tools are found in the lithic assemblages. We believe that a broad-based hunting economy was in place, with fishing perhaps increasing in importance over time. Until recently, it was believed that salmon were relatively rare in interior rivers and along on the coast until about 5,000 BP (Fladmark 1975). Recent discoveries suggest that sockeye salmon survived in glacial lakes through the most intense periods of glaciation at about 20,000 BP (Carlson and Klein 1996).

Early Period sites are probably the most difficult to predict through modelling. In general, they will not occur near major rivers, since the present-day rivers have been downcut through late Pleistocene deposits. The earliest sites will generally not be expected within the major valleys, since many of these were filled with ice or ice-dammed glacial lakes during this period. It is expected that population density was relatively low, and relatively few sites were likely produced by these earliest people. In addition, many sites will have been destroyed by erosion or deeply buried by Holocene deposits, making them difficult to find. This does not necessarily protect them from modern development, however, which often cuts into Pleistocene deposits,

MIDDLE PERIOD (7000 BP TO 3500 BP)

This period begins at the end of the Hypsithermal climatic period at about 7000 BP and continues to the beginning of the Shuswap horizon at 3500 BP (Stryd and Rousseau 1996:185). This Middle Period includes the Nesikep Tradition (7000-4500 BP) and the Lochnore phase (4500 BP – 3500BP) of the subsequent Plateau Pithouse Tradition. A newly defined Lehman Phase (6000 to 4500 BP) is now part of the Nesikep Tradition.

The Middle Period was characterized by a cool and wet climate that supported grasslands at low and mid elevations. The common fauna at this time were probably those well adapted to arid grasslands such as elk, antelope, and bighorn sheep (Hebda 1983:251). Towards the end of this period fir and pine forests expanded to lower elevations and deer would have become more common than elk.

The oldest date associated with this period comes from the Lehman Site, which dates to 6650±1 10 BP. Stryd and Rousseau see this period as a union of various cultural groups who subsisted on deer, elk, rabbits, rodents, freshwater molluscs and fish, salmon, small birds, and plants. Minor technological and stylistic changes during this period suggests that with further work phases within the period may be distinguishable.

The Early Nesikep Tradition is characterized by "well-made, lanceolate, corner-notched, and barbed projectile points;..formed unifaces; a microblade technology using wedge-shaped microblade cores; antler wedges; ground rodent incisors; bone points and needles; red ochre; and small oval scrapers" (Stryd and Rousseau 1996:188). Sanger (1970:119) suggests that the lanceolate points may be distantly related to the Plano Tradition points (1970: 119). Fauna recovered from excavated Early Nesikep Tradition sites include deer, elk, salmon, steelhead trout, birds, and freshwater molluscs (Arcas Associates 1985, Sanger 1970, and Stryd 1972 in Stryd and Rousseau 1996:188). For more detailed artifact descriptions see Stryd and Rousseau (1996).

Early Nesikep projectile point forms are only known from the Mid Fraser-Thompson culture area. Researchers suggest that they represent "a cultural manifestation that probably developed in the study area out of a mix of Early Period Traditions" (Stryd and Rousseau 1996:189).

The subsequent Lehman Phase (6000 BP to 4500 BP) is characterized by:

> thin, pentagonal projectile points with obliquely-oriented, B-shaped comer or side notches; lanceolate knives with straight cortex-covered bases; elliptical (or leaf-shaped) knives; tabular circular scrapers; "horse-shoe shaped" convex endscrapers; multi-directional flake cores with medium to large flake scars; unifacially retouched flakes with cortex or retouch backing; a high incidence of fine- and medium-grained basalt and an apparent lack of microblade technology (Stryd and Rousseau 1996:191).

Fauna1 remains recovered from the excavation of Lehman Phase sites include deer, elk, freshwater molluscs, turtle, and salmon. No cache pits have been found associated with sites of this phase but fire-cracked rock is evident. Semi-subterranean dwellings are also lacking, suggesting a fairly nomadic lifestyle for these peoples. Technological and stylistic continuity between the Early Nesikep and the Lehman Phase suggests that the latter developed out of the former.

The Lochnore Phase has been tentatively dated to between 4500 and 3500 BP. It is characterized by:

> leaf-shaped to lanceolate, unbarbed projectile points; some microblade technology; end and/or side scrapers on large blade-like flakes; crescentric flake scrapers; tear-shaped (elliptical) bifaces; flake scrapers with an obliquely-oriented straight scraping edge; and the introduction and use of pithouses (at least in the latter part of the phase) (Stryd and Rousseau 1996: 193).

Fauna1 remains from excavated sites include deer, elk, beaver, bear, marmot, muskrat, porcupine, rabbit, turtle, duck, hawk, loon , gohawk, eagle, goose, salmonid, sucker, peamouth chub, northern squawfish, burbot, whitefish, and freshwater mollusca. Domestic dogs remains have also been found (Stryd and Rousseau 1996: 196).

Food storage pits are evident at the Baker Site (EdQx-43). Roughly circular, oval and rectangular pits measuring up to 127cm in diameter and 45cm in depth were found inside pithouses (Wilson et al. 1992, cited in Stryd and Rousseau 1996:196). Pithouses from this phase are described as conical or square with gravel or cobble rims to hold down bark-mat siding. Large storage and refuse pits have been found in these structures and some contain boulder seats near the hearths. The contents of the bowl-shaped hearths include FCR, charcoal, and other refuse. They measure 75-110cm and are 18 - 25cm deep (Stryd and Rousseau 1996:196).

Stryd and Rousseau (1996:196) suggest that the occurrence of pithouses, food storage pits, possible fish smoking pits, and salmon remains suggest a culture that practiced seasonal sedentism. High fish protein counts in human remains suggests that salmon utilization was prominent by the Lochnore Phase. Long distance trade during the Lochnore Phase is marked by the presence of Olivella beads, keyhole limpits, and Oregon obsidian (Stryd and Rousseau 1996: 197).

Scattered human remains were recovered at EdQx 43. Wilson et al. (1992, cited in Stryd and Rousseau 1996) have suggested that these people may have placed individuals in trees or other elevated burials. Placing the deceased on elevated platforms is known ethnographically for the Carrier, but not the Secwepemc or Tsilhqot'in. The Tsilhqot'in were known to bury the dead in snow in the winter. This practice could also account for the scattered nature of the human remains identified by Wilson et al. (1992).

LATE PERIOD (3500 TO 200 BP)

The Late Period encompasses the time from 3500 BP up until contact with Europeans. Three archaeological horizons occur within the Late Period, including the Shuswap, Plateau, and Kamloops Horizons. Significant continuity exists between the Lochnore Phase of the Middle Period and cultural horizons of the late Period.. Continuation exists in lithic technology, pithouse use, artifact types, and there is an increase in the use of salmonids. Differences seem to be in "scale and intensity", with many things being done on a larger scale than in previous times. This period is characterized by an intensification in trade and a greater emphasis on storage in conjunction with increased salmon use.

Plateau Pithouse Tradition (4500 BP to Contact)

This Plateau Pithouse Tradition subsumes the Lochnore Phase of the Middle Period and the three horizons of the Late Period. It is a parallel classification that stresses the development and use of pithouses in the interior. Characteristics of ethnographic Interior Salish of the Canadian Plateau are thought to have first developed at the beginning of the PP Tradition. These include the use of semi-subterranean pithouses as winter dwellings in semi-permanent winter villages; a semi-sedentary, logistically organized, seasonally regulated subsistence and settlement strategy; and a hunting and gathering subsistence and settlement strategy with a strong emphasis on salmon fishing and use of food storage pits (Stryd and Rousseau 1996: 198).

Previous Archaeology in the Project Area

The number of archaeological projects in the WLFD has increased over the last decade, Many of these projects were initiated in response to pipeline and transmission line construction, development, or forestry. These include Rafferty (1976), Winram and Thomas (1977), Germann (1979a, 1979b), Lawhead (1979), Howe (1982), Bussey (1991a), Muir and Rousseau (1991, 1992), Bussey and Alexander (1992), Merchant and Rousseau (1993), Wilson (1993a, 1994a, 1995), Arcas (1994a, 1995), Yip (1994), I.R. Wilson (Hewer 1995), Yip and Choquette (1996a, 1996b), and Altamira (1996, 1997). Projects with a research focus include Sneed (1970), Keddie (1972), Mohs (1972), Matson and Ham (1974), Ham (1975), Pike (1974), and Eldridge (1976).

In the following section, a sample of archaeological projects carried out in the study area are summarized and evaluated. This summary is not exhaustive. Preference is given to *those* which offer detailed information about site type and location, or which serve as representative of archaeological material within a given area. Projects are evaluated on the basis of three criteria – survey type (reconnaissance or intensive), use of shovel testing (or description of exposures), and whether information resulting from the project was provided in digitial format.

RESEARCH-ORIENTED PROJECTS

Sneed (1970) surveyed a number of areas near the confluence of the Fraser and Chilcotin Rivers. This research was followed by Keddie (1972) and Mohs (1972), who examined three separate portions of the region. These included an area along the west bank of the Fraser River, an area around Far-well Canyon and Farwell Creek, and the Chilcotin Canyon approximately 2 miles west of the confluence of the Chilcotin and Fraser Rivers. These projects were aimed toward identifying archaeological potential and assessing the impact of a number of proposed developments through survey and test excavations.

Keddie (1972) directed an intensive survey of river and stream banks along the Fraser and Chilcotin Rivers. The project was designed to delineate, describe, and study recent and prehistoric environmental zones, human utilization of these zones, and changes in human ecology. The project was the first in the province of B.C. to employ systematic surface collection as a recording procedure. One hundred and seven new archaeological sites were identified through intensive survey of 14.8 km (no subsurface testing was employed). The majority of sites represent temporary base camps although a number of village sites were encountered and one pictograph was also recorded. Most of these sites were located along river terraces and river channels (both dry and running). One large pithouse village site (EkRo 48) was encountered during survey. This site was noted to be quite distinct from other sites in the area in that it contained substantial cultural deposits and large housepit features.

The largest area surveyed by Keddie (1972) was located two kilometres inland from the mouth of the Chilcotin River and six kilometres downstream from the Fraser River. An area measuring 6 km in length by 2 km in width was assessed along the west bank of the Fraser River.

A total of 93 archaeological sites were recorded from survey of this area. A second section of land was surveyed in the Chilcotin Canyon, which included an area two kilometres by 100 m. Six archaeological sites were identified in this area. The third section examined Far-well Canyon and creeks extending eleven kilometres north from the mouth of the Chilcotin on both sides of the river, Survey included an area 26 km in length and 100 m in width along the bank of Farwell Creek. Twelve previously recorded sites existed in this area, and eight new sites were added. No subsurface testing was conducted.

Pike (1974) used a judgmental sampling approach in conjunction with consultation with local people to evaluate five proposed transmission lines. A total of 55 archaeological sites and 8 historic sites were recorded during fieldwork including sites at Chimney creek crossing (FaRn 30), Canoe Lake crossing (EiR12) and "Dry Creek" crossing (EiR13). No maps of areas covered are provided in this report.

Matson and Ham (1974) examined settlement patterns within the vicinity of the mouth of the Chilcotin. They employed regional quadrat sampling at the confluence of the Fraser and the Chilcotin in order to predict site density and explain settlement patterns. A total of 181 quadrats (28.96 km^2), each 400 m by 400 m, were evaluated for archaeological resources. Twenty percent of quadrats were sampled and 41 sites were identified during fieldwork. No subsurface testing was conducted in this project.

Ham (1975) employed a stratified, random sample survey of the same area. The project was designed to describe and summarise the results of an archaeological survey in the area occupied by Secwepemc. A total of 40 sites were recorded, which included 163 cache pits and 32 housepit features, It was concluded that the data supports the ethnographically reported settlement pattern, with both winter house pit villages and summer villages located on benches above the Fraser River. No subsurface testing was conducted as part of this assessment.

Rafferty (1976) and Winram and Thomas (1977) identified a number of archaeological sites within the vicinity of Chimney Creek. One large site (FaRm 11) situated on a triangular terrace at the confluence of Frost and Chimney Creeks consisted of 54 circular depressions. A second site consisting of a single cultural depression was recorded on a bluff (FaRm 12) overlooking this site at an elevation of 760 m (Winram and Thomas 1977).

Eldridge (1976) conducted a probabilistic survey project west of Gang Ranch on the Fraser Plateau, south of the confluence of the Chilcotin and Fraser Rivers. In addition, areas near to Gang Ranch, Churn Creek Gaspard Creek and Gaspard Lake were judgementally surveyed. A 100 square kilometre area within the probabilistic portion of the study was systematically surveyed in 500 m by 500 m quadrats. This identified seven archaeological sites. Eleven other sites were identified during the probabilistic portion of the project. Subsurface testing was not conducted. Sites were found primarily in open meadows or in areas affected by development. The majority of sites identified were located within 100 m of a water source, and sites near to water sources were generally larger than those that were not. Eldridge (1976:6) observed that the low site densities encountered reflect the combined problems of low site visibility in forested areas and small predicted site size (for hunting, butchering, root gathering sites). Based on the survey results, Eldridge estimated that the study area contains approximately 140 sites, and noted that this estimate to be conservative.

IMPACT ASESSMENTS

In 1979, Germann (1979a, 1979b) assessed a number of areas within the Cariboo-Chilcotin region of the province to evaluate the impact of a number of proposed developments on cultural heritage resources. A total of 45 study areas were examined and 84 heritage sites were identified and recorded. Within the WLFD a section of land located along the south shore of the Chilcotin River west of Riske Creek, approximately 25 km northwest of the Chilcotin and Fraser Rivers confluence, was surveyed. The area examined was located on a terrace, ranging in width from between 200-500 m. Most of the area was flat, the maximum elevation variation was estimated by Germann (1979b) to be between 20-30m. Eight archaeological sites including two large pithouse sites were identified in this portion of the project. A number of cultural deposits and depressions were also identified.

During a large highways development AIA project, 36 proposed developments in the Cariboo area were assessed, seven of which were within the Williams Lake Highways District. Howe (1982) surveyed these areas. No archaeological resources were identified. Bussey (199 1 a) conducted archaeological inventory work within three highway districts, Quesnel, Williams Lake and McBride. One large site (EkRn 2) was identified during this project, as were a number of other sites outside of the WLFD.

Rousseau and Muir (1991a) directed an assessment along Chimney Lake Road and Churn Creek Bridge for a proposed Ministry of Transportation and Highways (M.O.T.H.) development in the Cariboo. The Chimney Lake road extends for 3.35 km along the north shore of Chimney Lake. Two low density lithic scatters (ElRl 18 and 19) had previously been identified along the north shore of Chimney Lake. Within the vicinity of Churn Creek three new sites were identified (EjRn 15, 16, 17). EjRn 15 is a moderately sized prehistoric site located 7 km south-west of Dog Creek to the west of the Fraser River. The site is located on a large terrace that dates between 8 000-10 000 B.P. At present, no water source exist within 400 m of the site. However, geological evidence suggests that a river was once much closer. Rousseau and Muir thus suggest that the site dates to somewhere between 5,000 and 8,000 B.P. The site of EjRn 16 is located on the west bank of the Fraser River on a sloping river terrace. The site consists of a medium sized lithic scatter (100 by 25m) situated 25 meters from a stream which runs into the Fraser River. A high density, small to medium sized lithic scatter and a cultural depression were identified on a moderately sloped river terrace near the Fraser River. A small creek was noted at the base of the terrace.

Subsequent work by Muir and Rousseau (1992) was conducted south of Chimney Lake in a Heritage Resource overview for the Dog Creek Band. During this project 12 archaeological sites were recorded, two sites in the Churn Creek area and 10 from along Dog Creek. This project examined a number of environmental zones within the Dog Creek Valley, resulting in the identification of a variety of site types including both historic and prehistoric habitation sites, a historic cemetery, lithic scatters, rock art sites, and roasting pits. One large winter pithouse village site, EjRn 20, containing 28 cultural depressions (including earth ovens and cache pits), was dated to 3200 years BP. The site occupied intensively at approximately 2400 years B.P.

During an AIA of six lots in the Dog Creek-Canoe Creek area by I.R. Wilson (Weinberger 1996) many of the sites recorded by Muir and Rousseau (1992) were revisited. It was noted that most sites in the region were small, reflecting a highly mobile population with small group size. Large sites were associated with lakes or near to game crossings (1996: 10).

An AIA of proposed roads within the vicinity of Chimney Creek was conducted by Merchant and Rousseau (1993). A total of 16 development areas were assessed on the east side of the Fraser River, south from Williams Lake to Chimney Creek, Three archaeological sites were identified during this project, two prehistoric village sites (one with 30 and the other with 90 cultural depressions) and a low density lithic scatter site. The low density lithic scatter (FaRn 40) is located 0.75 km west of the Fraser River on a prominent knoll near to the base of steep, west facing slope. The prehistoric winter pithouse village site (FaRn 39) with 30 cultural depressions (19 of which are larger than 3 meters in diameter) was identified on an open, flat terrace at the base of a steep west facing slope. The east and west boundaries of this site are framed by low lying knolls and a forest composed primarily of Douglas Fir trees. The closest permanent water source to this site is the Fraser River which is located 0.75 km to the west. Of the 90 cultural depressions at the third site (FaRn 41), 50 to 60 of these depressions were large enough to represent pithouse depressions. The remaining depressions were cache pits, roasting pits, and sweatlodges. This site was located 2.3 km north of Chimney Creek and 100 m east of the east bank of the Fraser River. Merchant and Rousseau (1993: 24) reported that this site if of high cultural and scientific significance, since it represents a "major traditional winter pithouse village, about which very little is known for the Chilcotin and Cariboo regions". They also note that the site continues to be significant to First Nations today, since many First Nations peoples camp in this area.

An archaeological resource overview was conducted near Big Creek by Wilson (1993a). Eight proposed forestry developments (approximately 500 ha in total) were evaluated for archaeological resources. All developments were evaluated by crews of two persons who systematically surveyed boundaries and roads. Judgemental transects were also run along natural topographic features that were considered to show heritage potential. Subsurface shovel testing was limited, and judgmental tests were excavated to sterile layers. Two archaeological sites were identified along a high ridge, away from any extant running water source. One site (EjRs 3) consists of two large cultural depressions. Both depressions are circular and measure approximately 20 m in diameter; they are located 10 m apart. The second site (EjRs 4) is a small lithic scatter located on a ridge. It measures approximately 30 m by 20 m in diameter. No maps identifying surveyed transects were included in this report.

An AIA for proposed forestry developments in the WLFD was conducted by I.R. Wilson et al. (1994). A field assessment of 50 cut blocks, tree traps, and beetle kill sites was carried out. A Traditional Use Study (TUS) component was included in their final report. Cut blocks in the traditional territory of the Soda Creek, Williams Lake, Alkali Lake and Canoe Creek Bands were evaluated for both archaeological sites and potential. A low density lithic scatter site (ElRn 22) was identified in the Alkali Lake area, on the south edge of a clearing by a marsh. Evidence from this site suggests a temporary prehistoric hunting camp. A second site located outside of the AIA project area was reported by Chief Chelsea of the Alkali Lake Band. The site (ElRn 23) contained a partially disturbed large, lithic scatter and a pithouse depression.

An AIA study was undertaken by Yip (1994) for a proposed development area in the West Churn Creek area. During the AIA three heritage sites were identified, one of which is archaeological (the other two sites are associated with TUS plant gathering). The archaeological site is located outside of the north boundary of the block and contains two cultural depressions, one basalt flake and FCR. The site was located near to water sources within an elevation range of 1450-1750 m asl. The surface was inspected by crews of 3 people. Transects were run throughout the block with crew members spaced 10 m apart. Both random and judgemental subsurface testing was conducted. Shovel tests were concentrated along proposed roads and were spaced at 50 and 100 m. Tests were approximately 40 cm^2 and were excavated to sterile.

An AIA for 12 proposed forestry developments (total of 432.5 ha) east of the Fraser River in the WLFD was undertaken by I.R. Wilson Consultants (Hewer 1995). A number of blocks within the current project area were assessed during this study including cutblocks by Knife Creek, Place Lake, and off of Enterprise Road. Survey was systematic, some areas immediately adjacent to proposed developments were judgementally inspected. Within developments, a transect was run into the central portion of the block following topographic features, Transects spaced at a 10-25 m interval were followed along cruise lines. Judgemental shovel tests were conducted and excavated to sterile sediments. Maps of all tests and transects are included in the report. No heritage resources were identified during this project.

In 1995, Arcas conducted archaeological testing for 42 proposed forestry developments on the Chilcotin Plateau (1995e), including some sections immediately adjacent to the WLFD. Within the vicinity of Stum Lake, Rosita Lake and Tautri Creek (located off of the northwest border of the project area), 7 archaeological sites were identified, including log structures, a burial feature, lithic scatters, and cultural depressions. Near to Stum Lake, two lithic scatter sites were located in flat areas, 400 m and 50 m from a water source. The two lithic scatters by Tautri Creek were also associated with creek terraces. A burial site is located along the edge of a meadow which borders a swamp between Tautri and Rosita Lakes along a historic trail. A second site within this vicinity reflects a multiple use (lithic scatter, habitation and cache pit cultural features), located between lakes with both south and north aspects. This site (FcRs 4) is situated between O-150 m from a water source. A lithic scatter was identified along a dry creek terrace at Zenzaco Creek (40 m from a water source), and two isolated finds and one lithic scatter was located along a terrace near Anahim Creek. One site near to Anahim Creek consisted of four lodgepole pine CMTs.

In the vicinity of Gaspard, West Churn Creek, Empire Valley and Mackin Creeks, Yip and Choquette (1996c) conducted a number of post-harvest AIA's. Although a number of heritage concerns were identified by members of the Toosey Band during fieldwork, no archaeological resources were encountered during reconnaissance. The authors noted that recent ethnographic research has indicated that significant plant collecting areas and hunting grounds are present in West Churn Creek.

I.R. Wilson Consultants (Hewer 1996) conducted an AIA for proposed Ministry of Forests cut blocks and salvages in the WLFD. The project area included portions of Alkali Lake Band and TNG traditional territory including Big Creek, Place Road, Witte Road, and Bambrick Creek. A number of subsurface tests were conducted in each of these areas. However, no archaeological resources were identified. Maps indicating specific transect coverage were not included in this report.

Yip and Choquette (1996) conducted an AIA for forestry developments near to Riske Creek. None of this area had previously been subject to archaeological assessment. During the assessment 11 sites and two isolated finds were located, all within or adjacent to Tsilhquot'in TUS sites. Archaeological sites consisted of lithic scatters and cultural depressions. Nine sites were located near to lakes, either above shorelines or situated on small knolls within the immediate vicinity. Four sites were identified along proposed haul roads.

An archaeological field assessment was conducted by Altamira (1997c) for 22 proposed fence line developments in the WLFD. Two of these are within the project area. One development located along the south-west boundary of the forest district near Willan Lake included four separate development areas. A second development located between Big Creek and Scallon Creek was assessed. No archaeological resources were identified during the reconnaissance of these or the other 20 proposed developments.

OVERVIEW ASSESSMENTS

Bussey and Alexander (1992) co-authored an archaeological assessment study of the Cariboo Forest District (which encompasses the WLFD). This report describes much of the previous archaeological work in the region and provides an evaluation of archaeological potential. Bussey and Alexander (1992) note that site types and site frequencies were similar throughout the Cariboo Forest Region. Lithic scatters were the most common site type identified. They suggest that future surveys with improved research methods and techniques would reveal a greater diversity site types.

An AOA for the central portion of the Alkali Lake Traditional Territory, located in the eastern portion of the WLFD, was conducted by Arcas (1994a). This report summarizes previous work in the study area and provides an assessment of archaeological resource potential.

An overview assessment of 451 proposed forestry developments within the WLFD was conducted by Altamira (1996). This review was conducted independent of fieldwork or consultation with First Nations. It amounted to an entirely judgmental model with no explicit definition of variables. A very small number of AIAs were recommended as a result of this assessment.

ARCHAEOLOGICAL EXCAVATIONS

Most of the mitigative projects conducted in the WLFD have focused on data recovery from pithouse village sites (Franck et al. 1993). Excavation projects have been conducted by Kenny (1972), Carl (1972), Williams (1974), Whitlam (1976) and Lawhead (1979). As Bailey (1994:6) notes, focusing on pithouse village sites has led to a significant bias with which all past human behaviour and material culture are viewed to be associated with Late Prehistoric winter villages.

Three pithouse excavation projects were carried out on river terraces of Fraser River tributaries in the WLFD in the early 1970's. Two house pit sites were excavated in the vicinity of Williams Lake - FbRn 13 or the Deep Creek Site (Kenny 1972) and FaRn 3 or the Stafford Ranch Site (Carl 1972). Williams (1974) conducted subsequent salvage excavation work at the Williams Lake site (FaRn 3), and FaRm 8. FaRn 3 (Stafford Ranch site), which included forty-five housepit depressions and cache pits on a terrace, was further investigated by Whitlam (1976). Whitlam also did work at FbRn 13, as well as at ElRn 3 to the southwest of Williams Lake. Subsequent mitigative work was conducted by Lawhead (1979) who conducted salvage archaeological projects at three sites (FaRm 14, FaRm 15, FaRm 16). Sites were in conflict with proposed highway development, and the area was assessed as having high archaeological potential. One of these sites (FaRm 14) was situated on a small knoll and consisted of surface lithic scatter extending over 1000 square meters.

IMPLICATIONS FOR THE POTENTIAL MODEL:

From this review of previous archaeological projects in the study area, a number of points concerning the location of archaeological resources can be identified. Expectations concerning site type and location include:

- A high site density within a 1000m of the Fraser River.
- A high site density within a 100m of the Chilcotin River.
- Base camps, village sites, and pictographs are often on flat river terraces, and benches (Ham 1975; Keddie 1972; Germann 1979).
- Sites are commonly focused at river crossings (Pike 1974).
- Sites are commonly found at the confluence of creeks (Rafferty 1976; Winram and Thomas 1977; Muir and Rousseau 1992).
- Sites often occur within a 100m of a water source (Eldridge 1976; Yip 1994) but can large sites may be situated further from extant water sources (Wilson 1993a; Merchant and Rousseau 1993).
- Sites near a water source are generally larger than those that are not (Eldridge 1976).
- Large sites are commonly associated with game crossings and lakes (Weinberger 1996; Muir and Rousseau 1992).
- Lithic scatters are often associated with prominent knolls (Merchant and Rousseau 1993; Lawhead 1979), ridges (Wilson 1993a), or terraces (Arcas 1995).
- Lithic scatters can also be found associated with marshes and swamps (Wilson et al. 1994).
- There is a common association between archaeological sites and Traditional Use Sites (Yip and Choquette 1996c).

Archaeological Projects in the Vicinity of the Project Area

Since boundaries of the WLFD and the area included in this study have been arbitrarily defined, archaeological work from outside these boundaries has a direct bearing on the interpretation of cultural heritage resources in the project area. The following discussion summarizes selective reports on previous archaeological work in other portions of the WLFD as well as research from areas adjacent to the WLFD. This discussion is elected rather than comprehensive or representative of cultures and culture history in the area. For present purposes, this summary is divided into three general geographic areas -- the Fraser Basin, the Chilcotin Plateau, and the Blackwater drainage.

Fraser Basin

South of Gang Ranch, Bussey (1982, 1990) conducted AIA work as part of the Kelly Lake-Cheekye Transmission Line project. A large village site was identified along a tributary of the Fraser River. A number of smaller lithic scatter sites were also recorded.

Bussey (1989b) conducted an overview assessment for the Mount Polley Copper/Gold project located outside of Williams Lake. Subsequent work by Bussey in the Williams Lake area includes a Heritage Resource Inventory for a proposed transmission line running from Kelly Lake to Cheekye (1990), and a heritage review for highways in the Quesnel, Williams Lake and McBride Highway Districts (1991a).

An AIA for a proposed development area located on the north shore of Williams Lake was conducted by Franck et al. (1993). Two archaeological sites were identified during this project, a large pithouse village site with a lithic scatter component (FaRm 4) and a smaller habitation site (FaRm 26). Thirty-one cultural depressions were recorded at the site of FaRm 4 in 1969 by Schuman; eight cultural depressions were added as a result of this assessment. The second site identified consists of 11 cultural depressions and a lithic scatter. Both sites are located on the shore of Williams Lake on an extinct river terrace.

Bailey (1994) examined portions of a proposed subdivision within the City of Williams Lake. A moderate-sized site which included a lithic scatter, roasting pit, and trail was identified approximately 80 m from the shore of Williams Lake.

An AIA for 10 proposed logging developments near Williams Lake was conducted by Arcas (1994b). No heritage resources were identified as a result of survey. In the Hanceville area, an AIA study was conducted for 55 proposed timber sales blocks by Arcas (1994c). One moderately dense lithic scatter (EjRs 5) and one isolated find were identified as a result of this assessment. EjRs 5 is located in a small clearing near the top of a hill overlooking the Bambrick Creek drainage.

South-east of the WLFD, Alexander (1987a) investigated the Bald Mountain (Cairn Peak) region east of the Fraser River south of Lillooet. Although this area is outside of the Forest District, the ethnoarchaeological research which was conducted is a good reference for predictive modeling within the WLFD due to their similar environments and shared cultural associations. In addition, very little research has been conducted in areas of higher elevation in the WLFD to date. Alexander (1987a) examined terrain within three biogeoclimatic zones: the Alpine Tundra, Interior Douglas Fir, and Engelmann Spruce-Subalpine Fir zones. A total of 18 archaeological sites were identified during fieldwork. Four were found in the Alpine Tundra zone. These included stone hunting blinds and two possible cairns. Twelve sites were located within the alpine/subalpine ecotone (referred to as parkland) including lithic scatters, roasting pits and cache pits. Alexander comments that

> ... almost all dry, flat land in the parkland contained an archaeological site. These sites typically contain small localised lithic scatters with a few cache and/or roasting pits. They are located close to water and to the trees which would have provided both fuel and shelter (1987a: 11).

Sites identified within this ecozone were suggested to represent base camps, that is, sites used during resource acquisition trips into the highlands. Ethnographic support for this interpretation was achieved through interviews conducted by Tyhurst in association with this project.

Two sites were identified at the lowest elevations surveyed in forested areas by Cinquefoil Creek. Both contained cultural depressions measuring between 1.5 m and 6 m in diameter. It was concluded that the Bald Mountain area was used for seasonal plant gathering and hunting (Alexander 1987a).

Spafford et al. (1995) conducted an AIA for 24 proposed forestry developments in the vicinity of Williams Lake Creek, Squawk Lake, Knife Creek, Macklin Creek and Chimney Lake. One low density lithic scatter was identified along the west end of Squawk Lake.

Antiquus (Merchant 1995) assessed three proposed forestry developments in the WLFD. No archaeological resources were identified. Antiquus also evaluated 12 proposed cutblocks within the vicinity of Elk, Skelton, and McCleese Lakes in the WLFD (Merchant 1995b). One small, low-density, prehistoric lithic scatter was recorded during fieldwork. The site (FcRm 1) is located on the north end of a lake between two glacial moraines. Artifacts suggested a short term occupation of the area, and the site was inferred as the remains of a short-stay hunting camp.

Chilcotin Plateau

Bussey and Alexander (1992:87) note that a large proportion of archaeological research conducted in the Chilcotin Plateau has been directed toward "identifying the origin and arrival time of the Tsilhqot'in Indians who are believed to have migrated into the area". This was

... and a quadrat survey of the Eagle Lake area continued the work of Matson and Ham (1974). During the survey of 30 quadrats in the Eagle Lake area they located emphasized in surveys and excavation projects in the 1970s and early 1980s. Survey coverage within the Chilcotin Plateau is varied. Some areas have been subject to more intensive archaeological investigation than others.

Work in the Chilcotin Plateau area includes inventories by Howe (1980, 198 1) and Bussey (1991 b). Bussey (1991b) conducted an intensive inventory project for the Ministry of Environment northwest of Redstone near Chilcotin Lake, which also included Clinchintampan Creek and portions of the Chilcotin River and Chilcotin Marsh. Areas within their study area considered to have heritage potential were traversed on foot and tested for subsurface deposits. Ten archaeological sites and one historic habitation site were identified during fieldwork. Most of these sites represented Late Period occupations. Two may be associated with the Shuswap horizon.

A large proportion of the archaeological work done within Tsilhqot'in territories has been conducted west of the Williams Lake Forest District in areas including Choelquoit Lake (often referred to as Eagle Lake), the Chilco River and the Potato Mountain Range. Although this area falls outside of the WLFD, the archaeological work from this region represents some of the best recorded cultural prehistory for the Tsilhqot'in to date. Choelquoit Lake is located approximately 300 km northwest of Vancouver and 125 km southeast of Anahim Lake on the east boundary of the Central Interior. The Potato Mountain Range is located on the south-west shore of Choelquoit Lake and extends to elevations of 2200 m (Choelquoit Lake is at 1200 m.) (Matson et al. 1980). In the vicinity of Choelquoit Lake and Chilco River, archaeological projects have been conducted by Matson et al. (1979, 1980), Magne and Matson (1982, 1984) Alexander et al. (1985) and Alexander and Matson (1987).

Matson et al. (1979) conducted a systematic quadrat survey of Choelquoit Lake. The following year (1980), Matson et al. surveyed approximately 7% of the Choelquoit Lake area to identify cultural differences between Salish and Athapaskan speakers during the Late Prehistoric Period. During their 1979 season, 35 quadrats measuring 400 m by 400 m were subject to probabilistic survey (total area 75.36 km^2). A total of 46 archaeological sites were identified. A systematic survey of areas located on both sides of the Chilco River near Choelquoit Lake was also conducted using 400 m quadrats. Fifty-seven archaeological sites were identified during research, thirty seven of these from grassland quadrats and twenty sites from forested areas. Site types included housepits, cache and roasting pits, lithic scatters and CMTs.

A probabilistic survey by Matson et al. (1979) of riverbank areas and benches at the mouth of the Chilcotin and a quadrat survey of the Eagle Lake area continued the work of Matson and Ham (1974). During the survey of 30 quadrats in the Eagle Lake area they located 40 prehistoric sites. They were surprised to find a high density of pit features and a lower than expected density of surface lithic scatters (Matson et al. 1979:43). A total of 105 sites were recorded between the mouth of Chilko Lake and 30km downstream. The sites included 37 housepits, 50 cachepits, 13 lithic scatters, and 3 isolated finds (Matson et al. 1979:54). Lithic scatters were "invariably found on low, open terraces immediately adjacent to the river, and often with historic fish camp remains.. . they are most surely prehistoric salmon fishing camps" (Matson et al. 1979:53). They also found small piles of rocks that fit the pattern of sweat lodge construction (Matson et al. 1979:55). Subsurface testing was not conducted.

Ethnoarchaeological investigations were conducted within the Choelquoit Lake-Potato Mountain Range by Alexander et al. (1985) using probabilistic survey of subalpine parkland. This project was directed towards data collection on Tsilhqot'in traditional land use and culture history. In the Potato Mountain Range area, sixteen sites were identified including 456 cache and roasting pits, lithic scatters, and historic heritage materials. Many of the sites identified reflected multiple occupations stemming from the Late Prehistoric Period to the middle of the 20th century. Historically, the area was used during summer months for root gathering and hunting. From these data, it appears that Native land-use patterns have been consistent, although varying in intensity, over time in the area. The large number of roasting pits points to the importance of plant foods in the area. Ethnographic information indicated that plant processing required anywhere from several hours to several days. The proximity of wood and water, and whether there was level ground, a view, and shelter were identified as important factors in the location of plant processing sites. Roasting pits were usually associated with temporary or more permanent habitation sites, since many of these factors are similar to those important in habitation site location. Ethnographic information is consistent with archaeological findings. In the Lingfield Lake-Echo Lake area, the majority of cultural depressions observed were located on flat ground at mid-slope or along the top of ridges at elevations between 1763-1915 m ASL. Evidence of root gathering exists in these areas, though it is not always in abundance.

In the Choelquoit Lake-Fishtrap Lake region, survey by Alexander et al. (1985) identified 15 new archaeological sites. These new sites included lithic scatters, a quarry site, roasting and cache pits, and a large fishing weir. Sites within this represent winter occupations. Roasting pit features are far less frequent in and around Fishtrap Lake relative to the Choelquoit Lake area, perhaps due to the abundance of plant resources in the Choelquoit Lake area.

Probabilistic survey work conducted by Alexander and Matson (1987) in the Potato Mountain Range resulted in the identification of sites in the parkland. Site types included cache pits and small roasting pits. Results indicate that large social groups (perhaps from different winter villages) made intensive summer use of the parkland for mountain potato harvesting. During the following season, Alexander and Matson (1987) continued with probabilistic survey work in alpine and subalpine environments. Large lithic scatter sites were recorded in the Potato Mountain area and around Choelquoit Lake. In the Potato Mountain area, 203 quadrats measuring 400 m by 400 m were assessed. Of the 203 quadrats, 18 were sampled and a total of 36 archaeological sites were recorded (35 from parkland and 1 from alpine areas). No subsurface testing was conducted.

In the Taseko Lakes region, Magne (1984) conducted a survey of 27.5 square km using 500 m by 500 m quadrats in the Gunn and Yohetta Valleys. A total of 16 sites were identified in 11 different quadrats. All quadrats examined were located close to water sources. No subsurface testing was done. Site types encountered included habitation-related cultural depressions, lithic scatters, cache pits, roasting pits, CMTs, and historic items. Most of the sites encountered were small, with the exception of one large village site of over 100 cultural depressions. In an analysis of the correlation between site location and environmental context, Magne (1984) identifies exposure, view, and proximity to fresh water as important variables in determining site location. In addition, environments with high Trembling Aspen and Lodgepole Pine forest and low Spruce forest content were highest in archaeological potential. From these results, Magne (1984) developed a model for settlement within the region in which winter habitation is tethered to large lakes. Subsequent work by Magne (1985a, 1985b, 1985c) in the Taseko lakes region included additional quadrat survey, excavation, and ethnoarchaeological research.

In the vicinity of Gay Lake (located southwest of Alexis Creek), an AIA involving eight cutblocks was conducted by I.R. Wilson (1994b). No heritage resources were identified during this assessment.

West of the WLFD in the Alexis Creek area, Arcas (1994d) evaluated a proposed forestry development after forestry personnel reported 5 cultural depressions. Subsequently, Arcas identified 16 archaeological sites containing a total of 37 definite cultural depressions and 32 possible depressions were identified.

Antiquus conducted an AIA for 82 proposed forestry developments west of the WLFD. The total area assessed was approximately 2463 ha (Klassen 1996). A number of heritage resources were identified through fieldwork. Blazed trails, wagon roads, a historic hunting camp, and four prehistoric archaeological sites were identified. The prehostoric sites consisted of an isolated chert flake (FcSb 1), a small subsurface lithic scatter (FbSa 3), a moderate-sized lithic scatter site (FbSa 4), and a retouched basalt scraper (FbSb 1). FaSa 3 is located approximately six km northwest of Puntzi Lake on a small flat terrace 75 m west of a large open meadow and small pond. Forest cover in the area is open lodgepole pine. Aspen is common along the border of the meadow. The site appears to represent a small hunting camp.

Yip and Choquette (1996c) conducted an archaeological impact assessment for 61 proposed cut blocks and 18 tree traps located to the north and west of the Chilcotin Military Training Reserve. During fieldwork, 11 archaeological sites and two isolated finds were recorded. Most of the identified sites were lithic scatters. However, a cultural depression, burnt bone remains, and other artifacts were also identified. Nine of the eleven sites were located within 25 m of a lake or a tributary of a lake. Sites were situated on terraces and knolls overlooking lakes or near to lake shores at elevations between 890 to 945 ASL. Two lithic scatter sites were recorded at elevations of 1295m and 1387m. Both of these sites were located on knolls with good exposure. The latter site was situated almost immediately on top of bedrock -- subsurface tests were limited to nine cm dbs. Vegetation cover for the majority of sites was sparse to extremely sparse. Understory species in the immediate area included pinegrass and soopalallie. In some cases, Lodgepole Pine and Trembling Aspen were situated on the margins of sites.

On the Chilcotin Plateau west of the Fraser River, Palmantier and Yip (1997) conducted an impact assessment for 22 proposed timber harvesting cut blocks, 19 tree trap salvages, one gravel pit and three roads. This project area included East Churn Creek, West Churn Creek, Gaspard, and Dash Creek. A total of five sites were identified, four basalt lithic scatter sites and one winter pithouse village site. Two of the lithic sites were located on terraces with a south aspect, overlooking a water source. Two sites were identified along knolls within 100 m of a water source. Maps detailing survey transects and subsurface testing are provided in the report.

Blackwater Drainage

A survey of the Fraser Basin, Fraser Plateau, Nechako Basin, and Nechako Plateau including the Blackwater, Euchiniko, Baezaeko and Nazko Rivers was conducted by Helmer and Wilson (1975). They concentrated coverage on riverbanks, creeks, and lake areas. This project was initiated on behalf of the Nazko-Kluskus Band Study Team as one component of a multi-disciplinary traditional territory assessment. For a total of 13 areas surveyed, 293 archaeological sites were recorded. High site concentrations were noted along the Euchinko, Blackwater, Baezaeko and Nazko Rivers (Helmer and Wilson 1975, Helmer 1976). The project area included an extensive prehistoric basalt quarry. Although the report describes sites in detail, it does not include specific maps or transects of areas assessed. Subsequent work in this area by Helmer resulted in the identification of an additional 185 heritage sites. Most of the sites identified in these surveys are relatively small, consisting of lithic scatters and small numbers of cultural depressions.

Wilson (1977) recorded 30 sites in the Baezaeko and Quesnel River areas in a project that developed from salvage archaeological concerns related to road construction activity. Most of the area Wilson assessed is located along the Baezaeko River, north-east of the WLFD project area. Wilson (1977) observed that the Blackwater Drainage exhibits an extremely high site density compared to other areas of Carrier territory. Large sites are located on river banks and islands, and small sites along lakes and stream and creek banks. Small sites tend to be located in areas suitable for ungulate winter ranging and migrating water fowl. Referencing available ethnographic information, Wilson (1977) note dthe similarity between archaeological and ethnographic seasonal settlement patterns, where large sites occur on rivers (corresponding to summer salmon fishing camps) and smaller spring, fall and winter sites along lakes (corresponding to hunting and fishing camps).

In the Kluskus Lakes area, Blacklaws (1978) directed an intensive survey project along valley bottoms, river banks and lake shores. This was coupled with some probabilistic survey of lake shores. Several linear study areas were inventoried and about 150 sites were recorded. A large number of sites with surface features were recorded during this project. These results led Blacklaws to argue that simple random survey can be used effectively for site prediction,

In 1979, Montgomery (1979), using both judgmental and probabilistic survey, examined valleys and higher plateau areas in the vicinity of Quesnel near the Fraser River. Survey concentrated along lake shores, river shores, and terraces. To broaden the recovered information, residents and landowners living in surveyed areas were interviewed, and archaeological crews were directed to known sites in the area. A total of 30 archaeological sites, all low density lithic scatters, were identified. Seven sites were found through 500 x 500 m quadrat-based surveys, 15 using the judgmental approach, and a further eight on the basis of informant information. The total area sampled was 605.5 km over 19 quadrats. Two sites were tested (FeRo 1 and FeRo 4) with trowel excavation. These two sites were produced through transitory settlement in the area. An archaeological potential model for the region was developed using six site location characteristics as predictor variables. A potential map was prepared based on descriptions of climate, geomorphology, vegetation, fauna, and culture history.

In 1980, Eldridge and Eldridge (1980) conducted a probabilistic survey of the Dean River Valley as part of an evaluation of heritage resources in the area. The project was an initial attempt to build a regional data base. Judgemental and statistically-based survey resulted in the identification of 17 sites. Thirty-six quadrats measuring 500 m by 500 m were surveyed, and subsurface testing was done. Sites were located near lakes and rivers in elevated areas, with views of waterbodies and surrounding terrain. Most sites were low density lithic scatters. One large housepit site (with over 100 cultural depressions) was identified.

IMPLICATION FOR THE POTENTIAL MODEL:

Though outside the present study area, the projects described above provide a series of relationships useful incorporating into predictive modelling. These relationships include:

- Sites may be associated with extinct river terraces (Franck et al. 1993).
- Lithic scatters have been found near small clearings overlooking drainages (Eldridge & Eldridge 1980, Arcas 199413).
- Alpine zone site types include stone hunting blinds and cairns (Alexander 1987a); subalpine areas contain lithic scatters, roasting pits, and cache pits (Alexander 1987a).
- Dry, flat land in the parkland has a high potential to contain archaeological sites (Alexander 1987a).

- Exposure, aspect and view, and proximity to fresh water are important variables affecting site location (Magne 1984).
- Winter villages are often located near large lakes (Magne 1984).
- Lithic scatters are often found near ponds and meadows (Klassen 1996), and on knolls (Pahuatier and Yip 1997).
- In Tsilhqot'in territory, there is an association between large sites and river bank locations.

Summary of Past Archaeology in the Project Area

Archaeological research within the study area has been conducted since the 1960s. Most of these projects have been AIA studies in response to particular development concerns. Many heritage projects lack detailed maps regarding survey coverage and subsurface testing. Mapping or the inclusion of maps in survey reports was not emphasized in archaeological reports until the late 1980s. This has serious implications in the development of appropriate potential models, particularly in the case of evaluations of areas without sites. It is difficult to confidently assess the reliability of survey coverage when survey notes and maps identifying specific transects covered and locations of subsurface tests are missing.

Bussey and Alexander (1992) have observed that many of the archaeological projects conducted to date in the Interior are limited with regard to insight into the cultural heritage of this region. They note that most survey work was done on a very large scale, and coverage was neither systematic nor intensive. As one example, Bussey and May (1974) assessed 4900 km during one field season in response to the demands of highway developments. Arcas (1994a:23) notes that:

> . . .though these studies have resulted in the identification of numerous archaeological sites, the distribution, frequency and types of sites found are not likely representative of archaeological resources in the study area as a whole.

Survey work to date has been largely restricted to areas in which development has occurred. Research has been patchy throughout the region, and cannot be considered representative of the varied ecological or geological zones within the region. Additionally, as Bussey and Alexander (1992) observe, in the past, most surveys have tended to focus on areas which reflect moderate to high potential. They recommend that future work include assessments of montane, marsh, and meadow areas that are at present poorly represented areas in archaeological projects.

Table 1 . Summary of probabilistic and systematic surveys conducted prior to 1993 (Eldridge and Mackie 1993).

Project	*Author*	*Date*	*Area Type*	*Type of Survey*	*Sub-surface*	*Length*	*Width*	*Total Quad*	*Total Km2*	*Sample of Quad*	*% Sample*	*# of Sites*	*Sites/km*	*Sites/km²*
Chilcotin Project	Keddie	1972	Riverbank/ Valley	Intensive/ Systematic	None	34000	N/A		14.80			117	3.44	7.91
Fraser W. Bank			Riverbank/ Valley	Intensive/ Systematic	None	6000	2000		12.00			93	15.50	7.75
Chilcotin canyon			Riverbank	Intensive/ Systematic	None	2000	100		0.20			6	3	30.00
Farwell Creek			Riverbank	Intensive/ Systematic	None	26000	100		2.60			18	0.69	6.92
Chilcotin Mouth	Ham and Matson	1974	River Valley	Probabilistic/ Quadrat	None	400	400	181	28.96	20	11.05%	41		9.10
Grasslands			Grass/ Valley	Probabilistic/ Quadrat	None	400	400	78	12.48	13	16.67%	39		5.82
Forest			Forest Valley	Probabilistic/ Quadrat	None	400	400	103	16.48	7	6.80 %	2		8.60
Fraser Plateau	Eldridge	1976	High Plateau	Probabilistic/ Quadrat	None	500	500	400	100.00	20	5.00%	7		1.40
Nazko	Blacklaws	1978		Probabilistic/ Quadrat					1.76		20%	13	36.88	65
Kluskus Middle				Probabilistic/ Quadrat	None	200	200	30	1.20	6	20%	8		33.33
Kluskus East				Probabilistic/ Quadrat	None	150	150	25	0.56	5	20%	5		44.44
Quesnel	Montgomery	1979	Plateau	Probabilistic/ Quadrat	Trowel	500	500	2422	605.50	19	0.78%	7		0.39
Eagle Lake	Matson *et al.*	1979	Plateau	Probabilistic/ Quadrat	None	400	400	471	75.36	35	7.43 %	46		8.21
Eagle Lake	Matson *et al.*	1980	Plateau	Probabilistic/ Quadrat	None	400	400	471	75.36	43	9.13 %	57		9.11
Dean River	Eldridge and Eldridge	1980	High Valley	Probabilistic/ Quadrat	Shovel	500	500	2968	742.00	36	1.21%	34		1.26
	Eldridge and Eldridge	1980	River/Lake Shore	Probabilistic/ Quadrat	Shovel	500	500	380	95.00	20	5.26 %	32		6.40
	Eldridge and Eldridge	1980	Away from Water	Probabilistic/ Quadrat	Shovel	500	500	2588	647.00	16	0.62 %	2		0.50
Taseko Lakes	Magne	1984	High Valley	Probabilistic/ Quadrat	None	500	500	110	27.50	11	10.00 %	16		5.82
Potato Mountain	Alexander	1985	Montane	Probabilistic/ Quadrat	None	400	400	203	32.48	18	8.87 %	36		8.6
			Alpine		None	400	400	135	21.60	9	6.67 %	1		0.69
			Parkland		None	400	400	68	10.88	9	13.24 %	35		24.31

Predictive Modelling

The development and application of a predictive model for the WLFD is presented below. This model reflects the characteristics/objectives highlighted at the end of the Methodology section. Presentation of the model is followed by discussion of 'in-field' testing of the model through survey conducted in the study area. The model is described in basic, conceptual terms. Detailed quantitative and statistical information relevant to the model is provided for those who are interested.

Data Collection and Definition of Variables

As discussed in the methodology section, we required three types of data to develop the model appropriately. These include (1) a set of known archaeological site locations, (2) a set of known locations without sites, and (3) a set of locations representative of the study area as a whole. For the purposes of the model, the three types of points for which information was gathered respectively include (1) site locations, (2) a 100 meter grid of points covering all surveyed areas which were further than 200 meters from any known archaeological site, and 3) a one kilometre grid of points covering the entire study area including both surveyed and unsurveyed sections. Information about these three types of locations was gathered in GIS format. Model development and testing were carried out primarily using a standard database program and the three datasets.

The primary comparisons to be made in the model are between locations with sites and locations without sites. These comparisons will tell us what environmental and other characteristics are typical of site locations and which ones are typical of non-site locations (and whether these are different). The differences between them form the basis for developing the predictive model. The model was built to maximize the number of known sites assigned by the model to high potential areas, and at the same time minimize the number of known non-site locations in any high potential area.

To make the model work we need to describe the characteristics of each location (site, non-site, or grid) with a number of variables. For every point, variables were created to describe its ecology, surficial geology, proximity to water sources, proximity to fishing sources, proximity to known human activity, forest cover, deer capability, and topography. These characteristics/variables were agreed upon jointly by the three archaeology firms involved in the Williams Lake AOA -- Arcas Consulting Archaeologists Ltd., I.R. Wilson Consultants Ltd., and Millennia Research Ltd.

VARIABLES

Ecology: The following variables were used to describe the ecology in which the site or point was situated. These ecological variables (Table 2) reflect the environmental zones described previously. The model building process considered both individual biogeoclimatic (BGC) zones, but also distance to the boundary if a biogeoclimatic zone ('ecotone'). This variable was used to determine whether sites are located near BGC boundaries to maximize ecological diversity. Archaeological correlates for the various zones listed are described in the section on Archaeological Land-Use Correlates.

Table 2. Variables Describing Ecology

variable	description	unit of measure
eco	ecosection in which the point is located	
zone	biogeoclimatic zone in which the point is located	
subzone	bioneoclimatic subzone in which the point is located	
ecotone	nearness to bioneoclimatic zone boundary	meters

Paleo-landforms: Glacial deposits known as eskers often contain types of stone used by First Nations groups to make stone tools. Thus, lithic quarrying sites can often be associated with these paleo-landforms (Table 3). Eskers were often used for lookout, travel routes, and 'mosquito-season' camps.

Table 3. Variables Describing Paleo-landforms

variable	description	unit of measure
meltlarge	nearness to meltwater areas	meters
meltsmall	nearness to meltwater lines	meters
esker	nearness to eskers	meters

Water sources: Water sources are resources necessary to sustain human life. The following variables were used to determine the proximity of sites or points to water sources (Table 4).

Table 4. Variables Describing Proximity to Water Sources

variable	description	unit of measure
lakevs	nearness to size class 1 lakes (< 5ha)	meters
lakesmall	nearness to size class 2 lakes (5ha - 100ha)	meters
lakemed	nearness to size class 3 lakes (100ha - 1000ha)	meters
rapids	neamesstorapids	meters
wetsmall	nearness to size class 1 wetlands (< 5ha)	meters
wetlarge	nearness to size class 2 wetlands (> 5ha)	meters
streamall	nearness to any stream	meters

Fish Resources: The following variables were used to determine the proximity of sites and points to fish resources (Table 5). Fisheries data was not available to identify rivers and streams that contained fish, so the nature of the river or stream -- its order in the watershed and its magnitude of water flow -- were used as measures of the likelihood that fish were present. Large (double line) streams, such as the Fraser and the Chilcotin, are known to contain salmon, Salmon and other fish species were very important aboriginal resources. The effect of slope and other fish concerns are discussed further in the Data Gaps section.

Table 5. Variables Describing Proximity to Fishing Resources

variable	Description	unit of measure
streamsalm	nearness to double line streams of greater than order 3 or order 3 with a magnitude of 25 or greater	meters
streamfish	nearness to single line streams of greater than order 3 or order 3 with a mawnitude of 25 or greater	meters

Other Site Locations: The following variables (Table 6) were used to compare the location of sites and points to other sites, and their proximity to trails. Archaeological sites are often clustered on the landscape, with sites being found quite close together or in groups.

Table 6. Variables Describing Proximity to Known Human Activity

variable	description	unit of measure
trails	nearness to identified trails	meters
sites	nearness to identified sites	meters

Forest Cover: The following variables (Table 7) were used to determine the nature of the forest cover in which the site or point is located. Whitebark pine was used primarily for its seeds and the animals the seeds attract. Its presence is indicative of high productivity subalpine areas immediately beneath the tree line. These areas were important for both hunting and gathering activities. Whitebark pine cambium was an important food in the Williams Lake area. Open range was considered to be important on the basis of ethnographic interviews with the Tletliniqox (Stone) Tsilhqot'in (see ethnographic section) and previous archaeological surveys.

Table 7. Variables Describing Forest Cover

variable	description	unit of measure
pa_nr	nearness to whitebark pine forest coverage	meters
pa-id	identities whether point is within whitebark pine forest coverage	yes/no
pa-crowncl	crown closure of whitebark pine in forest coverage	percent
pl_id	identifies whether point is within lodgepole pine forest coverage	yes/no
plgercent	proportion of lodgepole pine in forest coverage	percent
pl_ageclas	ageclass of lodgepole pine in forest coverage	
pl_age	age of lodgepole pine in forest coverage	years
pl_hghtcl	heightclass of lodgepole pine in forest coverage	
pl_height	height of lodgepole pine in forest coverage	meters
pl_crowncl	crown closure of lodgepole pine in forest coverage	percent
openrng_nr	nearness to openrange forest coverage	meters
openrng_id	identifies whether point is within openrange forest coverage	

Deer Capability: The following variable (Table 8) was used to identify how suited a site or point was for supporting deer. Deer were an important terrestrial resource hunted traditionally.

Table 8. Variable Describing Deer Capability

variable	description	unit of measure
deer	mule deer capability measure	

Topography: The slope, aspect, and elevation of all sites and points were recorded (Table 9). Sites are, according to traditional archaeological wisdom, usually located on flat ground. The aspect, or the direction of the slope, can be important for vegetation patterns and sun exposure. A southern exposure might be preferred in the cold, winter months, while a northern-facing aspect might be favoured during the hottest summer months

Table 9. Variables Describing Topography

variable	description	unit of measure
slope	slope	percent
aspect	aspect	degrees
elevation	elevation	meters

UNIQUE VARIABLES

In addition to the variables presented above, certain variables were created which were unique either to sites (Tables 10 and 1 1), surveyed non-site points (Table 12), or the 1 km grid (Table 13). These are described below,

Table 10. Additional Variables for Sites

variable	description	unit of measure
zbn	uniaue Borden number	
ztyitxt	description of site from CHIN database	
zmr	map number on which site is located	
lithic	whether or not site contains lithic artifacts *	
quarry	whether or not site contains/is a quarry	
housepit	whether or not site contains/is a housepit	
cave	whether or not site contains/is a cave site	
habitat	whether or not site contains/is a habitation other than those above	
subsist	whether or not site contains/is an unspecified subsistence depressions	
cache	whether or not site contains/is a cache pit	
roast	whether or not site contains/is a roasting pit	
hunt	whether or not site contains/is the remains of hunting activity	
fish	whether or not site contains/is a fishing feature	
subsothr	whether or not site contains/is a subsistence feature other than those above	
trail	whether or not site contains/is a trail	
burial	whether or not site contains human remains	
rockart	whether or not site contains/is a pictograph or petroglyph	
cmt	whether or not site contains/is a culturally modified tree	
historic	whether or not site contains/is a historic feature	
other	whether or not site contains/is a feature that is not captured in the above categories	
zrem	remarks from site inventory form	
lu5	length of site	meters
lu6	width of site	meters
zpn	permit number	
lu9	feature details (from site inventory form)	
zer	errors (from site inventor-v form)	
par	Paris number	

A typology that could be used for sites was developed in conjunction with Arcas Consulting Archaeologists Ltd. and I.R. Wilson Consulting Ltd. Feature components of sites were extracted from the CHIN (Canadian Heritage Inventory Network) 'ZTYI' field and from data from original paper B.C. Site Inventory Forms. The ztyi field is based upon the Archaeology Branch Typology as outlined in the Site Inventory Guide. Original ZTYI and Archaeology Branch typology were also maintained in a text field. The following table provides field names, and the corresponding Archaeology Branch typology.

Table 11. Site Typology

Field Name	Corresponding Archaeology Branch typology
lithic	cultural material, surface [or subsurface], lithics [or bone or fcr if other site type not identified]. Include cultural material, surface, isolated, lithic
quarry	cultural material, surface [or subsurface], lithics, quarry
housepit	habitation, depression, circular [rectangular], or cultural depression [over 4m diameter unless a different site feature type is specified or inferred, such as large root roasting pits]
cave	habitation, rockshelter [cave]
habitat	habitation, other [not to include historic features such as cabins]
subsist	subsistence depressions where function not specified [such as all cultural depressions less than 4m diameter only recorded as 'cultural depression']
cache	subsistence feature, depression, cache; or historic, subsistence feature, cache
roast	subsistence feature, depression, roasting pit [cooking pit, etc.]
hunt	subsistence feature, land mammal [or depression] [pitfall or deadfall or blind or drive lane or deer/caribou fence or corral, etc.]. Also Petroform, rock alignment [or cairn] related to hunting; and Historic, subsistence feature [aboriginal hunting related]
fish	subsistence feature, fish, [trap or weir or drying rack or smokehouse or fishing station, etc.]
subsothr	other subsistence features, including trapping [not including large animal hunting pitfall or deadfall traps, which are covered under 'hunting']
trail	Trail [or Earthwork, trail].
burial	Human Remains [burial, or cairn, talus, etc.]. Also aboriginal burial places in 'Historic, Human Remains'.
rockart	Pictograph; Petroglyph
cmt	Cultural Material, surface, culturally modified tree [also modified tree, without 'culturally']; also try Subsistence Feature, culturally modified tree; and zfe features field from CHIN
historic	anything with 'historic' as string header, without any other prehistoric site types or other exceptions noted above. Not included: sites with both prehistoric and historic components so as to avoid difficulties excluding historic only-sites
other	anything not covered by any of the above categories. Might include such things as Traditional Use Sites without associated archaeological remains but already assigned Borden Numbers and in the Archaeological Inventory. Also flag are pre-1846 Historic sites (e.g., early HBC posts) under this field.

For the surveyed points (points without sites), the following information was collected so that each surveyed area could be accurately identified. In addition to the permit number, surveyor, and type of survey conducted, a unique identification was given to each point. Only intensive surveys were used in the model development.

Table 12. Additional Variables for Surveyed Points

variable	description
grid id	unique id. for each point in surveved area
surveytype	type of survey (intensive or reconnaissance)
surveyor	name of surveyor
permit	permit number

For the 1 km grid, a unique identification was given to each point in addition to the geographic data discussed earlier.

Table 13. Additional Variables for lkm Grid

variable	description
km-grid-id	unique id. for each point in 1km grid

The geographic data were calculated by Timberline Forest Inventory Consultants Ltd. using ARC/INFO and the following digital data:

- TRIM (at 1:20 000) was used for lakes, streams, wetland boundaries, slope, aspect, elevation, eskers, and rapids.
- Watershed atlas (at 1:50 000) data was used to calculate the order and magnitude of double and single line streams,
- Forest Cover maps (at 1:20 000) were from the Ministry of Forest data.
- Biogeoclimatic zones came from the B.C. Environment FTP site.
- Deer Capability information was provided by Mike Howard, MoF, Cariboo Region.

The data were stored using FoxPro in three database tiles (.dbf format): (1) sitelist, 2) survlist and 3) kmgdlist. With the amount of information collected, some limits had to be placed on calculations of nearness (nearness functions) to avoid excessive computing time. For all of the variables, nearness of sites or points to features of the natural and cultural environment was limited to 2000 meters. Exceptions include nearness to trails, sites, and single and double line (large) streams, These variables were not limited. Nearness to 'ecotone' was limited to 5000 meters. When the nearness of a point or site exceeded the set limit (e.g., over 2000 meters for most variables), the information was treated as missing. The data included in the statistical tests described below therefore were limited to those cases that fell within the limits of the nearness functions.

Modelling Methodology

Once the data were acquired and arranged into tables, the preliminary model could be developed. The first step of model development was to determine which variables were important in predicting the locations of sites. Variables were compared to each other to look for strong correlations in the data. A strong positive correlation between two variables would suggest that the variables were measuring similar things. If so, the use of both in the model would be redundant. Pearson's r statistic was used to measure the strength of relationship between the variables. A correlation matrix of the continuous variables was constructed for sites, survey points, and 1 km grid points. Overall, there appeared to be no strong positive correlations between the variables. Where two variables appeared to correlate, these variables often included only few cases (a product of the limits set on the variables).

This process was designed as an initial screening process to identify variables that were providing no new information. These could be eliminated from the model, simplifying its operation. The outcome of this procedure did not cause us to remove any of the variables from consideration -- at this point they all remain relevant,

The second step in the analysis was to compare the site locations to the non-site locations on a variable by variable basis. This procedure determines whether features in the environment that are thought to affect where sites occur are in fact closer to known site locations than to locations without sites. For example, if small lakes are thought be good predictors of site locations, then we would expect that, overall, sites would be closer to small lakes than would locations without sites. Whether this is the case was investigated for the entire data set and for each biogeoclimatic zone separately. The statistical evaluation of this idea involved using two sample t-tests, which were calculated to see if there were significant differences between the means (averages) of the variables. For each test, rather than simply testing whether or not the means were different, the alternative hypothesis that the mean of the variable for sites was less than the mean of the variable for surveyed points was used ($\mu X_{site} = \mu X_{surv}$ vs. $\mu X_{site} < \mu X_{surv}$ where X is the variable in question). Based on this, a table was created which showed whether the variables were significant overall and by zone (probability < 0.05).

Table 14 summarizes the relevant results. An answer of 'yes' means that sites are closer to the feature in question than are non-site locations. An answer of 'no' means that site locations were not closer to these features than non-site locations. In this latter case, the variable is not a good predictor of where sites occur, but may be a good predictor of where sites are not located. This allows us to determine which of the variables affected where archaeological sites were located. These variables can be used at further stages in the predictive model.

Table 14. Significance of Continuous Variables (sites vs. non-sites).

Variable	Overall	BG Zone	ESSF Zone	IDF Zone	MS Zone	SBPS Zone
ecotone	No	No	No	Yes	No	No
esker	No	†		No	No	
lakevs	Yes	No	No	Yes		No
lakesmall	Yes			Yes		Yes
lakemed	Yes			Yes		Yes
meltlarge	No	No		No		
meltsmall	Yes			Yes	No	No
rapids	No	No		No		
wetsmall	No*		No	Yes	Yes	Yes
wetlarge	Yes		No	Yes	No	Yes
pa_nr	Yes		Yes		No	
plgercent	No		Yes*	No	No	No
pl_crowncl	Yes		Yes	No	No	No
openrng_nr	Yes	Yes		Yes	No	No
streamsalm	Yes	Yes	No	No	No	No
streamfish	Yes	Yes	No	Yes	No	Yes
streamall	Yes	Yes	Yes	Yes	Yes	Yes
slope	No*	No*	No*	No*	No*	No*

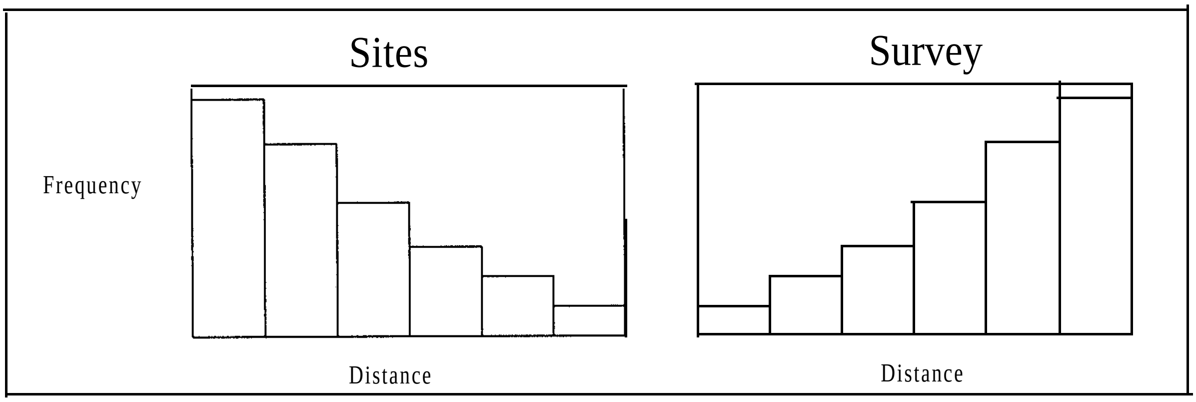
* Indicates that the opposite relationship to that which was expected was true. Sites were further from wetlands 1 than the surveyed points and slopes were on average significantly greater for sites than surveyed points.

†Missing cells indicate that, owing to the limits placed on the variables, the variable was not available for that zone. The variables in MS zone were largely not significant due to the small sample size, thus significance was assessed by examining the histograms of the assemblages.

After determining the features that sites are closer to, we can look at the distance of sites from these features. Histograms were created to visually compare non-site locations and sites for each variable (over all cases and by zone). The histograms show the distributions of the values for the variables. The ideal situation for site locations (left) and non-site (or surveyed locations, on the right) is presented in Figure 1.

The feature in question is assumed to be at the far left and the height of the bar represents the relative number of sites within a certain distance of that feature (distance away increases from left to right). The ideal situation with good predictor variables is that most sites will occur quite close to the feature, and as we move away from it the number of sites becomes less and less. In other words, a strong left skew was sought, signifying a strong tendency for the sites to be near the geographic feature. The opposite is ideal for non-sites – if sites generally occur close to a feature, then most non-site areas should exist some distance away from the feature.

Figure 1. Ideal Distribution of a Significant Variable



The real distributions for each variable should approximate the ideal ones for that variable to be a good predictor of site locations. Based upon an examination of the histograms produced (which are not included here for reasons of space) and the significance of ethnographic correlates outlined earlier, certain variables were considered to be highly predictive of site locations, either overall or by zone. These variables were given greater weight in the development of the model. The highly predictive variables included:

Table 15. Highly Predictive Variables

Variable
lakesmall
lakemed
wetlarge
pa_nr
streamsalm
streamfish

Other variables were also given greater importance in each biogeoclimatic zone. If a variable was not present for a particular zone in the surveyed area (i.e., all data points were greater than the set limit) but significant overall, it was given weight as if it were significant. Such points often occur, but have not yet been present in our survey. Variables without predictive value were dropped from the model at this point, and those with marginal predictive value were incorporated at a later stage of the model development.

Development of the Model

Having gone through the process of identifying variables important in the location of archaeological sites, it is now necessary to develop a system of rating locations for archaeological potential. The archaeological potential of a location should reflect the number of good predictors that it is near. Consequently, the potential for the occurrence of archaeological sites was evaluated using an additive model.

No model can accurately predict the probable location of all sites, nor can it reflect all possible uses of the landscape by past human populations. A place may have significance for living peoples or for peoples in the past that is not recorded in the archaeological record. For these reasons, all locations in this portion of the study are considered to have archaeological potential. Sites can occur and have been found in areas of low potential. The areas with the lowest values in the additive model (low potential) are considered to have the greatest constraints on archaeological potential. The areas with the highest values (highest potential) in the additive model are considered to have the least constraints on potential. Low potential does not necessarily imply that there is an absence of sites, but that there are factors present which are not conducive to *either* site formation or past human occupation.

A possible complication for modelling is that sites in unusual or marginal locations (according to the predictive model, in areas of low potential) may be of the greatest cultural and scientific significance. These uncommon sites may be important as markers of shifts in land-use patterns that are related to either chronological or environmental factors, or they may indicate a cultural preference for secluded locations (e.g., ritual isolation). They can also represent extraordinary circumstances or (of most concern to modellers and managers) an entire class of archaeological data which is presently unrecognized. These factors were taken into consideration in determining buffer sizes and analysing the model's accuracy.

With these considerations in mind, we have developed a rating system to produce a number ('additive value') reflecting the potential of a site or non-site location. How this number is arrived at is explained fully in subsequent sections describing the application of the model. The resulting values relate to potential as shown in Table 16.

Table 16. Potential Ratings

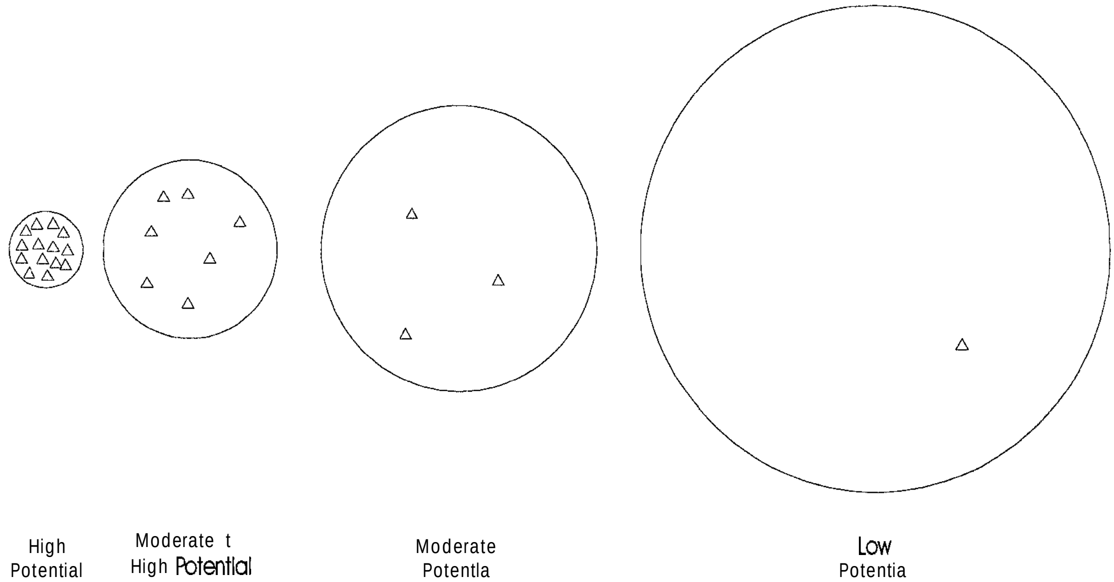
Potential	"Constraints on Potential"	Additive Value
Low	Greatest	1
Moderate	Moderate	**2**
Moderate to High	Low to Moderate	**3**
Highest	Least	4+

In applying the concept of 'potential', a buffering-type model involving 'near to' functions was used. In a buffering model, geographical or other features are buffered. Buffers are simply areas of a set size around a significant feature. Areas within these buffers are considered to have greater potential for the occurrence of archaeological sites than areas outside these buffers.

Different runs of the model involve using different buffer sizes in order to produce landscapes that designate areas of different archaeological potential. This process is guided by an overall ideal of what an appropriate 'potential landscape' should look like. Two factors played into the generation of what we consider to be an appropriate potential landscape. First
3 and foremost was the protection of archaeological sites. Second was the use of the area for forestry and other development. In other words, the model attempts to balance the interests of further development with cultural heritage protection. A model could be 100% accurate by predicting all lands as having high potential.

The ideal model is one in which the size of the buffers around various environmental features are set so that most of the known sites fall within areas of highest or moderate to high potential (least constraints on potential). The majority of the locations without sites should fall within the categories of low potential (greatest constraints on potential). In addition, the ideal model would maximize the total area (lkm grid points) in the category of low potential while at the same time maximizing the density of sites in high potential zones. There should thus be an inverse relationship between the sites and non-site surveyed areas in terms of their archaeological potential. This ideal model is expressed in the diagram below.

Figure 2. Diagram of Ideal Model



In the diagram, each circle represents the area covered by each category of potential. The smallest area (high potential circle) contains the greatest number and density of sites (triangles), while the largest (low potential circle) contains the fewest number and lowest density of sites. Similarly, low potential areas should contain the most non-sites. The relative sizes of the areas of potential may differ from the ideal model. However, the density of archaeological sites across those areas should remain ideal.

In any run of the model, the outcome may differ from the ideal. For example, the (unlikely) possibility exists that in the best possible model for an area (that is, the one that puts the majority of sites in the highest potential zones), the area with the highest potential also turns out to be the largest area. This would not be ideal from a development perspective, however, it would satisfy the requirements of heritage protection -- which, again, is our ultimate responsibility. However, we feel that a model that places the most sites in an area of high potential AND has the lowest potential zone as the largest area is optimal, since it (1) minimizes the area for which intensive survey will be required (and thus management costs), and, at the same time, (2) satisfies heritage concerns. We consider this the best possible model.

The size of the buffers used in the model were selected using *an iterative* process. Initial buffer sizes were chosen based on the frequency histograms for each significant variable (discussed earlier). For each "iteration" (or run) of the model, the buffer sizes were changed one at a time by a relatively small amount (usually 50 meters) and the model was again run on the data. The accuracy of the model was calculated each time and the buffers were again modified. This process was repeated until several of the previously mentioned modelling criteria were met and the model resembled the basic pattern underlying the ideal model (see Figure 2).

Two versions of the model are presented below -- a preliminary and a final model. In both cases a potential landscape is produced, and then our three sets of locations -- sites, non-sites, and lkm grid points -- are subsequently assigned potential in order to test the accuracy of the model. A preliminary and final model are both presented in order to show some of the evolution of our thinking and results. Hopefully, this will provide insights into the decisions we confronted, the choices we made, and the affect these had on the final model.

APPLICATION OF THE PRELIMINARY MODEL

For the preliminary model, only biogeoclimatic zone, forest cover data, slope, and data derived from TRIM (water features, eskers, etc.) were used. The preliminary model presented below was generated several times using different buffer sizes within FoxPro (see program instructions below). After the model was run, a table which assessed its overall accuracy was generated (see below for preliminary model accuracy table).

Three stages of generating potential values were involved in the preliminary model -- (1) buffers which reflected the variables which were significant overall, (2) buffers which reflected the importance of highly significant variables or those drawn from ethnographic information, and (3) buffers which emphasized the importance of the bunchgrass zone (other zonal information was included in the first two stages). These are described below.

First Stage

The first stage in the application of the model was to create buffers around each variable that was a good predictor of the occurrence of archaeological sites (Table 13). Areas within any of these buffers at this stage were given a value of 2, indicating at least moderate potential. If outside of this buffer, they were given a value of 1, indicating a lower potential. If an area fell within more than one buffer, it was given a maximum value of two. The buffers were defined as follows:

150 meters around:

- all lakesvs, all lakesmall, all lakemed in all zones
- all meltsmall in all zones
- all wetlarge in all zones
- all streamsalm in all zones
- all streamfish in all zones
- wetsmall in MS zone only
- streamall in MS zone only
- openrange (including within openrange) for all zones except BG

200 meters around.

- whitebark pine in all zones

100 meters around:

- streamall for all zones except MS

(areas within lakes, wetlands and streams were not included in the buffering)

Second Stage

In the second stage of the preliminary model, the potential value of an area was increased by one point for those areas which met the following conditions. The addition of values at this stage was not limited; one point was added for every condition that was met.

everything within 150m of lakesmall in all zones
everything within 150m of lakemed in all zones
everything within 200m of whitebark pine in all zones
everything within 150m of wetlarge in BG, MS and SBPS zones only
everything within 150m of streamsalm in all zones except ESSF
everything within 150m of streamfish in all zones except ESSF
everything within 100 meters of streamall in ESSF only
everything within 'ESSF' which meets all of the following conditions:

Lodgepote pine ageclass = 8

Lodgepole pine percentage > 40
Lodgepole crown closure < 65
Lodgepole pine heightclass > 2
and is already in a buffer.

Final Stage

The final stage of the preliminary model gave an extra point for all areas within the bunchgrass zone. This was done since the bunchgrass zone as a whole contained the majority of the sites in our portion of the study area, and is known to have been used heavily aboriginally, yet, did not have many significant variables in it as a group. Thus, the whole of the bunchgrass zone was given at least moderate potential.

This three stage process thus created different areas of potential based on the significance of variables known to be good predictors of the occurrence of archaeological sites. Maps of the resulting areas of different potential were produced by Timberline Forest Inventory Consultants Ltd. on the following map sheets:

Table 17. Map Sheets Produced for Preliminary Model

92B035	at 1:20 000	920027	at 1:20 000
92B045	at 1:20 000	920079	at 1:20 000
920004	at 1:20 000	920087	at 1:20 000
920014	at 1:20 000	920088	at 1:20 000
920016	at 1:20 000	920109	at 1:50 000

Applying the Model to the Data Points

Potential values were assigned to the three categories of data points (site locations, non-site locations, and lkm grid) with the FoxPro commands listed below. These resulting values were used to assess the model and to locate any gaps or errors in it, and to generate the tables presented below.

1) repl all potential with 1
2) repl potential with (potential +1) for (lakevs < 150 and lakevs <> 0) or (lakesmall <150 and lakesmall <> 0) or (lakemed <150 and lakemed <>0) or (meltsmall <150 and meltsmall 00) or (wetlarge <150 and wetlarge <> 0) or (pa_nr <200 and pa-m <> 0) or (streamsalm <150 and streamsahn 00) or (streamfish < 150 and streamfish 00) or (zone <> 'BG' and openrng_nr <150 and openrng_nr 00) or (streamall < 100 and streamall 00) or (zone = 'MS and ((wtl-nr <150 and wt1_nr <>0) or (streamall < 150 and streamall <>0))) or (zone <> 'BG' and openrng_id = 'OR')
3) repl potential with (potential + 1) for (lakesmall < 150 and lakesmall <> 0)
4) repl potential with (potential + 1) for (lakemed < 150 and lakemed <> 0)
5) repl potential with (potential + 1) for (pa_nr < 200 and pa_nr <> 0)
6) repl potential with (potential + 1) for (zone = 'BG' or zone = 'MS' or zone = 'SBPS') and (wetlarge < 150 and wetlarge <> 0)
7) repl potential with (potential + 1) for (zone = 'BG' or zone = 'MS' or zone = 'SBPS' or zone = 'IDF') and (streamsalm < 150 and streamsalm <> 0)
8) repl potential with (potential + 1) for (zone = 'BG' or zone = 'MS' or zone = 'SBPS' or zone = 'IDF') and (streamfish < 150 and streamfish 00)
9) repl potential with (potential + 1) for zone = 'ESSF' and (streamall <100 and streamall 00)
10) repl potential with (potential + 1) for zone = 'ESSF' and (pl_ageclas = 8 and plqercent > 40 and pl_crowncl < 65 and pl_hghtcl >2) and potential > 0
11) repl potential with (potential + 1) for zone = 'BG'

[Note: zeros indicate that the value is greater than the set limit.]

Assessment of the Preliminary Model

The following tables assess the accuracy of the model. Accuracy is assessed by checking how close the assignment of site, non-site, and 1 km grid locations to areas of potential is to our pattern of our ideal model (Figure 2). The model is evaluated overall, by zone, and by site type. The potential, the number of sites, and the proportion of sites are presented. According to the ideal model presented above, the proportion of sites should progressively increase as the potential rating goes from 1 to 4+, whereas both the surveyed (non-site points) and the lkm grid points should progressively decrease.

Table 18. Assessment of the Preliminary Model

Overall	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	22	8.21%	3394	55.96%	5016	77.05%
2	80	29.85%	1619	26.69%	1101	16.91%
3	100	37.3 1%	914	15.07%	337	5.18%
4+	66	24.63%	138	2.28%	56	0.86%
total	268		6065		6510	

BG	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	**0**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**
2	32	26.23%	113	45.38%	98	41.70%
3	44	36.07%	110	44.18%	95	40.43%
4+	46	37.70%	26	10.44%	42	17.87%
total	122		249		235	

IDF	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	**12**	12.24%	1229	60.72%	2130	80.68%
2	41	41.84%	706	34.88%	416	15.76%
3	40	40.82%	84	4.15%	94	3.56%
4+	5	5.10%	5	0.25%	0	0.00%
total	**98**		2024		2640	

SBPS	Sitelist		Kmedlist		Survlist	
potential	n	%	n	%	n	%
1	**5**	20.83%	872	64.64%	1839	89.71%
2	4	16.67%	242	17.94%	181	8.83%
3	8	33.33%	207	15.34%	27	1.32%
4+	7	29.17%	28	2.08%	3	0.15%
total	**24**		**1349**		2050	

MS	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	1	25.00%	589	50.73%	972	66.94%
2	3	75.00%	399	34.37%	398	27.41%
3	0	0.00%	156	13.44%	82	5.65%
4+	0	0.00%	17	1.46%	0	0.00%
total	**4**		**1161**		**1452**	

ESSF	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	**4**	20.00%	504	53.11%	75	56.39%
2	0	0.00%	56	5.90%	8	6.02%
3	8	40.00%	327	34.46%	39	29.32%
4+	8	40.00%	62	6.53%	11	8.27%
total	**20**		949		133	

AT	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	0	n/a	196	59.57%	0	n/a
2	0	n/a	103	31.31%	0	n/a
3	0	n/a	30	9.12%	0	n/a
4+	0	n/a	0	0.00%	0	n/a
total	0		329		0	

Table 19. Assessment of Preliminary Model by Site Type

Site Type	Lithic		Housepit		Cachepit	
potential	n	%	n	%	n	%
1	10	8.62%	5	6.76%	5	3.97%
2	34	29.31%	18	24.32%	38	30.16%
3	54	46.55%	25	33.78%	42	33.33%
4+	18	15.52%	26	35.14%	41	32.54%
total	116		74		126	
	Roast		Hunt		Burial	
potential	n	%	n	%	n	%
1	1	12.50%	2	66.67%	0	0.00%
2	0	0.00%	0	0.00%	1	14.29%
3	5	62.50%	1	33.33%	1	14.29%
4+	2	25.00%	0	0.00%	5	71.43%
total	8		3		7	
	Rockart		CMT		Historic	
potential	n	%	n	%	n	%
1	1	12.50%	2	22.22%	1	6.67%
2	2	25.00%	1	11.11%	6	40.00%
3	1	12.50%	1	11.11%	5	33.33%
4+	4	50.00%	5	55.56%	3	20.00%
total	8		9		15	

Discussion of Preliminary Model

Based on the above analysis, the following areas were highlighted as problematic in the preliminary model.

Overall

The pattern for both the 1 km grid and the non-site survey grid approximate the ideal model. However, the potential ratings for site locations are problematic in the preliminary model. The number of sites within moderate to high potential areas is the highest. In the ideal model, the highest number of sites should fall into the area of highest potential.

By Zone

In the Bunchgrass zone, many of the sites (26%) were only included when the entire zone had its potential increased by a point. The majority (approx. 75%) of those sites missed otherwise were cache pits. This suggests that the variables selected for analysis are not diagnostic of this site type in this zone. Increasing the potential for this zone overall is not entirely arbitrary, since the majority of the sites in the study area are located in this zone (this greater number of sites in BG does not appear to be the product of a higher proportion of surveying in this zone).

In ESSF zone, the model was not accurate in the prediction of hunting site locations. Also, the model appeared to weight those areas near to significant environmental features too heavily, since no sites fall in the moderate category. This is due in part to the somewhat arbitrary nature of the forest cover modelling. The forest cover addition that was chosen for the final model was designed to increase the potential of areas with CMTs. The preliminary model was generally not very accurate in the prediction of non-CMT sites in ESSF.

The model appeared to be reasonably accurate for IDF zones, although the model did not identify several lithic, housepit, and cache site types. It also did not identify the only recorded CMT in that zone.

Modelling for the MS zone was problematic due to small sample sizes. Modelling for SBPS was reasonably accurate, however the bulk of the misclassified site types were lithic sites. Modelling for Alpine Tundra zones will remain problematic because of the lack of recorded sites and the lack of survey work in the area.

By Site Type

The model was least accurate for hunting site types, with two of the three hunting sites falling into the lowest potential zone. CMT modelling was poor in zones other than ESSF, with 22% of the CMTs being assigned to low potential zones. Thirteen percent of rock art and roasting sites ended up in low potential zones (however, this only amounted to a single site). The relatively high percentage of misclassification for these site types may be the product of low sample size of these site types.

Final Model

Results of the preliminary model were less accurate than desired in certain types of site location prediction. Methodological changes that would improve the model were pursued, and the result was the development of a 'final' model, which is presented below. In developing the final model, several additional variables were used. Certain GIS coverage was either not available or not analyzed at the time the preliminary model was developed. Two variables not included in the preliminary model, slope and deer capability, were used in the final model. In addition, certain important variables were given larger buffers to reflect their importance in the ethnographic record.

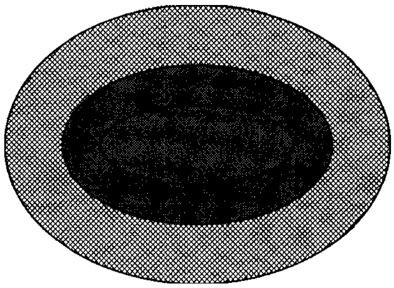
One interesting outcome of the preliminary model concerned slope. Modelling for slope was problematic because the pattern of slope was opposite to that expected. Sites were on average, according to the statistics used, on steeper ground than non-sites. Archaeological and ethnographic information consistently demonstrates that sites are almost always set on fairly level ground. The problem appears lie partly with the coverage available in GIS, and partly because the Digital Elevation Model points are often 80-100 m on a side. Slope information was likely at too large of a scale to catch small terraces. Thus, sites located on small, flat terraces in otherwise steeply-sloped areas would be given a steep slope rating. These "steep" sites were common along either the Fraser or Chilcotin Rivers (in either Bunchgrass or IDF zones), and probably reflect a real tendency for a high site density in the canyons and adjacent terrace systems. Few sites did occur on steep slopes. To deal with this problem, it was decided to consider the relationship between steep slopes and sites rather than flat areas and sites. No sites were found in areas with slopes greater than 60% in all zones, and few sites were found in areas with slopes greater than 45% in all zones except Bunchgrass and Interior Douglas Fir. In generating potential values for the final model, one point was subtracted for areas with steep slopes.

Deer capability, which was not a part of the preliminary model, was incorporated into the final model. A Chi-square test was used to determine whether moderate/high areas differed from low or nil areas when comparing sites versus surveyed, non-site areas. The observed values were significantly different from the expected values ($p<0.01$). Deer capability was thus considered a significant variable, since sites were located more often in areas of higher deer capability.

In the preliminary model, the addition of a point of potential for all areas within the Bunchgrass zone was somewhat arbitrary. Concern was expressed that the present day biogeoclimatic zone boundaries were not likely to accurately reflect prehistoric zone boundaries, Past environments certainly did differ from those of the present, as discussed in the Setting section. To deal with this, we decided to add a point for nearness to the most prominent feature of Bunchgrass zones – salmon-bearing streams. Consequently, in Bunchgrass zones, a 2 km buffer was placed around salmon-bearing streams and the previous buffer on all of the Bunchgrass zone was dropped. This buffer reflects the ethnographic importance of general propinquity to salmon rivers,

In addition to a large buffer on salmon bearing streams, a second buffer was also placed on streams with fish potential and medium sized lakes (there were no large lakes in the study area). Fish-bearing streams were important resource areas and locations for village sites. Medium to large sized lakes were important areas for establishing winter villages. These buffers were additive with the previous buffers. This had the effect of creating transitional buffers of slightly lower potential around these significant areas (see Figure 3).

Figure 3. Transitional Buffers



lake
high potential
moderate potential

Modelling for CMTs was a problem in the preliminary model. Two CMTs outside of the ESSF zone fell in low potential areas. It was decided to extend the lodgepole pine modelling to areas outside of ESSF. This required limits to be placed on the area included in lodgepole pine forest cover, since lodgepole pine is one of the dominant forest covers in the study area. To solve this problem, only old stands of lodgepole pine near bodies of water would be included. Many bodies of water were already buffered (as described above), so only points were given to old stands of lodgepole pine near streams that did not fall within previously defined buffers. This was intended to catch CMTs, but in fact improved the capture rate for non-CMT sites.

As with the preliminary model, an iterative stage process was employed to incorporate these new classes of data. When the final model was assessed, there were significant improvements in accuracy. The proportion of known sites in 'low' potential areas fell from over 8% to under 4%. However, a slightly larger proportion of the study area fell under areas in higher classes of potential.

APPLICATION OF THE FINAL MODEL

First Stage

After all variables were reset at '1', the first stage in the application of the final model was to create buffers around each variable that showed significance (Table 13). The values within any of the buffers at this stage were given a value of 2, indicating at least moderate potential. The values outside of this buffer were given a value of 1, thus indicating low potential. At this stage, any overlapping buffers were only given a value of 2. The buffers were defined as follows:

150 meters around:

- all lakevs, all lakesmall, all lakemed in all zones
- all meltsmall in all zones
- all wetlarge in all zones
- all streamsalm in all zones
- all streamfish in all zones
- all openrange (including within openrange) in all zones

200 meters around.

- whitebark pine in all zones
- streamall in all zones except MS

(areas within lakes, wetlands and streams were not included in the buffering)

Second Stage

In the second stage of the final model, the potential value of the buffer was increased by one point for those areas which met the following conditions (at this stage one point of potential was added for every condition met). These buffers represented the highly significant water features:

- everything within 150m of lakesmall in all zones
- everything within 150m of lakemed in all
- everything within 150m of wetlarge in all zones
- everything within 150m of streamsalm in all zones
- everything within 150m of streamfish in all zones

Third Stage

In the third stage of the model, a buffer was placed around the following areas. The potential value was increased for everything within these buffers. If any area fell within more than one of these buffers, the value was only increased by one (i.e., this buffer was not cumulative). These buffers created transitional zones of potential around significant areas:

- everything within 2000m of streamsalm
- everything within 500m of streamfish
- everything within 500m of lakemed

Fourth Stage:

In the fourth stage of the final model, the potential value of the buffer was increased by one point for those areas that met the following criterion. These buffers relate to deer capability:

- all areas with Deer Capability of M or H

Fifth Stage:

In the fifth stage of the final model, the potential value of the buffer was increased by one point for those areas which met any of the following conditions (one point for each condition met). These buffers reflect significant forest cover areas:

- everything with lodgepole pine ageclass greater than or equal to 8 and within 150m of all streams with fish potential
- everything within 200m of whitebark pine (including within)

Sixth Stage:

In the sixth stage of the final model, the potential value of the buffer was decreased by one point for those areas that met the following conditions (the subtraction of values at this stage was cumulative). These buffers represented steep areas where sites were not commonly found:

- everything with slope greater than or equal to 45% for all zones except BG and IDF
- everything with slope greater than or equal to 60%

Applying the Final Model to the Data Points

In FoxPro, the potential of locations in the three datasets (sites, non-sites, and the 1 km grid) was generated using the following set of commands:

1) repl all potential with 1
2) repl potential with (potential +1) for (lakevs < 150 and lakevs <> 0) or (lakesmall <150 and lakesmall <> 0) or (lakemed <150 and lakemed **00)** or (meltsmall <150 and meltsmall 00) or (wetlarge <150 and wetlarge <> 0) or (pa_nr <200 and pa-nr <> 0) or (streamsalm <150 and streamsalm <>0) or (streamfish < 150 and streamfish 00) or (openmg nr <150 and openrng_nr **00)** or (zone <> 'MS' and streamothr < 200 and streamothr <>0) or (openrng_id = 'OR') or (pa-id = 'WBPINE')
3) repl potential with (potential + 1) for (lakesmall < 150 and lakesmall <> 0)
4) repl potential with (potential + 1) for (lakemed < 150 and lakemed <> 0)
5) repl potential with (potential + 1) for (wetlarge < 150 and wetlarge <> 0)
6) repl potential with (potential + 1) for (streamsalm < 150 and streamsalm <> 0)
7) repl potential with (potential + 1) for (streamfish < 150 and streamfish <>0)
8) repl potential with (potential +1) for (streamsalm < 2000 and streamsalm <> 0) or (streamfish < 500 and streamfish <> 0) or (lakemed < 500 and lakemed <> 0)
9) repl potential with (potential +1) for (deer = 'M' or deer = 'H')
10) repl potential with (potential + 1) for pl_ageclas >= 8 and streamothr <150 and streamothr < (streamfish - 1)
11) repl potential with (potential + 1) for (pa_nr < 200 and pa-nr <> 0) or (pa-id = 'WBPINE')
12) repl potential with (potential -1) for (zone <> 'BG' and zone <> 'IDF' and slope >= 45)

repl potential with (potential -1) for (slope >= 60)

[Note: zeros indicate that the value is greater than the set limit].

Assessment of the Final Model

The following tables provide results used to evaluate the accuracy of the model produced by the FoxPro commands given above. The potential, the number of sites, and the percentage of sites are presented. The model is assessed overall, by zone, and by site type. According to the ideal model, the proportion of sites should progressively increase as the potential rating goes from 1 to 4+, whereas both the surveyed, non-site locations and the lkm grid points should progressively decrease as potential increases.

Table 20. Assessment of the Final Model

Overall	**Sitelist**		**Kmgdlist**		**Survlist**	
potential	n	%	n	%	n	%
1	10	3.73%	2640	43.53%	4131	63.46%
2	34	12.69%	1778	29.32%	1371	21.06%
3	95	35.45%	1161	19.14%	736	11.31%
4+	129	48.13%	486	8.01%	272	4.18%
total	**268**		6065		6510	
BG	**Sitelist**		**Kmgdlist**		**Survlist**	
potential	n	%	n	%	n	%
1	**0**	**0.00%**	1	0.40%	0	0.00%
2	6	4.92%	102	40.96%	27	11.49%
3	61	50.00%	82	32.93%	158	67.23%
4+	55	45.08%	64	25.70%	50	21.28%
total	**122**		249		235	
IDF	**Sitelist**		**Kmgdlist**		**Survlist**	
potential	n	%	n	%	n	%
1	**3**	3.06%	817	40.37%	1733	65.64%
2	20	20.41%	652	32.21%	500	18.94%
3	19	19.39%	390	19.27%	271	10.27%
4+	56	57.14%	165	8.15%	136	5.15%
total	**98**		2024		2640	

SBPS	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	4	16.67%	549	40.70%	1225	59.76%
2	4	16.67%	402	29.80%	614	29.95%
3	6	25.00%	259	19.20%	168	8.20%
4+	10	41.67%	139	10.30%	43	2.10%
total	24		1349		2050	

MS	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	3	75.00%	751	64.69%	1127	77.62%
2	1	25.00%	218	18.78%	208	14.33%
3	0	0.00%	136	11.71%	102	7.02%
4+	0	0.00%	56	4.82%	15	1.03%
total	4		1161		1452	

ESSF	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	0	0.00%	344	36.25%	46	34.59%
2	3	15.00%	273	28.77%	22	16.54%
3	9	45.00%	271	28.56%	37	27.82%
4+	8	40.00%	61	6.43%	28	21.05%
total	20		949		133	

AT	Sitelist		Kmgdlist		Survlist	
potential	n	%	n	%	n	%
1	0	n/a	174	52.89%	0	n/a
2	0	n/a	131	39.82%	0	n/a
3	0	n/a	23	6.99%	0	d a
4+	0	n/a	1	0.30%	0	n/a
total	0		329		0	

Table 21. Assessment of the Final Model by Site Type

Site Type	Lithic		Houseuit		Cacheuit	
potential	n	%	n	%	n	%
1	7	6.03%	2	2.70%	0	0.00%
2	16	13.79%	5	6.76%	8	6.35%
3	33	28.45%	19	25.68%	57	45.24%
4+	60	51.72%	48	64.86%	61	48.41%
total	116		74		126	

	Roast		Hunt		Burial	
potential	n	%	n	%	n	%
1	0	0.00%	0	0.00%	0	0.00%
2	2	25.00%	0	0.00%	0	0.00%
3	3	37.50%	2	66.67%	1	14.29%
4+	3	37.50%	1	33.33%	6	85.71%
total	8		3		7	

Rockart			CMT		Historic	
potential	n	%	n	%	n	%
1	1	12.50%	1	11.11%	1	6.67%
2	2	25.00%	2	22.22%	4	26.67%
3	1	12.50%	2	22.22%	4	26.67%
4+	4	50.00%	4	44.44%	6	40.00%
total	**8**		9		15	

Discussion of the Final Model

The accuracy of the final model has improved significantly overall. The proportion of the sites in low potential has decreased to under 4% from 8% and the number of sites in high potential areas has increased from approximately 25% to 48%. The final model better approximates the ideal model overall, since the number of sites increases in zones of increasingly higher potential. However, the proportion of the total study area in higher categories of potential has increased slightly. Overall, the model enjoys a better tit with the data at hand.

By zone there are several areas of improvement. In the Bunchgrass zone, more sites fall in higher potential areas. It is stressed here that the methodology that made this happen was not arbitrary. Significant improvements were made in IDF zone. The initial model placed more sites in low potential areas than high potential areas. In the final model, only three sites in IDF fall in the low potential area and the majority of the sites fall in the high potential area. Minor improvements were also made in the SBPS zone. The final model was less accurate for the MS zone predictions than in the preliminary model (however, data supplied by Arcas suggests that the data in our portion of the study area shows significant survey biases). Significant improvements were made for the ESSF zone. In the final model no sites fall in low potential areas, whereas in the preliminary model 20% of the sites fell in areas of low potential.

The most significant improvements in the final model were made regarding site type prediction. For all major site types, the bulk of the sites fall within the highest two categories of potential. Improvements were made in predicting the location of hunting sites and CMTs in zones other than ESSF. Rock art site potential remained the same as in the preliminary model. The final model showed improvements for all other site types.

Data Gaps

This discussion of datagaps identifies physical areas, ecological zones, or other data types for which information is insufficient for reliable modelling. Data gaps were assessed along several lines, including biogeoclimatic zone and ecological section (ecosection).

Survey Location and Coverage

The areas where intensive and reconnaissance survey was conducted were described using the GIS database and ArcInfo. These areas were divided into biogeoclimatic zones and ecosections in order to determine which of these areas were adequately represented in the database and which were not. This analysis differs from a similar data gaps analysis by Equinox (Franck 1997) in two principal ways. The present study differentiated between intensive (including systematic) and reconnaissance surveys and used GIS data rather than 1:250 000 paper maps to determine biogeoclimatic zones. The present data also also reflects a different study area. The present study area comprises roughly 600 000 ha, whereas the Equinox study area included the total forest district (about 1 million hectares). Equinox counted 10,300 ha in their study. In our study area there are roughly 4,000 ha of intensive survey and 3,000 ha of reconnaissance level survey. Some of the values are considerably different from those presented in the Equinox report, and may be based on a different original data source. For instance, Equinox reports 19,400 ha of Alpine Tundra zone in the WLFD, whereas we calculate 30,000 hectares in just our portion of the Forest District. Other differences reflect the additional archaeological survey and reporting since the short time since the Equinox data was gathered. For example, Equinox records 13 ha of survey in Montane Spruce zone, while we map around 1 300 ha as surveyed.

From the point of view of modelling, intensive survey data is of primary importance. This is because the absence of sites ("negative data") can confidently be assumed for intensive data but cannot be assumed for reconnaissance level survey, since sites may well have been missed. In addition, the apparent site density will be markedly different between an area surveyed almost shoulder-to-shoulder, and a cutblock or woodlot with only one or two traverses across it.

Table 22. Biogeoclimatic Zone Abbreviations.	
AT	Alpine Tundra
BG	Bunch Grass
ESSF	Englemann Spruce-Subalpine Fir
IDF	Interior Douglas Fir
MS	Montane Spruce
SBPS	Sub-boreal Pine-Spruce

In general, the patterns noted by Equinox are corroborated. The two highest zones, AT and ESSF (see Table 22 for code abbreviations) have had very little archaeological survey (Table 23). This gap has little impact on forestry operations since AT is not normally logged. However, ESSF is extensively logged. Surveys in areas adjacent to the study area indicate a very high density of sites in this zone (Alexander 1987a, Alexander 1987b, Alexander, et al. 1985, Eldridge 1996). This suggests that models for the ESSF zone will have to be re-evaluated in the future when more data becomes available to ensure that the model accurately reflects archaeological potential. To compensate for the lack of survey, the recent Paradise Creek impact assessment (Eldridge 1996) was included in the analysis. This project, which found some 14 sites within four small cutblocks, was conducted just south of the study area.

Table 23. Area surveyed, Williams Lake Forest District.

Area in Hectares

ZONE	INTENSIVE (HA.)	RECCED (HA.)	TOTAL HA. IN STUDY AREA
AT	0.00	0.00	30,116.60
BG Total	207.63	362.65	24,816.74
ESSF Total	49.70	0.00	87,662.88
IDF Total	1,181.05	1,593.68	203,251.93
MS Total	1,311.98	116.47	115,564.98
SBPS Total	1,157.74	884.39	134,839.58
Total	3,908.09	2,957.18	596,252.71

As a percentage of the surveyed area/study area.			
ZONE	INTENSIVE	RECCED	TOTAL STUDY AREA
AT	0.00%	0.00%	5.05%
BG	5.31%	12.26%	4.16%
ESSF	1.27%	0.00%	14.70%
IDF	*30.22%*	*53.89%*	*34.09%*
MS	*33.57%*	*3.94%*	*19.38%*
SBPS	29.62%	29.91%	22.61%
Total	100.00%	100.00%	100.00%

As a percentage of the total study area.		
ZONE	INTENSIVE	RECCED
AT	0.00%	0.00%
BG Total	*0.84%*	1.46%
ESSF Total	*0.06%*	*0.00%*
IDF Total	*0.58%*	*0.78%*
MS Total	1.14%	0.10%
SBPS Total	*0.86%*	*0.66%*
Total	*3.47%*	*3.00%*

Data from Table 23 are also presented in graphic form in Figure 1 (below). The relative heights of the bars allow for an assessment of the relative proportion of surveyed areas by zone. The most seriously underrepresented zones are AT and ESSF zones. In all other zones the survey proportion is close to representative or somewhat over-represented (as in the case of MS intensive survey). The proportion of intensive survey in Bunchgrass zone is representative of the total proportion of Bunchgrass in the study area. This is surprising considering the relatively large number of academically-oriented systematic surveys in the early to mid-1970s. Bunchgrass is only slightly over-represented at the reconnaissance level of survey, with 560 ha of survey recorded. This is noteworthy since about half (49%) of the recorded sites fall in this area, but Bunchgrass only accounts for 4% of the study area. However, many BG sites were recorded during judgmental surveys. For the most part, the area1 coverage of the judgemental surveys was not adequately described, and this prevented them from being mapped.

Table 24 and Figure 2 (below) show the distribution of surveys by ecosection. Two ecosections, the Central Chilcotin Ranges and the Nazko Upland, are either underrepresented or missing from the surveyed areas. The Cariboo Basin is somewhat underrepresented in the intensive surveys, although it is greatly overrepresented at the reconnaissance level. The Chilcotin Plateau, on the other hand, is greatly overrepresented in the intensive survey. Again this is surprising in light of the BG biogeoclimatic zone site location results, and the fact that 65% of recorded sites are recorded there. The Fraser Basin is slightly underrepresented in terms of intensive survey.

Figure 1. Graphs of Survey Area by Zone.

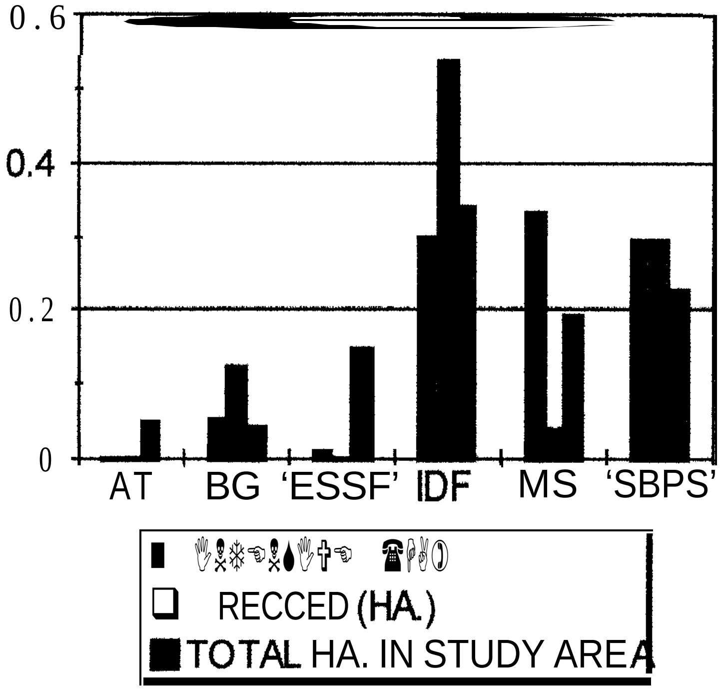
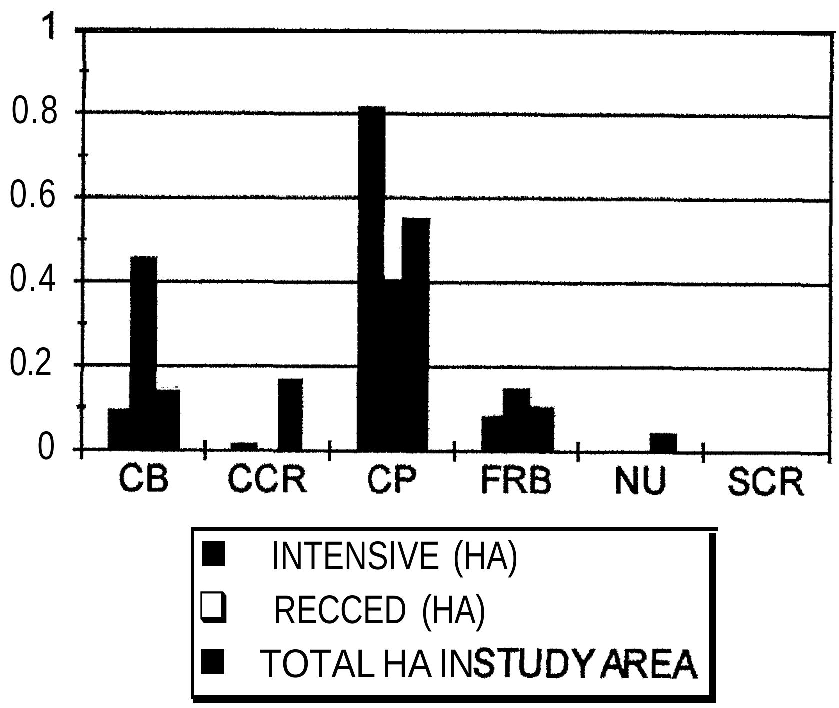


Table 24. Areas by Ecosection,			
ECOSECTION	INTENSIVE (HA.)	RECCED (HA.)	TOTAL, HA. IN STUDY AREA
Cariboo Basin	*368.42*	1,336.16	82,556.46
Central Chilcotin Ranges	*48.49*	*0.00*	99,084.79
Chilcotin Plateau	3,180.99	1,193.43	328,813.75
Fraser River Basin	310.19	*427.59*	61,283.87
Nazko Upland	0.00	0.00	24,792.21
Southern Chilcotin Ranges*	0.00	0.00	25.91
Total	3,908.08	*2,957.* 18	596,557.00

* Southern Chilcotin Ranges, with less than 26 hectares, is deleted from the accompanying graphs

In the ecosection analysis, only the Chilcotin Plateau has an adequate sample in terms of numbers of surveyed hectares. The Cariboo Basin and Fraser River Basins have minimal (between 300 and 400 ha) samples of intensive survey. This can be largely corrected by examining site distribution patterning from adjacent study areas.

Figure 2. Graphs of Surveyed Area by Ecosection.



To determine whether the surveys carried out in the study area cover areas representative of the entire study area (or entire zone in the study area), the geographic locations of the surveys were compared to the geographic locations of the entire study area. For this, the data assembled for the predictive model was used. A 100-meter grid was placed over all of the surveyed areas and a one-kilometre grid was placed over the entire study area. These grid points were compared on a variable by variable basis. For geographic features such. as lakes and rivers, the number of points (either one-kilometre grid points or points in the surveyed areas) that fell within the two kilometre buffer were counted. For features such as forest cover or wildlife capability (moderate or high) the number of points within that forest cover were counted. The proportion of points was compared for the survey and one-kilometre grid points. The proportion of kilometre grid points was subtracted from the proportion of surveyed points. A variable was considered to have a data gap when the proportion of surveyed points was over 10 percent less than the one kilometre grid coverage. Since the Bunchgrass zone is considered to be adequately surveyed and is a relatively homogeneous zone in terms of the variables considered (i.e., it is primarily open range near major rivers) it was not included. Alpine Tundra as a whole is considered to be a data gap, therefore it was also not included in this analysis. Variables with data gaps are listed below in Table 25.

Table 25. Data Gap Variables

ZONE	VARIABLE*	DIFFERENCE
ESSF	Lakevs	22% less than total area
	Meltsmall	17% less than total area
	Wetsmall	35% less than total area
	Wetlarge	14% less than total area
SBPS	Lakevs	25% less than total area
	Meltsmall	19% less than total area
	Wetsmall	19% less than total area
IDF	Deer	15% less than total area

*see Table *** in predictive modelling chapter for a description of the variables.

Other Data Gaps

FISHERIES DATA

Important data gaps for the entire study area include (1) the absence of "macro-reach" and associated data for the Watershed Atlas, and (2) the lack of digital FISS (fisheries) data. This information is needed to accurately portray or predict fisheries values. A TRIM-based approximation of fish values was used instead. A TINARC routine was run to determine streambed slopes (as opposed to the valley/gully slopes on the creek sides, determined through TIN). The *Forest Practices Code* defines any stream less than 8% gradient as having high fisheries potential. Between 8% and 12%, a moderately high potential is assumed, although many species are stressed at gradients greater than 4% (Josh ** 1997, personal communication). The ARCTIN identified many streams at high elevation and running through quite rugged terrain that had less than 8% slope but which were unlikely to contain large fish populations. There was no easy way to delete these sections from the data, however.

We used the 1:50 000 scale Watershed Atlas to identify high-order streams (Class 4 and above or Class 3 with a magnitude of 25 or greater) that would likely have sufficient stream width and volume to contain fish populations. Due to the poor fit between the TRIM and Watershed Atlas stream locations, the Watershed streams of sufficient order were buffered at 50m, and the TRIM rivers and creeks inside this buffer were identified as having high fish potential.

SLOPE DATA

In the process of data analysis, it was noted that for Bunchgrass zone many sites were on steep slopes. Although sites may have been located on steep slopes, most sites that actually occurred on flat terraces were given very steep slope values. It appears that the TIN facets used for describing slope were of an insufficient resolution to catch many of the smaller terraces containing sites. This is considered a serious limitation to the use of slope. Rather than modelling for flat slopes as has often been done previously, only steep slopes were used for modelling purposes.

TRAIL DATA

An important data gap in our information is the lack of trail research. Owing to a number of circumstances it was difficult to obtain aboriginal traditional use studies of the area and other sources of reliable trail data. In field testing the model, sites were located in areas that would otherwise not be considered high potential except that they were on major travel routes through the study area. In our study area, trails and sites are significantly associated. This is perhaps the most serious data gap in the present study. Studies of trail location and use should supplement the present model, and these trails should be considered to have high site potential.

SITE LOCATION DATA

Another aspect of the present study that will have an effect on the outcome of the model is the location of known archaeological sites. The present study used a combination of data downloaded from the Canadian Heritage Inventory Network, original Site Inventory Forms and GIS data obtained from the Archaeology Branch at the Ministry of Small Business, Tourism and Culture. The location of the sites on the maps and thus the related geographic data obtained is considered to be reasonably accurate, however still approximate. This is certainly true of sites that were recorded before more reliable means of locating the sites (i.e., GPS info and digital mapping) were available.

With CHIN, sites are entered as point data (that is, they are simply recorded as a dot on a map). In certain types of analyses, it is necessary to consider that sites do have an area, and thus need to be recorded as polygons. In fact, it may be a useful management strategy to map larger sites as polygons on maps with scales of 1:50 000. Another problem with CHIN data is that in many cases, data have been inaccurately recorded and/or translated to the database. Errors in the data base are greatly hinder the development of accurate predictive models. When errors are identified, often the original site forms and maps must be consulted to clarify or correct inaccuracies.

CMT Recording

The number of CMTs in the study area is low. One of the reasons for this is the lack of coherent standards in CMT recording. Some archaeologists record CMTs as sites and others do not. In addition, it has only been relatively recently that CMTs have been studied and recorded at all. The ability to model for CMTs in the present model is thus limited.

Other Data

Other data that could have been used for predictive modelling include detailed and digitized terrain and landform mapping, and ungulate capability mapping at larger than the 1:250 000 scale mapping that is available. However, while these variables may have refined the model, we do not believe that markedly different results would have been produced.

Summary

Specific data gaps are identified in this chapter. Regarding the location of archaeological surveys, specific biogeoclimatic zones and ecosections are under-represented. AT and ESSF zones are not adequately represented in previous archaeological surveys. Biases in the location of surveys are also noted for both ESSF, IDF and SBPS zones. Only the Chilcotin Plateau ecosection has been adequately surveyed in this study area. Other data gaps include access to fisheries data, problematic slope data, the general lack of trail data, problems with site location data, and CMT recording issues. While these data gaps warrant attention, we have attempted to work around data gaps that exist and to work toward filling those data gaps in the future.

Field Results for Ground-Truthing of Archaeological Potential Maps

In March of 1998, field survey was conducted in selected areas of the Williams Lake Forest District in order to refine the model for the archaeological overview assessment. Fieldwork was undertaken in three different traditional territories: that of the Williams Lake Band, the Esketemc First Nation (Alkali Lake Band), and the Yunesit'in (Stone)Band. Each area was defined by the named First Nation, but overlaps with other First Nations territories occur in most cases. The work was not conducted under Archaeology Branch Permit and therefore was limited to the observation of surficial features and natural exposures. The survey was conducted by Tina Christensen and Owen Grant of Millennia Research Ltd between March 5 and March 11, 1998. Assistants from the Esketemc First Nation included Irvine Johnson and Karen Robbins. Assistants from the Stone Band included Tony Meyers, William Meyers, and Cecelia Quilt. Assistants from the Williams Lake Band were not available.

The maps used for ground truthing were produced from the final model, with the exception of buffers around known sites, which were excluded for testing purposes. The method of archaeological investigation consisted of judgementally selecting 'representative' areas of approximately one square kilometre (termed 'quadrats' below), with each quadrat crossing two or more zones of differing archaeological potential. In cases where it was difficult to find or access these areas, a survey of a lakeshore or a creek using traverses of varying length was substituted. Field investigation techniques were limited to non-invasive observation with no shovel testing or probing involved. The surveyed areas were chosen primarily based on their ability to be accessed by vehicle, and by their ability to be reasonably accessed by foot with Native elders, while covering the different archaeological potential zones.

Prior to fieldwork, a review of previous archaeological surveys in each area was undertaken to eliminate survey overlap. Throughout the field investigation, many pre-selected areas had to be shifted due to areas of deep snow. In those cases, an area at a lower elevation or with a southern exposure was substituted. We were therefore not able to include samples from the higher elevation environments (such as ESSF), but the ground testing was nevertheless a good test of a wide range of conditions typical of much of the Forest District.

Results for Williams Lake Band Traditional Territory

Three areas were selected for investigation in Williams Lake Band Territory, all on the eastern side of our surveyed area, within the Cariboo Basin ecosection.

SURVEYED AREA 1:

Area 1 is a one-square-km-block, located west of Williams Lake at the junction of the 8000 Road and the main Lignum Road, approximately 13 km south of the junction of the Enterprise Road and the Chimney Lake turnoff. The surveyed area is bordered by 8000 Road to the south and by the Lignum Road to the east. A large section in the southeastern portion of this surveyed area has been previously clear-cut, so survey was concentrated in the northwestern portion. The area is generally flat, characterized by open pine forest, interspersed with trembling aspen and Englemann spruce, a grassy ground cover, and a willow understory. The hydrology consists of two smaller swamps and one smaller lake all connected by a seasonal stream. Low, medium, medium-high, and high archaeological potential zones were surveyed. The area that has been clear-cut lies primarily in the low potential zone.

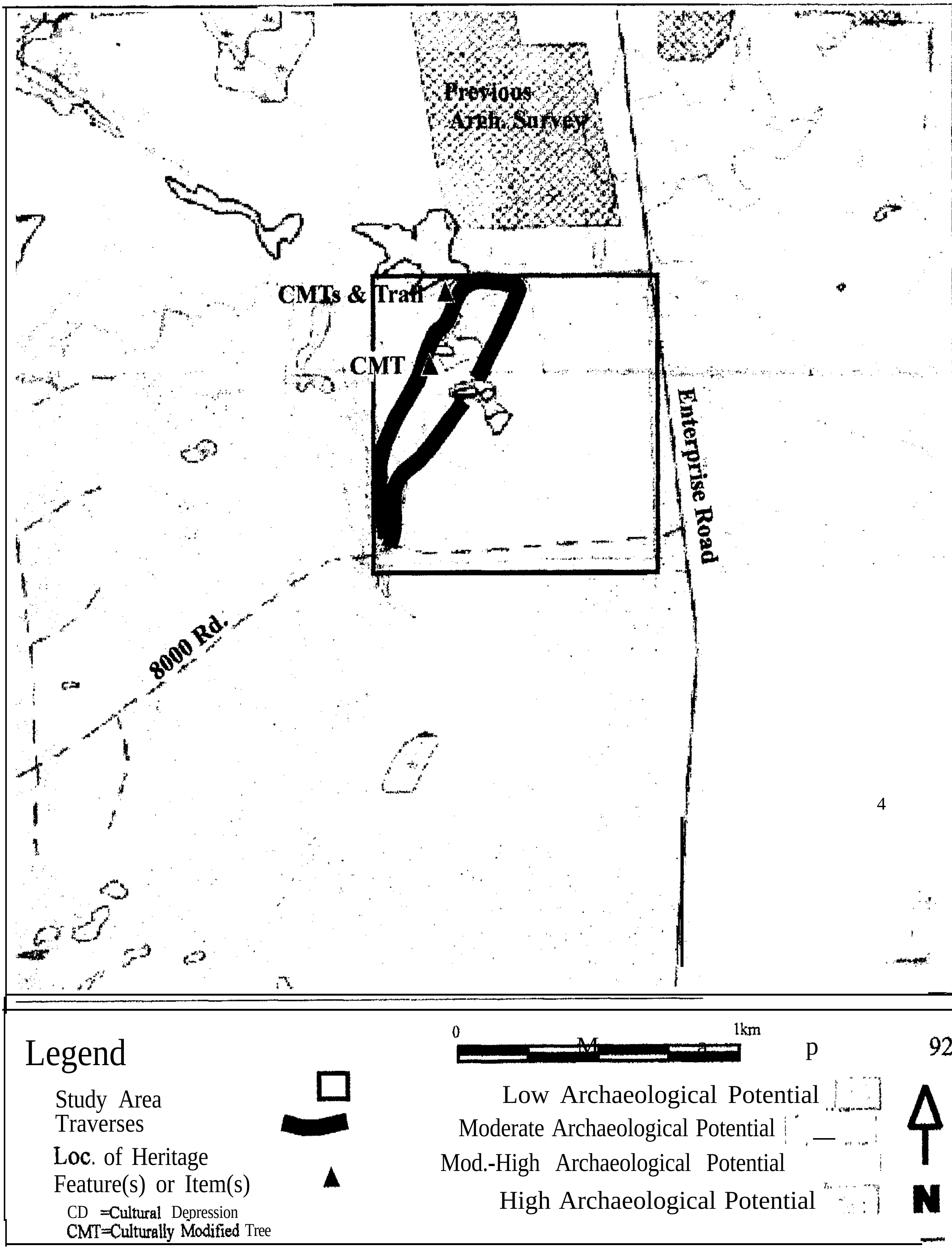


Figure 4. Williams Lake Area 1

The first traverse began at the southwest comer of the surveyed area, and continues northeast for lkm. No archaeological resources were discovered on Traverse 1. Area 1 does appear to be of high potential, especially around the swamps. Abundant tracks of deer, snowshoe hare, coyote, and ruffed grouse were noted, as well as many well-worn animal trails around the swamps. Snow cover limited the ground visibility throughout much of Area 1, which made it difficult to identify any possible lithic scatters or other cultural resources. However, the plentiful signs of fauna around the swamps may indicate a good hunting area.

At the end of the first traverse the second traverse ran east for 200m. This area has a higher concentration of spruce; however, the rest of the vegetation is similar to the first traverse. A blazed trail running north-east/south-west crossed this traverse. Between a large swamp edge and a small meadow, at the edge of the quadrat, are three CMTs, all bark-stripped lodgepole pine with no cut-marks present. The CMTs appear to be relatively recent given the small healing lobes.

At the 200m mark of the second traverse a third traverse was begun which ran southwest to the western edge of the quadrat. Terrain and vegetation are similar to the previous traverse. Halfway along the third traverse there is a young bark-stripped pine CMT with two scars. The tree's diameter was only 18 cm indicating that it is probably relatively young; one of the scars appeared to have knife marks on it. The traverse ended at the start of traverse one. No further discoveries were noted in Area 1.

SURVEYED AREA 2

Located 4.6 km south of Area 1 along the Enterprise Road, Area 2 is a one-square-km block, The northern boundary of the area is in the high and moderate archaeological potential zones. At the northeastern comer heading west is a flat low-lying swampy area surrounded by stunted spruce. To the north, the ground gently slopes up to a clear-cut. The main forest cover in this area is Englemann spruce near the water and lodgepole pine interspersed with Douglas-fir in dryer areas. Spruce and pine are very small in diameter (less than 20 cm) near the creek but get larger as one proceeds south. Ground cover consists mainly of bunchberry and moss. The understory is mainly comprised of willows. The hydrology consists of an unnamed creek cutting across the northern boundary of the surveyed area and another small creek at the southeastern comer. Snow covered about 50-70% of ground making it difficult to spot archaeological resources. The identified fauna consists of moose, snowshoe hare, mule deer, ruffed grouse and other small mammals.

Traverse 1 began at the culvert next to Enterprise Road at the north end of the study area and ran south. The traverse began in a low lying swampy area with an unnamed seasonal creek running through it. At the edge of the swamp there is an abrupt change in slope with a 45° slope up to a flat terrace. On the flat is a dramatic switch in forest cover to lodgepole pine, most of them young trees. On the terrace are what appear to be numerous naturally fire scarred pines. Juniper trees grow on the terrace as well, and throughout the flat area are small thickets of trembling aspen. Many of the aspens are naturally scarred by moose chewing off sections of bark. At approximately 500m along the traverse the forest opens significantly. Toward the western edge of the surveyed area, Douglas-firs increase in frequency. The traverse ended at 1000m, shorter than the true end of the study area due to elevation changes. We crossed Enterprise Road to survey the southeast comer of the study area which had been given a high potential rating. The area has recently been clear-cut except for a narrow buffer paralleling a small stream.

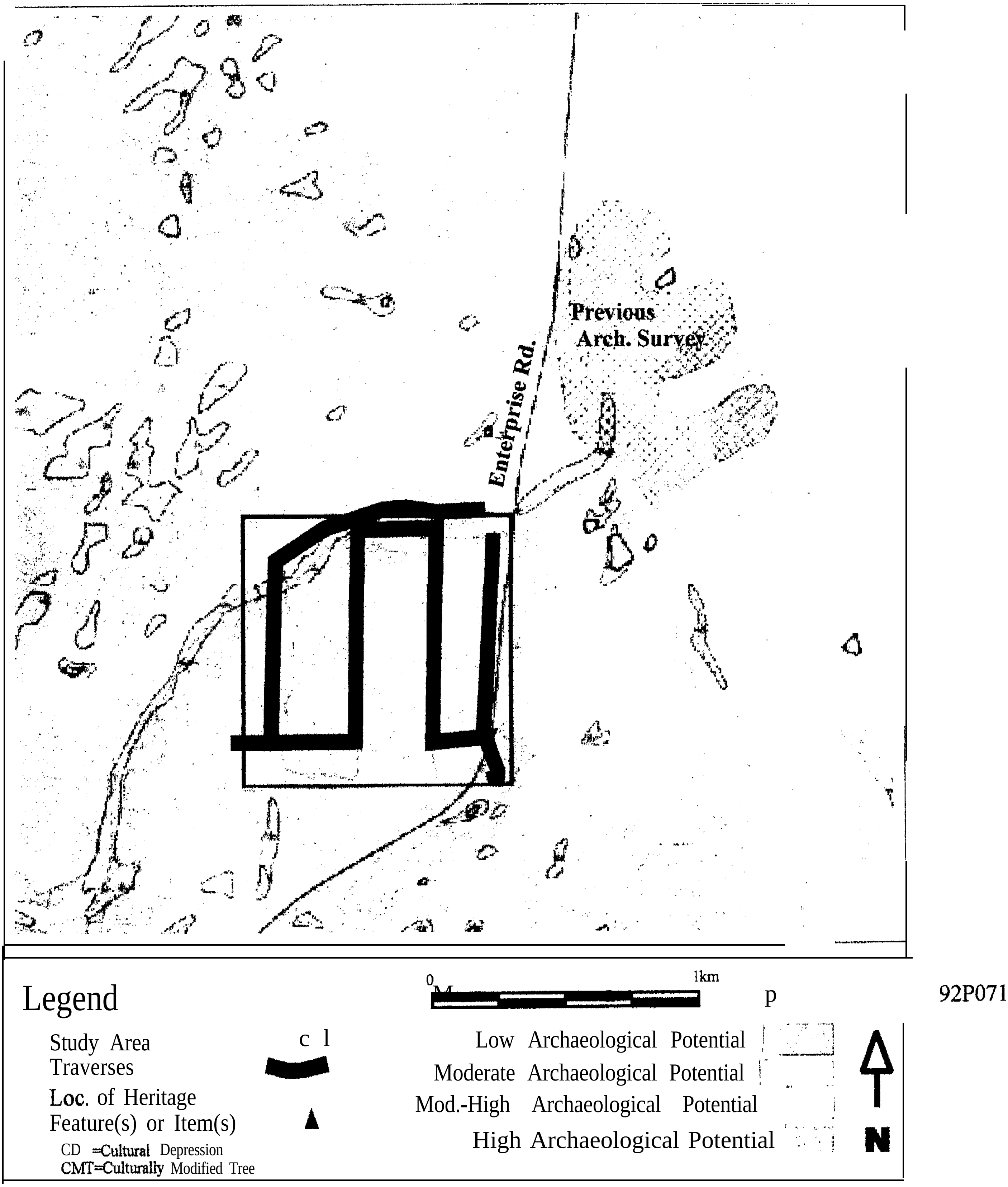


Figure 5. Williams Lake Area 2

Traverse 2 began 250 m west of the road and the end of Traverse 1. This area is characterized by Douglas-fir and spruce scattered throughout a leading-species pine forest. A small meadow was encountered in the middle section of the surveyed area. Near the meadow, the forest cover contained more spruce and much less pine. Approximately 500m along the transect the edge of the terrace was encountered again. The area was characterized by naturally scarred (fire scarred) pines, a juniper understory, and generally flat and open forest. Near the north end of the transect the edge of the terrace dropped down the same 45" slope to the same small-unnamed seasonal creek discussed at the start of Traverse 1. Various outcroppings of bedrock parallel the slope. A frozen creek meanders throughout the rock outcropping, surrounded by Douglas-fir and Englemann spruce. The northern boundary of the study area, a ridge with southern exposure overlooking the grassy wetlands below, has high potential for archaeological remains.

Traverse 3, began 250m west of the northern end of Traverse 2, and ran south for 1000m. It is characterized by the same geology, geography, and vegetation as traverses 1 and 2. The traverse ends in an open Douglas-fir predominating environment. Traverse 4 begins 1 00m west of the end of Traverse3. This traverse ended at the top of the northern ridge.

Although no cultural material was located during this survey subsurface testing was not undertaken and a fairly large portion of the study area had thick snow cover hampering the identification of archaeological remains. The northern portion of Area 2, the southerly exposed ridge above the unnamed creek appears to be of the highest potential. Lithic scatters are expected but soil development is too thin for the excavation of cultural depressions. The ridge may have once had some CMTs but has been logged.

SURVEYED AREA 3

Surveyed Area 3 is a one square km quadrat that can be accessed by continuing down 8000 Road for 3.2km past Surveyed Area 1. The surveyed area includes Gulach Lake and an unnamed lake to the east. The GIS archaeological ratings for Area 2 show high and moderate potential areas around the lakes and low potential these zones between the lakes.

An open clearing, produced by logging activity, at the end of a small dirt was the starting point on the first traverse south (see figure 3). The tranverse starts in low potential terrain, previously logged and disturbed, primarily covered by Douglas-fir. Many of the Douglas-firs are interspersed with immature Englemann spruce. The understory is mainly comprised of Juniper, while ground cover is bunchberry and various grasses. The slope is gentle to rolling. This traverse was walked south for 500m at which time we headed west (traverse 2) to locate Gulach Lake.

A possible CMT was present at the beginning of the second (west) traverse, however there were no cut marks visible on the scar. Above the lake at 350m, we encountered a high flat ridge covered with old growth Douglas-fir. Depressions were visible but they appeared to be tree throw wells. In this area a number of animal/horse trails travel in various directions, some are partially grown over others are not. The terrain begins to slope down toward Gulach Lake at approximately 500m. Vegetation around the lake is mainly comprised of spruce and pine interspersed with grassy ridges and patches of aspen and cottonwood.

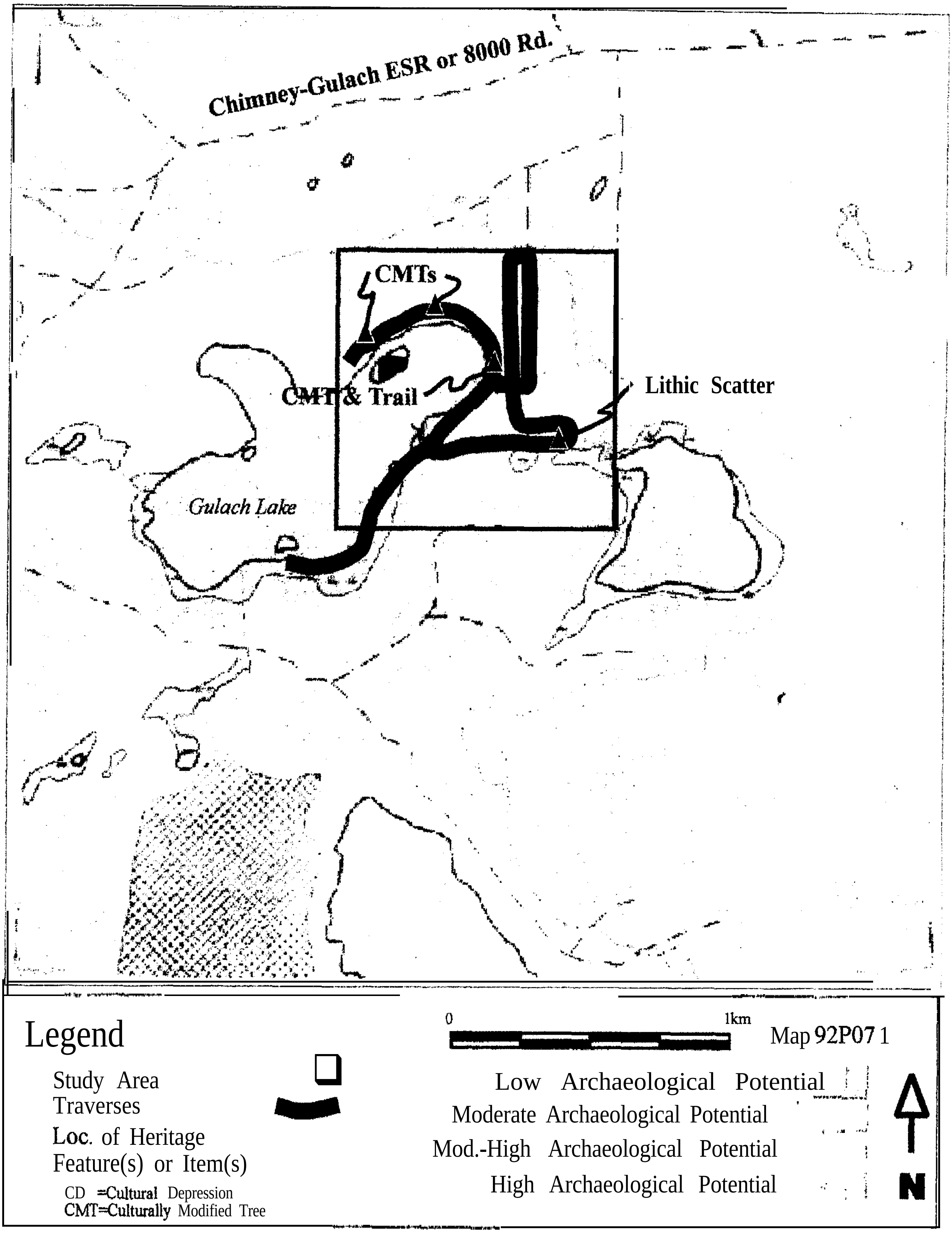


Figure 6. Williams Lake Area 3

A traverse was run north and east along Gulach Lake. On the northwest side of Gulach Lake is a well worn, maintained trail used by humans and animals. Along the trail are a number of sawn logs, blazed trees, and the occasional fire pit. The terrain around the north shore of the lake is comprised of gentle sloping terraces with aspen, cottonwood, and pine turning to rolling grassland-like terrain with pine spruce and Douglas-fir. According to Irvine Johnson (personal communication 1998) of the Esketemc First Nation, the lake is too alkaline to contain any fish. Off the northeast arm of the lake, along the previously mentioned trail, were a number of CMTs, some with chop marks. The area appeared to have a high potential for lithic scatters based on the terrain and the available fauna. No cultural material was located during a brief survey of the island in the northwest corner of the study area. Snow cover restricted a more intensive survey. The lack of vegetation, especially on the north shore of the lake, suggests that the water level has dropped significantly in the recent past.

Traverse 4 follows the lakeshore to the southwest for 600m to the small island shown at the off of the southern shore of the lake. The shoreline was bounded by a flat terrace with predominatly old growth pine stands. Moose sign is common. The area has a northern exposure so it was covered with thick snow hiding any exposures that could have been used to locate cultural material.

The crew headed east from Gulach Lake beginning at a point approximately 400m northeast along the shore from the small island at the end of Traverse 4. This transect yielded no archaeological resources until reaching a small-unnamed lake in the moderate-high zone. This small lake appeared alkaline and has little or no vegetation growing around its shores. The predominant forest cover is Douglas-fir and pine with a juniper understory and grass ground cover. The slope is gentle to rolling. No water sources other than the lake are in the immediate area. Flat dry areas around lake are interrupted by swampy meadows, and interspersed with stands of old Douglas-firs.

A small lithic scatter was discovered at the northeast edge of the marsh surrounding the lake. A small retouched, fine-grained flake of black basalt was found on the surface within the moderate-high potential area. The extent of the site could not be determined without sub-surface testing. The artifact remains *in situ.*

Table 26. Sites in Williams Lake Band Traditional Territory

Surveyed Area	Site Type	GIS Archaeological Rating
Area #1	Pine CMT	High
	Pine CMT	High
	Pine CMT	High
	Pine CMT	High
	Blazed Trail	High
Area #2	No cultural material	All Classes
Area #3	Pine CMT	Moderate-High
	Pine CMT	Moderate-High
	Pine CMT	Moderate-High
	Pine CMT	Moderate-High
	Blazed Trail	Moderate-High
	Lithic Scatter	Moderate-High

SUMMARY FOR WILLIAMS LAKE BAND TRADITIONAL TERRITORY

For the three one square kilometre study areas surveyed in the Williams Lake traditional territory, a total of eight CMTs, two blazed trails, and one lithic scatter were discovered. Given that this was a low intensity reconnaissance survey with snow cover and no shovel testing or probing, the relatively high number of sites found indicates that there are probably even more sites within these surveyed areas. The AOA predictive model appeared to work well. All sites were found in high or moderate-high potential areas, and no sites were found in low potential areas. The absence of sites in Area 2 may be a result of the deep snow cover in the high potential zone and previous logging removing CMTs.

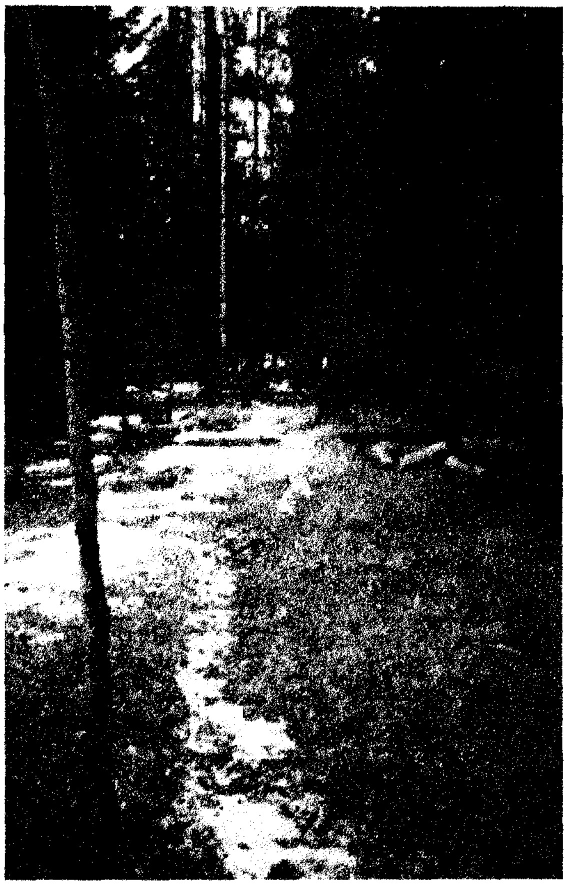


Plate **1.** Blazed Trail at Gulach Lake

Plate **2.** CMT at Gulach Lake

Plate 3. CMT at Gulach Lake

Plate 4. Area 3 Lithic Scatter

Results for Esketemc Traditional Territory

SURVEYED AREA 1 – JOE'S LAKE

Joe's Lake is located approximately 4.7 km southeast of Alkali Lake, and approximately 14 km east of the junction of the Chilcotin River and the Fraser River. Survey was conducted within 30 to 150 m from the shoreline.

Only a short traverse was undertaken on the southern shore of the lake (southern slope), because of 30+ cm of snow. Evidence of historic logging operations as well as the remnants of an old sawmill were noted on the south shore of the lake. According to Irvine Johnson the mill was owned and operated by Dan Basseraba (a Euro-Canadian) in the 1950s and 60s. The dominant vegetation on the south shore consisted of Douglas-fir, trembling aspen, and alder. Also present were some younger stands of Englemann spruce. The occasional stand of birch trees was also present along the south shore, and Irvine Johnson (personal communication 1998) noted that birch bark may have been harvested historically and prehistorically from the area.

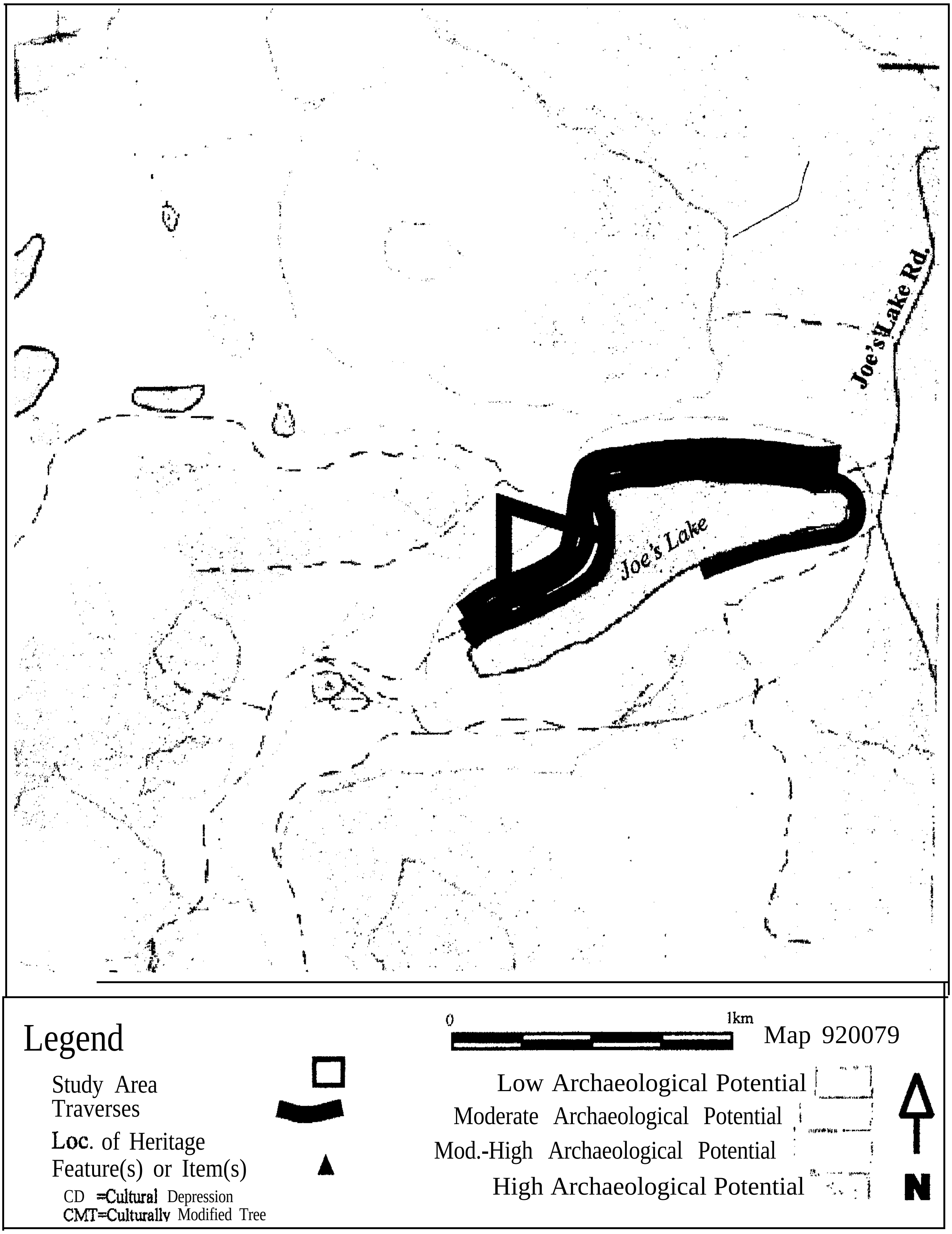


Figure 7. Esketemc Area 1 Joe's Lake

The understory comprised wild roses, The ground cover wasn't visible due to the snow. The land gently sloped, occasionally interrupted by flat terraces. The hydrology consisted of the lake itself with a seasonal stream at each end.

The north shore of Joe's Lake was snow-free which allowed for a more intensive survey. A 150m wide transect was walked from the east end to the west end of Joe's Lake. Open grassland with patches of trees covered most of the north side of the lake. The forest cover was predominantly Douglas-fir, with juniper understory, and grass ground cover. The slope is 5-10° sloping down toward the lake. Above the lake, the terrain flattens to a gently rolling terrace. Visible stumps of old Douglas-fir show signs of logging within the last five years.

Another traverse was conducted from the protruding point along the northern lakeshore. It was run on a 300" bearing for 500m. The first 105m consisted of a steep slope (30%) with mostly grass cover. At 105 m the slope flattens out to form a promontory, a perfect hunting lookout. No cultural material was found at this location but no subsurface testing was conducted. At 200-t the ground slopes almost imperceptibly and is covered with Douglas-fir. Logging has been undertaken in the area and old roads criss-cross the landscape. A 100m to the southwest the start of the traverse back to the lake began. This traverse runs due south and covers the same terrain as described above. No cultural material was located along these traverses.

No archaeological resources were discovered around Joe's Lake, however, disturbances fi-om logging and road building may have impacted the potential for discovering lithic scatters. Joe's Lake occurs in the medium-high archaeological potential rating zone and though there are no recorded sites Irvine Johnson (personal communication 1998) indicated that the area was traditionally used for hunting and collecting. Future archaeological surveys around Joe's Lake with sub-surface testing may yield archaeological sites.

SURVEYED AREA 2-ALIXTON LAKE

Alixton Lake is located approximately 8km due east of the Alkali Lake reservation. The shorelines of the lake were surveyed with a 30m to 150m wide traverse. The survey area was predominantly within the medium-high archaeological potential zone. The dominant vegetation consisted of lodgepole pine, Douglas-fir, and trembling aspen. No visible understory noted. The ground cover was primarily bunch grass. The terrain was generally flat to slightly rolling. The hydrology consists of the lake with a small stream entering and exiting. A natural spring occurs at the south east end of the lake where there appeared to be an upwelling of fresh water beside the shore in an ice free zone surrounded by thick ice from the main body of the lake.

Surveys on the southern shoreline of the lake showed evidence of archaeological remains, Numerous CMTs and blazed trails were observed and noted. The presence of cultural material other than CMTs was difficult to ascertain because of the thick snow cover. The traverse along the southern shore began at the western end of the lake and proceeded east until reaching the tributary at the eastern end. Beginning at a swamp at the western end of the lake, numerous CMT bark-stripped pine trees with tool marking were noted.

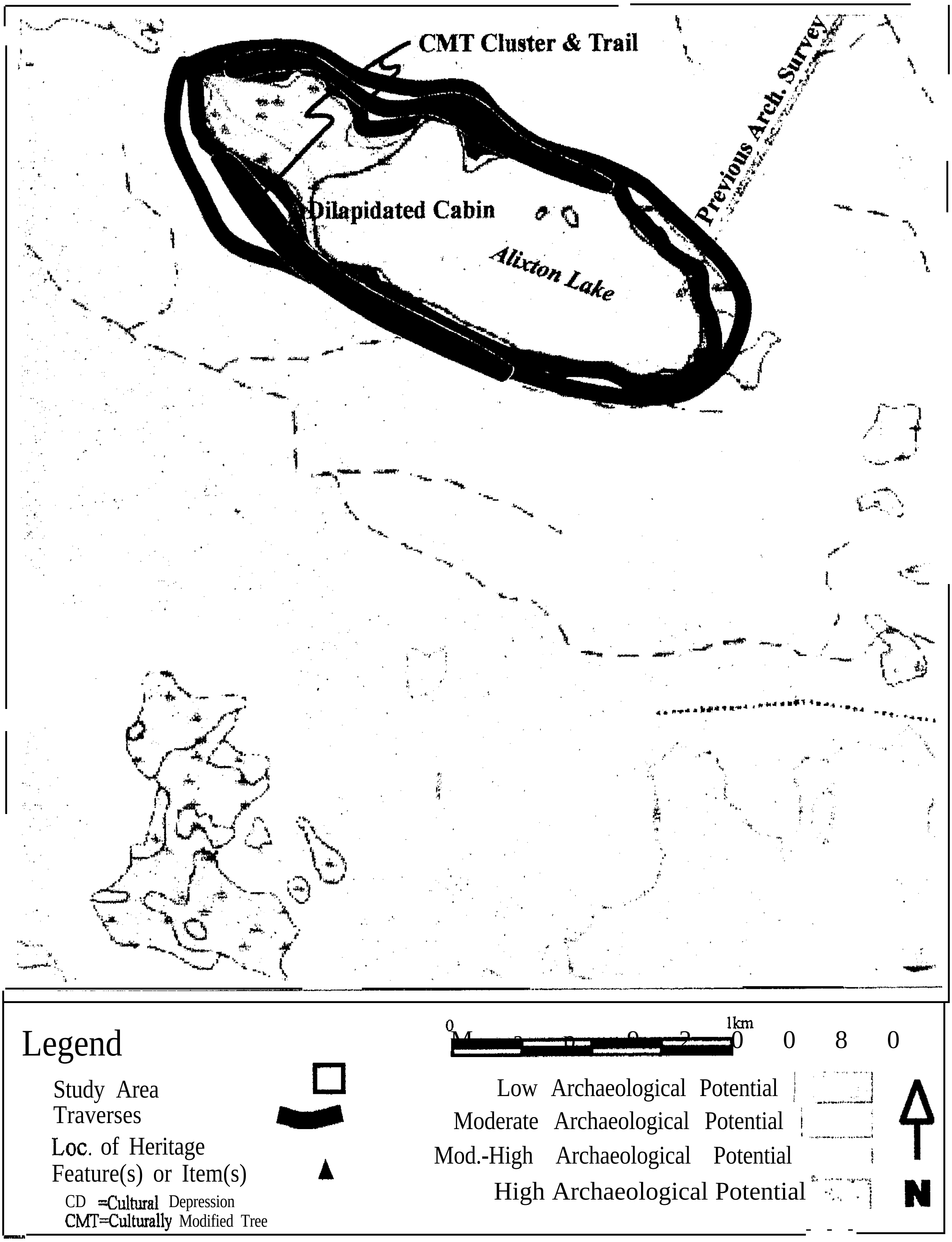


Figure 8. Esketemc Area 2 Alixton Lake

Wagon trails as well as human and animal trails with associated blazed trees circled the lake. An old dilapidated cabin was located on the southwestern shoreline of the lake close to the marsh that surrounds the creek. The cabin according to Irvine Johnson was owned and occupied by Antoine Napoowid, a First Nation Alkali resident who died in the 1950's. The cabin was approximately 12 by 12ft and contained square as well as modern wire nails with round heads. The roof appears to have been caved in for quite some time. Numerous historic artifacts were scattered around the cabin including skis from a horse drawn sleigh, bottles, scraps of metal, and old horseshoes. Surrounding the cabin are 18+ bark stripped lodgepole pine CMTs with tool marks. Many more CMTs may occur in the area but were not observed due to the low intensity survey. East of the cabin was an old Russel log fence paralleled by a recently built barbed wire fence.

Horse trails paralleling the fences eventually veered off to the south. Numerous CMTs follow along the horse trail. Irvine Johnson noted that the trail goes to Gustafson Lake and Green Lake, and was used by his elders. CMTs are still present a half-km down the lake. An old hunting camp was also discovered at this location which contained sawn logs placed in a square shape, surrounded by bark-stripped lodgepole pine CMTs. As one continues southeast, there is a higher frequency of Douglas-fir and less lodgepole pine.

The north side of Alixton Lake was surveyed using a similar traverse and had similar vegetation. The shore on the north side of the lake is buffered by a wide, open grassy area turning into a young pine forest. Erratic boulders were littered over much of the open area. Locals refer to the lakeshore as the "Devil's Golf Course" (Irvine Johnson personal communication 1998). From the western end of the lake beginning at a culvert, many bark–stripped pines with subsequent kindling chops were noted. A trail was also noted along the shore with blazes on both pine and aspen trees. CMTs were present for the majority of the traverse along the northern shore except for the eastern end, which was characterized by a lot of blow down and a high percentage of Douglas-fir. A stone cairn or trail marker was discovered along the trail. No lithic scatters or cultural depressions were found, however the lack of sub-surface testing may have restricted their discovery.

SURVEYED AREA 3

Surveyed Area 3 is a one square km quadrat located in the bunch grass zone along the main Dog Creek Road approximately 5.5km south of Alkali Lake. The surveyed area encompasses all of the archaeological potential rating zones and has within it one previously recorded site, EkRn-1, a pictograph site. Vegetation consists of the occasional cluster of old Douglas-fir. Sagebrush and juniper make up the shrub layer, with grasses and small cactus comprising the ground cover. Hydrology consists of Alkali Creek traversing the northern comer of the surveyed area, and an unnamed seasonal creek flowing across the southern portion of the quadrat. Snow cover was minimal in the non-forested areas.

The first traverse was a south to north traverse on the eastern side of the main road in the moderate potential zone. The slope was very steep 30+° on this side of the road. No archaeological resources were discovered in this section of the quadrat, EkRn-1 was not relocated because the traverse did not cross its location.

The second traverse from east to west covered the medium-high zone, which is primarily flat cultivated grassland, heavily grazed, with no trees. A circular cluster of grasses surrounding berry bushes indicative of large cultural depressions (CD3) was present along this traverse. It appears to be the remnant of a large pit house partly disturbed by years of being tilled with discs and grazed by cattle. No other cultural material was located along this traverse.

The crew spread out and walked the edge of the terrace high above Alkali Creek. Two small cultural depressions were located approximately 300m along the terrace edge from the end of Traverse 2. Cultural depression 1 (CD1) appeared to be a cache pit measuring 2.9m wide and 60 cm deep. The second cultural depression (CD2) was measured as 3.24m across and 40cm deep. No artifacts were observed near the site, and both depressions were overgrown with sagebrush.

The crew then headed south traversing the grasslands to the small creek at the south end of the study area. The north edge of the creek was inspected up to Dog Creek Road. The southern portion of the surveyed area is in both moderate and moderate-high zone that has one large circular depression (CD4) that is characterized by clusters of grass circling wild rose bushes. It resembles CD1, again years of being tilled and grazed made its cultural authenticity difficult to determine without subsurface examination.

The north west corner of the surveyed area had to be accessed from a wagon road on the opposite side of Alkali Creek within the high archaeological potential zone. The vegetation in this area appeared to be denser and had a higher concentration of alder along the banks of the creek. The slope is very steep on either side of the creek with some areas above the creek becoming truncated cliff faces. Along the banks of the creek there are gentle terraces gradually sloping downstream. Along the northwest creek bank were four cultural depressions, one of which was a large housepit and the other three smaller house pits or matt lodges and cache pits or roasting pits. The largest housepit depression measured 7.70m wide and 20cm deep. The next depression measured 4.6m wide and was very shallow. The third depression measured 4.5m wide and was also very shallow. The fourth depression was 2.20m wide by 30cm deep. All of the depressions were approximately 10m from the creek and were surrounded by large Douglas-fir, willow and various grasses. No artifacts were observed on or near the cultural depressions.

Table 27. Sites in Esketemc Traditional Territory.

Surveyed Area	Site Type	GIS Archaeological Rating
#1 Joe's Lake	No cultural material	Moderate-High
#2 Alixton Lake S. side	Pine CMTs (30+)	High
	Cabin and artifacts	High
	Blazed trail	Moderate-High and high
	Hunting Camp with CMTs	Moderate-High
	Snare Trap	Moderate-High
#2 Alixton Lake N. side	Pine CMTs (25+)	Moderate-High
	Blazed Trail	High, Moderate-High
#2 Alixton Lake E. end	No cultural material	Moderate-High
Area #3 (Alkili Creek)	EkRn- 1 (pictograph)	Moderate
	Cultural depression 3 (housepit)	Moderate-High
	Cultural depressions 1 and 2 (cache pits)	Moderate-High
	Cultural depression 4 (housepit)	Moderate-High
	Cultural depressions (cache and housepits)	High

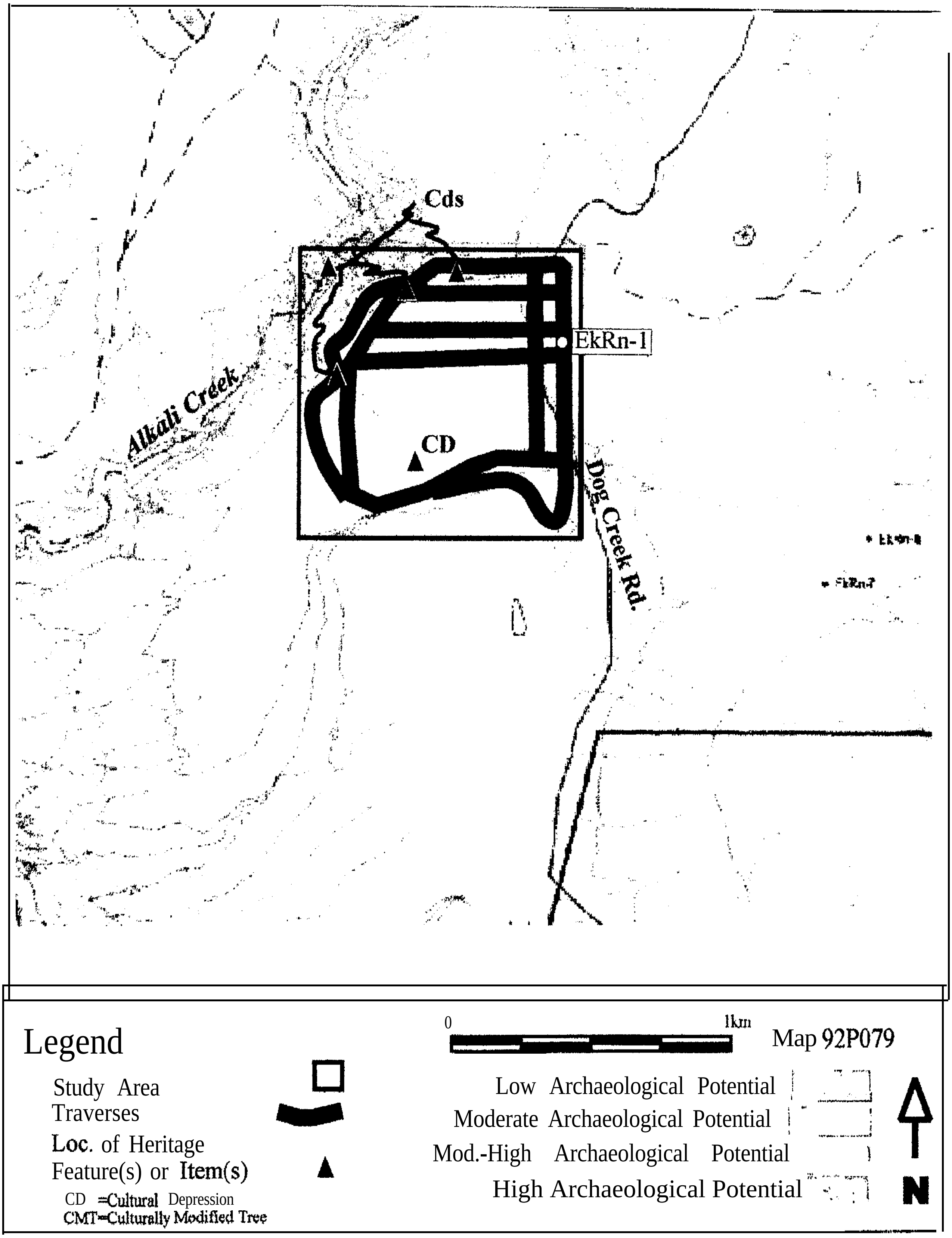


Figure 9. Esketemc Area 3

SUMMARY FOR ESKETEMC TRADITIONAL TERRITORY

A total of 11 new sites and one previously recorded site (historic and prehistoric) were located within the areas surveyed in Esketemc traditional territory. Two large CMT clusters (totalling 55+ CMTs), two hunting/trapping sites with CMTs, a historic cabin with associated artifacts and CMTs, two blazed trails with CMTs, and four house pit or cachepit sites were recorded. Given that this was a low intensity survey a relatively high number of sites were discovered indicating that many more sites could be expected in these areas during a more thorough survey. All sites were discovered in the high or moderate to high potential and no sites were discovered in the low or moderate potential zones.

The model does not discount potential because of steep slope in the bunchgrass and lower IDF, and the appropriateness of this was reinforced. Along the banks of the Fraser River Irvine Johnson showed us a large number (10+) of cache pit depressions that occurred on slopes as steep as 40°. The majority of them were discovered on very small ledges that occur along the walls of the steep gulches that interrupt the sides of the river canyon.

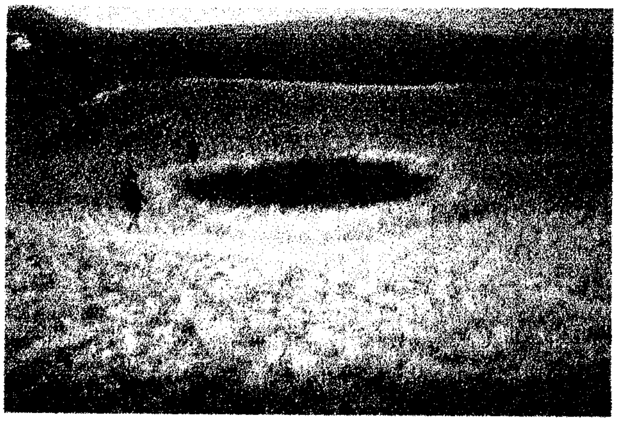


Plate 5. Circular Depression Area 3

Plate 6. General Shot Area 3

Plate 7. CMTs on the north side of Alixton Lake

Plate 8. Cabin at Alixton Lake

SURVEYED AREA 1 BIG CREEK

Surveyed Area 1 for the Yunesit'in Band traditional territory was a one square km area located adjacent to Big Creek approximately 9km south of Barnbrick Creek. Big Creek was the eastern boundary of the surveyed area. The vegetation consisted of predominantly lodgepole pine forest cover with a few Englemann spruce scattering the creek banks. The understory was primarily wild rose bushes. The ground cover was difficult to determine because of the snow cover (approximately 40cm). The hydrology consists of Big Creek to the immediate east and a small unnamed creek flowing east into Big Creek from a large swampy area in the northern portion of the surveyed area. A series of three or four terraces stepped up from Big Creek.

The potential ratings for Area 1 were moderate, moderate-high, and high however the majority of the traverses covered in Area #1 were in moderate-high and high potential areas. The low potential areas have all been recently clear-cut and were under 50cm of snow in some areas. The first area surveyed was a campground area close to the shores of Big Creek. The area had been previously disturbed by road building and what appeared to be a dry sort area for logging. A Russel fence surrounds a portion of the campground. Some 15-20 bark-stripped pine CMTs were identified in the campground area with the majority of them having later kindling chops taken from them. According to Tony Meyers (personal communication 1998), the portion of the surveyed area that bordered Big Creek was traditionally used as a camping and a berry picking area but there are very few longer-term habitation sites there.

The CMTs along the creek indicate an old horse trail that goes from the Big Creek to the mountains west and south. The creek was also utilized traditionally for its fish resources; rainbow trout, Dolly Varden char, and other species. William and Tony Meyers pointed out areas in the campground that were traditionally used for smoking meat, and also noted areas where piles of cobbles may have been used as part of a sweat lodge.

Across the road, following the unnamed creek upstream was an old trail with blaze marks and CMTs all along it. The terrain, which is in a high archaeological potential zone, was characterized by rolling grassy areas interrupted with stands of lodgepole pine, spruce, Douglas-fir, aspen with willow and rose bushes growing around the creek and marsh. The other side of the unnamed creek has similar but flatter terrain and has CMTs along the banks of the creek. As survey along the traverse headed further west outside of the high and moderate/high potential zones there appeared to be less CMTs. However extensive clear-cutting and snow cover restricted the survey from proceeding further west (at the 450m mark) and surveys had to be concentrated elsewhere. Other than CMTs and recent campsites, no other archaeological resources were discovered. Tony Meyers indicated that the area was used extensively for its trails, camping and food resources while travelling through to others areas.

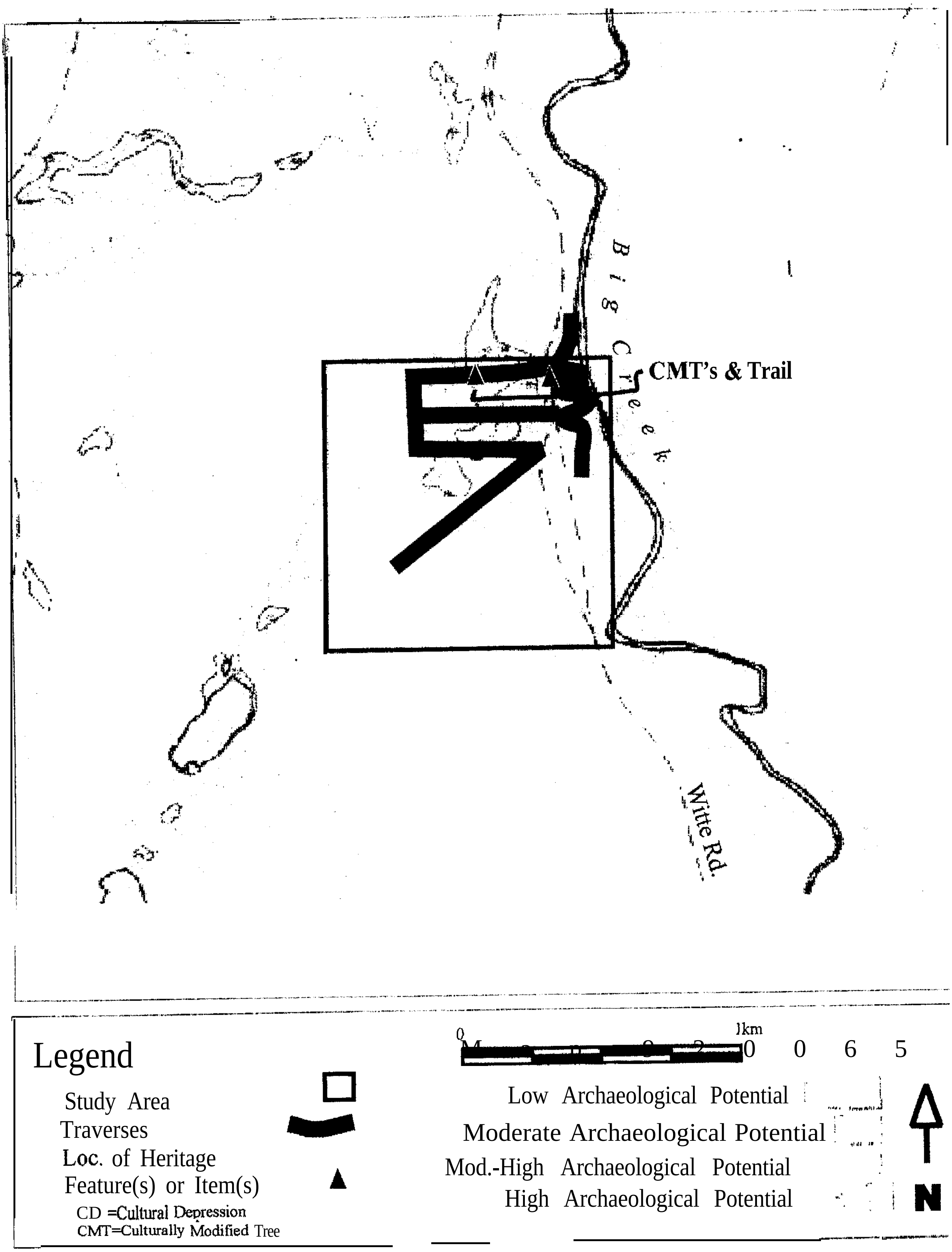


Figure 10. Yunesit'in Area 1 Big Creek

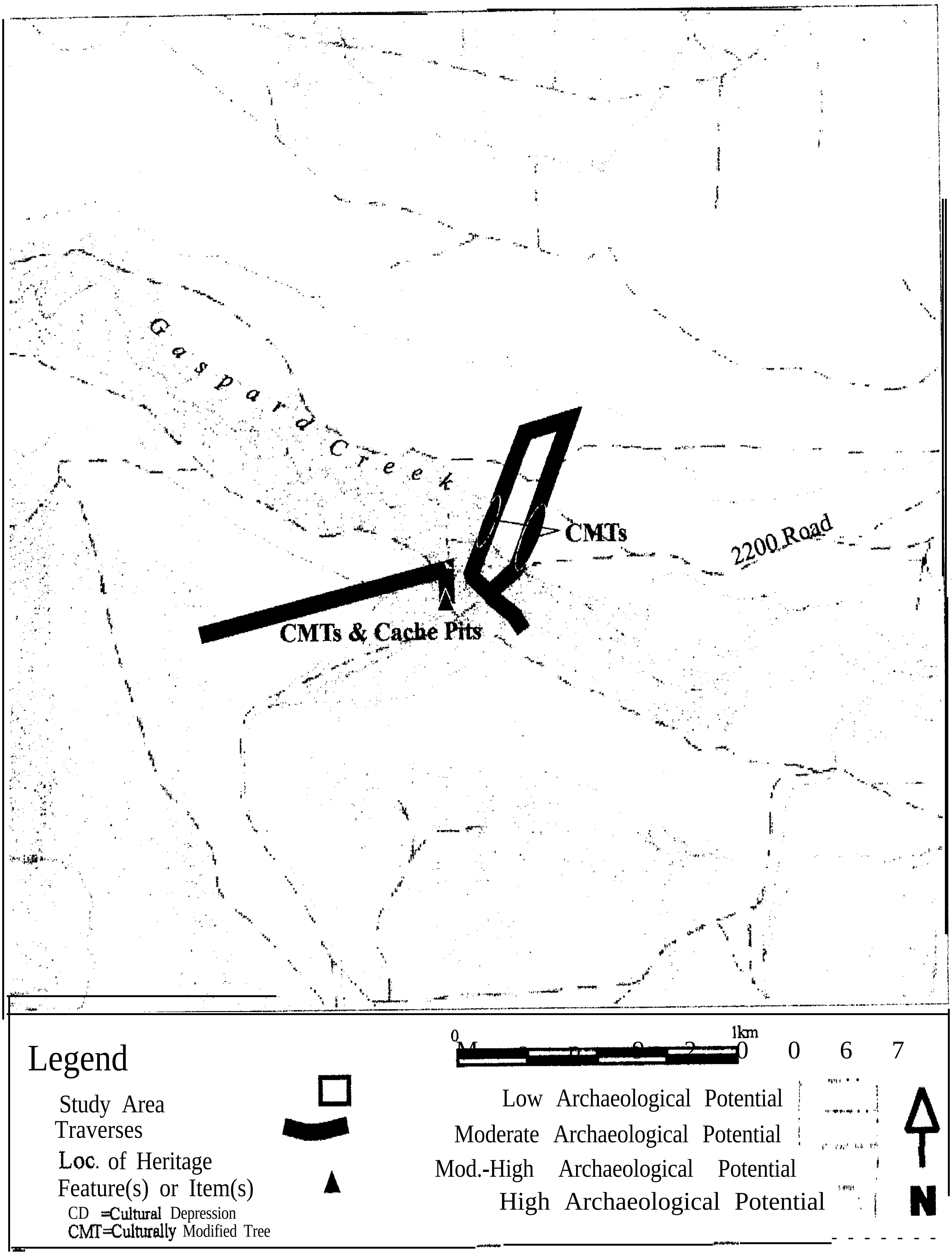


Figure 11. Yunesit'in Area 2 Gaspard Creek

SURVEYED AREA 2 GASPARD CREEK

The second area surveyed in Yunesit'in Band traditional territory was in the area of Gaspard Creek. The area is located approximately 19.2km south down the 2200 Road from the Farwell Canyon Road (Chilcotin South Forest Service Road). The surveying methods consisted of traverses of various lengths covering all archaeological potential zones. The vegetation consists of predominantly lodgepole pine forest cover with occasional stands of spruce and Douglas-fir, and trembling aspen. The understory is mainly willow along the creeks, the ground cover is mainly grasses and moss. The hydrology consists of Gaspard Creek with one other unnamed seasonal creek entering Gaspard Creek near the bridge. The slope is a gentle rolling terrain with terraces stepping their way up from the creek.

A traverse was run along the south side of Gaspard Creek along a terrace or ridge overlooking the creek yielding three CMTs and four cultural depressions. The depressions appeared to be shallow cache pits with no noticeable rim, and were all clustered in one area approximately 10m by Sm. Traverses south away from the creek increased in elevation and saw a noticeable shift in forest cover from pine to fir. On an 800m traverse south away from the creek which entered into moderate and low potential zones no archaeological resources were discovered however snow cover and old logging operations and road building along various ridges made it difficult to identify archaeological resources.

The north side of the creek was very open with scattered pine groves. A traverse was run from the bridge 50" for 686m. Numerous bark-stripped pine CMTs were noted on the first terrace off of the creek (158m) up to 450m, many with later kindling chops. CMTs were also noted on the same terrace on the south traverse back. According to Tony Meyers and Cecelia Quilt (personal communication 1998), the open areas on the north side of the creek were traditionally used for hunting and camping.

SURVEYED AREA 3 SUGARCANE JACKS

Area 3 was shown to us by Tony Meyers, William Meyers and Cecilia Quilt. The area surveyed was located 7. lkm east of the 2400 Road and 1.3km down a wagon trail. Traverse surveys began 1.3km down the wagon trail at the crossing of an unnamed creek. The elders from the Yunesit'in Band refer to this area as Sugarcane Jack's, the name of an individual who lived and built cabins there. The cabins appear to have been abandoned for years and are partially decayed. Traverse surveys in this area cover moderate and moderate-high archaeological potential. The vegetation is comprised of Douglas-fir, lodgepole pine, Englemann spruce and trembling aspen. The understory is mainly comprised of willows and wild roses. The ground cover is grasses and moss. The slope is generally flat to rolling with the unnamed creek being bordered by small terraces. The hydrology consists of the small-unnamed creek as well as a swamp with a second stream flowing in and out of it. Large erratics were present all throughout the area.

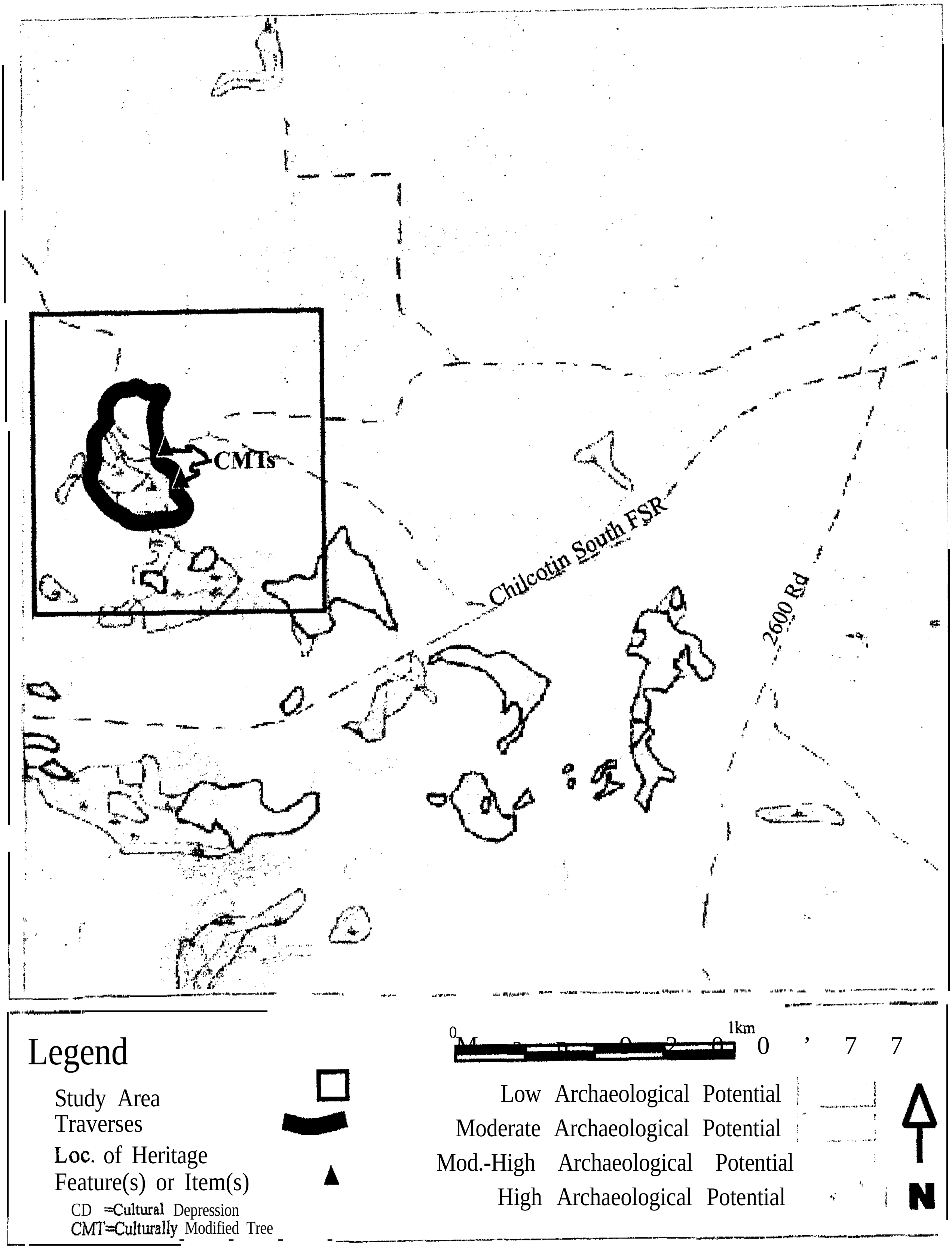


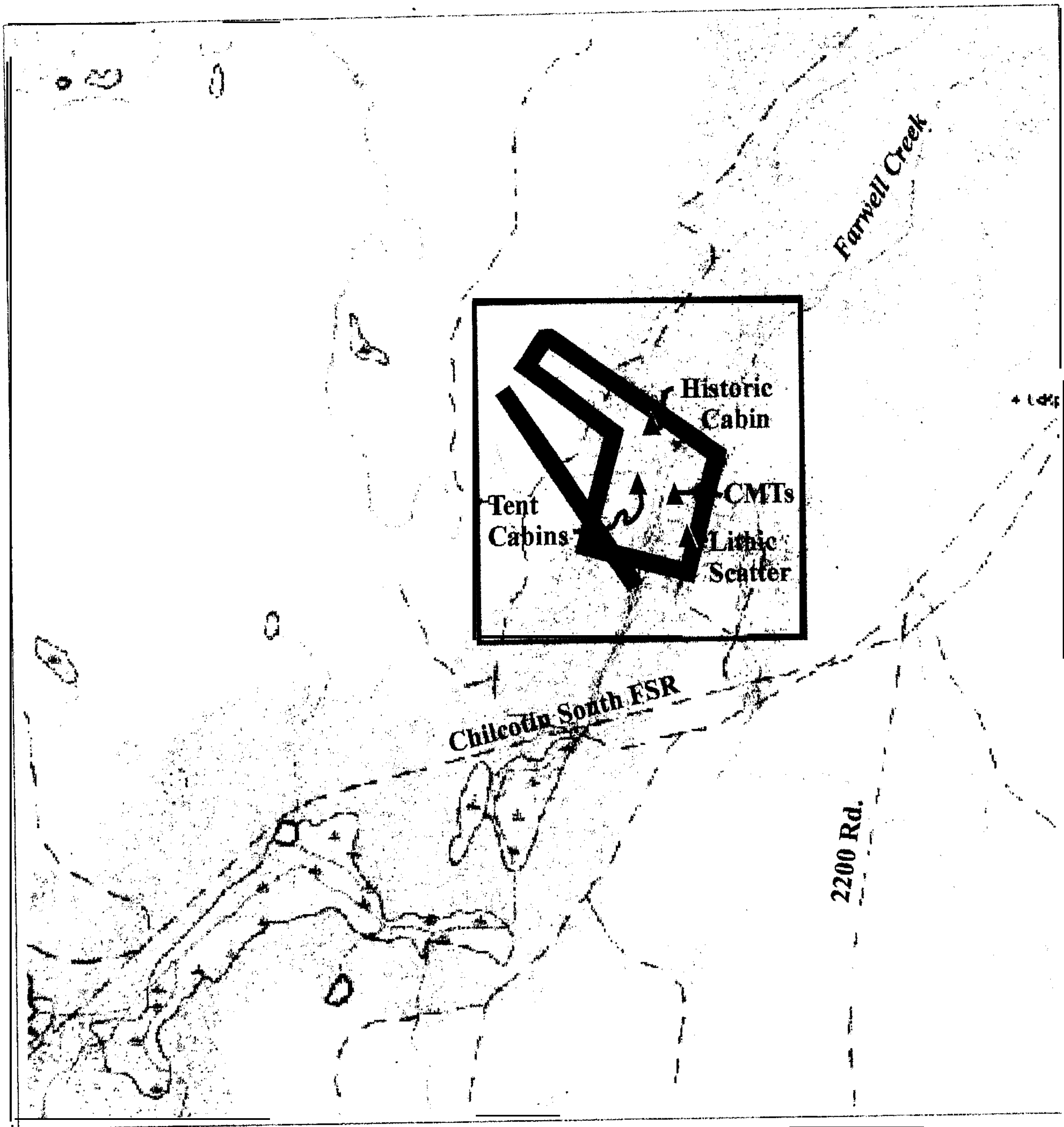
Figure 12. Yunesit'in Area 3 Sugarcane Jacks

A 300m traverse north along the terrace of the unnamed creek in the moderate archaeological potential zone passed through a stand of 10+ CMTs, many with tool markings on them. According to Tony Meyers, the area around Sugarcane Jack's did not have many cultural depressions because of the lack of fish. One of the trails through this area, paralleling the unnamed creek for a few hundred meters, is an old horse trail that went from Anahim Lake to Ashcroft. CMTs occur all the way along it. Surveying around the swamp in moderate-high archaeological potential showed similar terrain and vegetation as well as two very large, old bark-stripped pine CMTs with tool marks. The snow cover was approximately 30cm deep and restricted ground visibility. No lithic scatters or diagnostics artifacts observed in this area.

SURVEYED AREA 4 FARWELL CREEK

Surveyed Area 4, adjacent to Farwell Creek is located 1.7km west of the junction of the Farwell Canyon Road and the 2200 Road, 0.7km down a wagon trail off the north side of Farwell Canyon Road. The traverses surveyed around Farwell Creek are in the high and moderate-high archaeological potential zones. The vegetation in the area consists of lodgepole pine, Douglas-fir, trembling aspen, and alder along the creek. No understory and grass ground cover was noted. The hydrology consists of Farwell Creek and in some areas a marsh surrounding the creek. The slope was generally flat with ridges resembling eskers interrupted by small gullies.

Survey traverses paralleling Farwell Creek on the south side yielded two clusters of CMTs. Many have been sawn down and only the stumps remain. A recently used hunting camp was also present with a fire pit and pole strung between two trees. Three historic cabins were also discovered; two tent cabins and one regular cabin. Both of the tent cabins were almost completely decayed with only the bottom logs remaining. According to William and Tony Meyers, the area was known to have draft dodgers from the First and Second Word War homesteading in the area. Survey traverses heading north away from the creek saw no CMTs or evidence of habitation. Logging operations were present in the area with many old roads and Douglas-fir stumps visible. A small basalt lithic scatter was observed 0.7km down the wagon trail from the main road and on the south side of the creek. Approximately 20 small fine-grained flakes of basalt were observed in a 4 by 6m area. No diagnostic artifacts were observed.



Legend

Study Area
Traverses
Loc. of Heritage Feature(s) or Item(s)
CR =Cultural Depression
CMT=Culturally Modified Tree

0 1km

Low Archaeological Potential
Moderate Archaeological Potential
Mod.-High Archaeological Potential
High Archaeological Potential

N

Figure 13, Yunesit'in Area 4 Farwell Creek

Table 28. Sites in Yunesit'in Traditions1 Territory

Surveyed area	Site Type	GIS Archaeological Rating
#1 Big Creek	Pine CMTs	High
	Trail (w/ CMTs)	High
#2 Gaspard Creek	Cultural Depressions (3)	High and Moderate-High
	Pine CMTs	High Moderate-High
#3 Sugarcane Jacks	Pine CMTs	Moderate
	Trail (to Ashcroft) w/ CMTs	Moderate
#4 Farwell Creek	Cabins and Russel Fences	High Moderate-High
	Pine CMTs	High
	Lithic Scatter	High

SUMMARY FOR THE YUNESIT'IN TRADITIONAL TERRITORY

For the four different areas surveyed in the Yunesit'in traditional territory a total of four CMT sites, one cultural depression site, two historic trails (w/ CMTs), two historic fences (one associated w/ cabins), and one lithic scatter was discovered. All sites were discovered in moderate to high archaeological potential zones with the majority of them being found in the yellow and red zones (moderate to moderate-high). The surveys all seem to confirm the predictive modelling except for trails as some traverse all four of the archaeological potential zones. Absence of trails in the model may contribute to some areas being overlooked as having moderate to high archaeological potential, Numerous CMTs were discovered along trails.

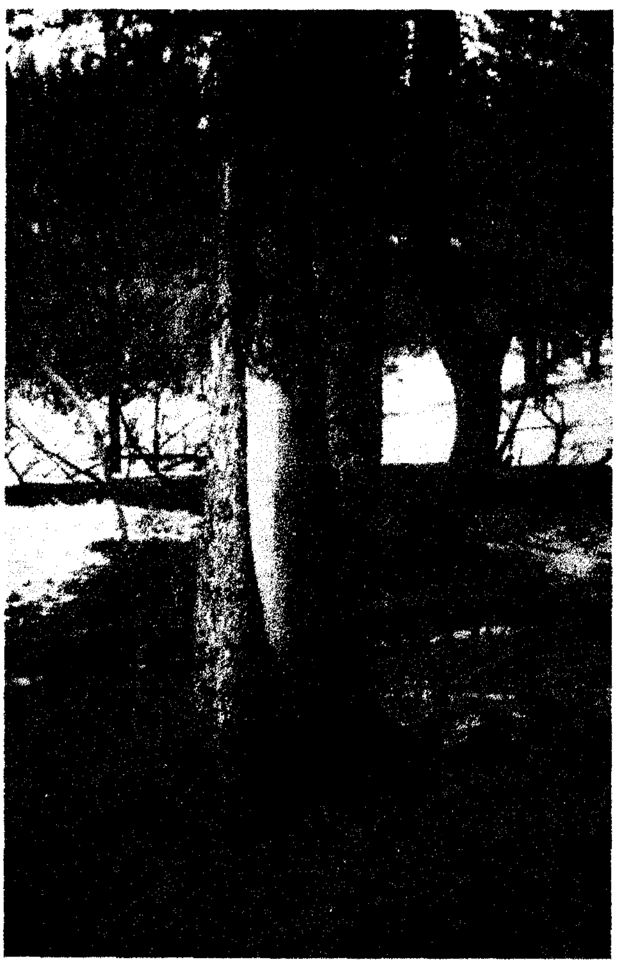


Plate 9. CMT at Big Creek Campsite

Plate 10. Cecelia Quilt beside CMT

Plate 11. Cabin at Farwell Creek

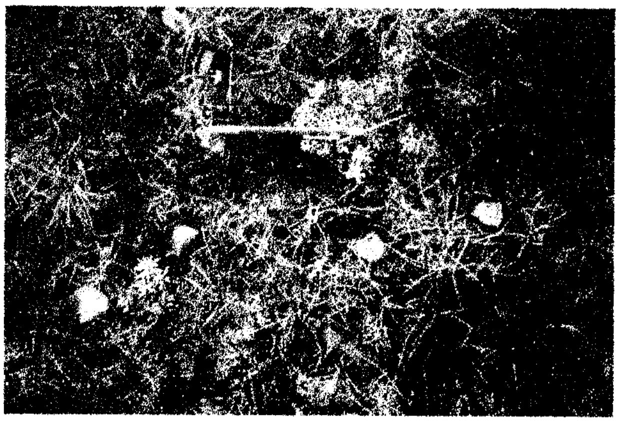


Plate 12. Lithic Scatter at Fame11 Creek

Overall Summary

No major problems in the model were found during this ground truthing. However, relatively little low potential area was surveyed and no high elevation areas were surveyed, so the model has not been tested in a completely representative manner. Snow often hampered ground observations even at lower elevations. Nevertheless, many sites were found. CMTs were especially common, and appear to be under-reported in the existing inventory.

Evaluation and Discussion

Overall, the model presented in this report shows considerable accuracy in predicting the location of known archaeological sites. The methodology of this report combines statistical rigor with ethnographic data and First Nations' consultation to produce the final product. In short, it provides a useful tool for the management of heritage resources. This report does not, however, deal with all of the issues concerning heritage resource management. It must be verified and improved on an ongoing basis through continued archaeological survey and research. In addition, this report is not intended to supersede or replace First Nations' consultation regarding the cultural significance of the archaeological sites discussed.

The accuracy of the final model presented was tested in database format and through field survey. When tested in the database, less than four percent of the known archaeological sites were located in areas of low potential and 84 percent of the sites were located either in moderate high or high potential. This suggests considerable accuracy from a modelling perspective. The field testing of the model, which was conducted primarily in lower elevations supported the findings of the model. The bulk of the sites recorded in this phase of the research were in areas of high or moderate to high potential areas. The field testing of the model was however limited in scope and further survey and inventory work will be required in the future to verify the findings presented here, particularly in higher elevation areas. The field testing of the model and the First Nations consultation that we undertook suggest the importance of trails for site location. We lacked sufficient data to model for trail locations. It is evident from ethnographic sources and from interviews that trails exist in areas that would otherwise have low archaeological potential. We suggest that Traditional Use Studies and First Nations consultation be undertaken to identify and protect these significant features as other archaeological sites may be associated with them. Because of the nature of low potential areas, and the stated concerns of the First Nations whose territory is affected, it is strongly recommended that future Archaeological Inventory Surveys (AIS) be conducted in areas of low potential.

Predictive modelling must remain an ongoing process. The more surveys that are conducted, the more data become available for modelling purposes. The datagaps discussed in this report need to be addressed in the future. Specific areas of concern include the lack of fisheries data, development biases inherent in the surveying process, the lack of documented ethnographic information such as trail locations and issues concerning CMT recording. Another surprising statistical finding of this study is that site slope is less important than previously thought for predictive modelling. This was independently corroborated through both First Nations' consultation and field survey. This suggests that the combination of First Nations' involvement and a rigorous modelling methodology will challenge the assumptions that many archaeologists uphold.

In summary, although we are confident in the results of the modelling process, we recognise that modelling and heritage resource management is an ongoing process that must incorporate both further archaeological study and First Nations' consultation.

Recommendations

The recommendations generated by the AOA are organized in two categories: the first is specific to the use of the potential maps in operational planning and to the level of archaeological effort required for potential zones; the second category addresses ways in which the model can be improved and provides guidelines for its re-evaluation.

Potential Zones and Operational Planning

The Level of Effort appropriate for archaeological study should be negotiated between First Nations, the Archaeology Branch, and the MoF. However, as a guideline, the following recommendations are offered for the various potential areas. The guidelines are organized into two groups: the first deals with cutblocks or other large-scale developments that are wholly contained in a single potential area. The second deals with the more likely scenario that a cutblock contains a variety of potential areas.

Sing/e Potential Zone

High and Moderate-High Potential Areas: Developments within High potential areas and Moderate-High areas both run a high risk of damaging archaeological sites if not subject to AIA. High potential areas will usually have greater site density, and therefore can be expected to require higher budgets to deal with inventory and assessment. Both types of study should be done under permit and should meet the requirements for AIAs outlined in the Archaeology Branch Guidelines.

Moderate Potential: Where no high or moderate-high exists, but **moderate** potential occurs, the block should be assessed by an archaeologist to determine if a field reconnaissance or AIA is necessary. This assessment should take into consideration factors such as: proximity to known sites or large areas of high or moderate-high potential; the values of variables contributing to the potential (access to the database connected to the potential map will be necessary for this step); the presence and nature of Traditional Use information, where available; and gathering of additional information through air photo interpretation, discussion with professional or technical staff who have walked the area, archaeologists who have surveyed nearby blocks, and so on. Often, site densities can be expected to be higher in moderate potential areas near to high potential (as was the case with most of the areas ground-truthed during this study), than in peripheral areas where only a few variables contribute to potential.

Moderate potential areas should normally be subject to field assessment, since almost 13% of known sites occur in lands with Moderate potential. A "Reconnaissance" level of effort, with judgmental coverage of the area, should minimize the risk of not finding a site when in fact a site is present. This work should be done under permit to allow for subsurface testing or upgrading to a full AIA if required.

Low Potential: Sites occur infrequently in these areas, with less than 4% of known sites in Low Potential areas. Archaeological sites in these areas are often associated with trails, wagon roads, or other Traditional Use Sites. These features were not included in the present model, since a good database of these sites was not available. First Nations and the MoF should determine the appropriate level of effort for further archaeological work in Low Potential areas.

Developments Overlapping Several Potential Zones

In many cases, especially when cutblocks are designed without archaeological consideration, developments will often span several different potential zones, with conflicting suggested methods. It will often not be necessary to complete a full impact assessment.

For developments that have even a very small amount of **high** potential, an AIA should be completed. However, in many cases, this high potential will be distributed in a very thin sliver along the edge of a cutblock. In this situation the cutblock will usually also contain areas of moderate-high and moderate potential. In effect, the "AIA" that is conducted in this situation would more closely resemble a reconnaissance survey, with the area of high potential walked through (shovel testing as required), with a return sweep through the moderate-high or moderate potential, expanding to full AIA of these zones if archaeological concerns are identified in the initial passes.

Where no high potential exists, but **moderate high** occurs, some flexibility is necessary. If the area of moderate-high exceeds about 2ha, then a reconnaissance survey or AIA of that part of the block, with inspection of moderate potential lands adjacent to the moderate high, should be conducted under permit. If the area of moderate high is less than 2ha, the block should be assessed by an archaeologist to determine if a field reconnaissance or AIA is necessary. This assessment should take into consideration factors such as: proximity to known sites or large areas of high potential; the values of variables contributing to the potential (access to the database connected to the potential map will be necessary for this step); the presence and nature of Traditional Use information, where available; and possibly gathering of additional information through air photo interpretation, discussion with professional or technical staff who have walked the area, archaeologists who have surveyed nearby blocks, and so on.

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Model

It is difficult to evaluate the accuracy of the predictive model with the relatively small sample sizes available. Archaeological Inventory Surveys (AIS), which have been funded under the FRBC program, can be used to gather data to improve and refine the predictive model developed for the WLFD. Whereas individual AIAs may not examine a large enough area to see the 'big picture', AISs would certainly provide data useful for refining the model, especially in terms of examining what are currently thought to be "low potential" areas.

AISs should focus initially on poorly known areas, as identified in the 'Data Gaps' section of this report and should include a sample of low potential areas. This can serve as a check on the accuracy of the predictive model, ensuring that the model is not missing large numbers of sites in low potential areas. If large numbers of sites are found in low potential areas, then it will be necessary to return to the modelling stage and (1) conduct an analysis of potential problem variables and analytical methods, and (2) identify ways to improve the model.

Future AIS survey and AIAs will quickly produce a much larger sample of CMT sites. From the modest amount of ground truthing undertaken in this project, CMTs appear to be seriously underreported in previous archaeological investigations conducted in the study area. CMTs were found predominantly in 'Moderate' through 'High' potential zones. Particular attention should be paid to the 'Evaluation of Research' components of AIA and AIS studies to ensure that CMT locations are accurately predicted by the model.

The model should be re-examined after one or two years to assess its accuracy and usefulness. At the same time, the database upon which it is evaluated should be updated with information from subsequent AIA and AIS survey. Thereafter, every 5 to 10 years should be an adequate interval for determining whether an update is needed.

Model Revisions

Any revisions to the model should include the expert opinion of an archaeologist. As part of any revision, the database should be queried with revised parameters to determine the effect of buffer changes on the model's accuracy.

References

Alexander, D .

1987a *A Preliminary Inventory and Assessment of Archaeological Resources on Bald Mountain, Southwestern British Columbia.* Report on tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1987b *Ts 'kwa 'ylaxw Ethnoarchaeology: A Preliminary Survey.* Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1992 A Reconstruction of Traditional Land Use Patterns in the Mid-Fraser River Area Based on Ethnographic Data. In *A Complex Culture of the B.C. Plateau: Traditional Stl 'atl 'imx Resource Use,* edited by Brian Hayden, pp. 47-98. U.B.C. Press, Vancouver.

1994a *Ethnographic Overview of the Alkali Lake Band. Archaeological Overview of the Central Portion of Alkali Lake Band Traditional Territory./* Report prepared for Williams Lake Forest District. On tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1994b *A Heritage and Sustenance Inventory of the Pavilion Creek Valley, Southwestern BC.*

1996a *A Cultural Heritage Overview of the Western Half of the Williams Lake Forest District./* Report prepared for the Ministry of Forests, Williams Lake, B.C. On file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1996b *A Literature Review of Native Land Use in the Northern Half of the Horsefly Forest District.* Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1997 Personal communication with Kat Roberts.

Alexander, D., R. Tyhurst, R. G. Matson and L. Burnard

1985 *A Preliminary Ethnoarchaeological Investigation of the Potato Mountain Range and the Eagle Lake Area..* Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C. Permit 1984-14.

Alexander, Diana and R.G. Matson

1987 *Report on the Potato Mountain Archaeological Project (1985).* Report submitted to the Social Sciences and Humanities Research Council of Canada, the Heritage Conservation Branch, and the Nemiah Valley Indian Band Valley Council. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Altimira Consulting Ltd.

1996 *Archaeological Overview Assessment Williams Lake Forest District East of the Fraser River.* Report submitted to the Williams Lake Forest District. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1997a *Archaeological Impact Assessment 1996 TSL A51 773. Report prepared for the Williams Lake Forest District.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1997b *Archaeological Impact Assessment 1996 Small Business Enterprise Projects Williams Lake Forest District.* Report Submitted to the Williams Lake Forest District. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1997c *Archaeological Impact Assessment Preliminary Field Reconnaissance Range Fenceline Developments, Williams Lake Forest District.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Apland, Brian

1980 *Heritage Resource Overview of the Proposed Kelly Lake to Cheekye 500 kV Transmission Line.* Report submitted to B.C. Hydro and Power Authority, Vancouver. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1981 *Williston to Kelly Lake 500 kV Transmission Line , Heritage Resource Impact Assessment.* Report submitted to B.C. Hydro and Power Authority, and the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Arcas Associates

1991 *Archaeological Impact Assessment Williston-Kelly Lake 500 kV Transmission Line Project.* Report on tile, Archaeology Branch, Victoria, B.C.

1985 *Excavations at the Rattlesnake Hill Site (EeRh 61), Ashcroft, B.C.* Authors: Stephen Lawhead and Arnoud H. Stryd. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1994a *Archaeological Overview of the Central Portion of Alkali Lake Band Traditional Territory. Prepared of the Williams Lake Forest District, Williams Lake, B.C.* On *file* with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1994b *Archaeological Impact Assessment, Proposed Logging Developments, Williams Lake Forest District, Near Williams Lake, B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1994c *Archaeological Impact Assessment, Proposed Logging Developments, Williams Lake Forest District, Near Hanceville,* B.C. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1994d *Preliminary Archaeological Impact Assessment, Proposed Logging Development, TSL A50857 Near Alexis Creek, B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1995 *Archaeological Impact Assessments of Forestry Developments on the Chilcotin Plateau, 1995. Volume* 2. Report on file at the Archaeology Branch, Victoria, B.C. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1996 *Archaeological Impact Assessments in Chilcotin, Williams Lake, and Lakes Forest Districts,* 1996. On file, Archaeology Branch, Victoria, B.C.

Bailey, Jeff

1994 *Results of an Archaeological Impact Assessment Study of B.C. Lands ' Proposed Subdivision of Part of the Remainder of Lot 1, Plan 26673, Part of Lot A, Plan 28136, and Part of Lot 1, Plan 32202, District Lot 71, Cariboo District, in Williams Lake, B.C.* Report on tile at the Ministry of Small Business, Tourism and Culture, Victoria B.C.

Beime, Patricia D., and David L. Pokotylo

1979 *Hat Creek Project: inventory, assessment and evaluation of the cultural heritage resources. Permit* 1978-12. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Blacklaws, R.W.

1978 *Final Report of the Nazko #2 archaeological survey. Permit 1978-7. On* file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Boas, F.

1890 The Shuswap. *In Sixth Report of the Northwestern Tribes of the Dominion of Canada,* pp. 632-647. Report of the British Association for the Advancement of Science, London.

Borden, Charles E.

1953 Results of Archaeological Investigations in Central British Columbia, 1952. *Anthropology in British Columbia Memoir* 3:31-43. Victoria, B.C.

Bouchard, R. and D. Kennedy

1979 *Shuswap Stories: Collected 1971 -* 1975. Concept Publishing Ltd.: Vancouver, B.C.

1990 Shuswap Indian Use of the Squilax Area. Appendix I . *In Archaeological Excavations at Sites EfQv-121, EfQv-123, and EfQv-133 near Squalix, BC,* edited by T. Richards and A. Stryrd, pp. 239-321. Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

British Columbia

1994 Heritage Conservation Statutes Amendments Act (Bill 21).

1994 *British Columbia Forest Practices Code: Standards with Revised Rules and Field Guide References.* Queens Printer: Victoria, B.C.

1994 *Protocol Agreement on the Management of Cultural Heritage Resources.* Ministry of Small Business, Tourism. and Culture and the M.inistry of Forests.

Bryan, A.L.

1980 The Stemmed Point Tradition: An Early Technological Tradition in Western North America. *In, Anthropological Papers in Memory of Early H. Swanson Jr.* L.B. Harten, C.N. Warren and D.R. Tuohy Eds. Special Publication of the Idaho State University Museum of Natural History.

Burnard-Hogarth, L.

1983 *Ethnoarchaeological Investigations in the Chilcotin Region of B.C.: Summer, 1983.* Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1984 Ethnoarchaeological Investigations in the Chilcotin Region. In *Athapaskan and Earlier Archaeology at Big Eagle Lake, British Columbia,* edited by M. P. R. Magne and R. G. Matson, pp. 45-78. Report prepared for the Social Sciences and Humanities Research Council of Canada.

1987 *Metes and Bounds: A Search for Archaeological Indicators of Hunter-Gatherer Territoriality.* Unpublished M.A. thesis, University of British Columbia.

Bussey, Jean

1982 Stage II Heritage Resource Impact Assessment: B.C. Hydro and Power Authority Kelly Lake - Cheekye Transmission Line Project. Report submitted to Cypress Resource Consultants Ltd., Vancouver. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1983 *Alexis Creek Archaeological Investigations. Report submitted to Heritage Conservation Branch, Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1989a *Heritage Resource Inventory and Impact Assessment: Blackwater River and Euchiniko River Bridge Projects Quesnel, B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1989b Heritage Resource Overview Assessment: Mount Polley Copper/Gold Property, Wiliams Lake, B.C. Report submitted to Griffing Consultants Inc., Delta. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1990 *Heritage Resource Update: Proposed Kelly Lake/Cheekye 500 kV Transmission Line. Report submitted to B.C. Hydro, Vancouver.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1991a *Heritage Resource Inventory and Impact Assessment: Quesnel, Williams Lake and McBride Highways Districts, 1991.* Report submitted to Archaeology Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1991b *Heritage Resource Inventory and Impact Assessment: Chilcotin Marsh Project.* Report submitted to Archaeology Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Bussey, Jean and Diana Alexander

1992 *Archaeological Assessment of the Cariboo Forest Region. Report prepared for the Archaeology Branch, Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Bussey, Jean and Joyce May

1974 *Department of Highways Archaeological Survey.* On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Carl, A.

1972 *Salvage Archaeology at the Stafford Ranch Site (FaRn 3).* Report submitted to Archaeology Sites Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Carlson, C. and K. Klein

1996 Late Pleistocene Salmon of Kamloops Lake. In *Life in Stone: A natural history of British Columbia's fossils,* edited by R. Ludvigsen, pp. 274-280. University of British Columbia Press, Vancouver, B.C.

Carlson, R.L.

1983 The Far West. In, *Early Man in the New World.* R. Shutler Jr. Ed. Sage Publications. Beverly Hills.

1991 Clovis from the Perspective of the Ice Free Corridor. In, *Clovis Origins and Adaptations*. R. Bonnichsen and K.L. Turnmire eds. Center for the Study of the First Americans, Oregon State University, Corvallis.

Choquette, Wayne

1987 Typological Visibility and the Stemmed Point Tradition. Paper presented at the Canadian Archaeological Association Conference, Calgary.

Clague, John J.

1981 Late Quaternary Geology and Geochronology of British Columbia. *Geological Surveyof Canada*, Paper 80-35.

Cunningham, Evelyn and Emma de Hullu

1967 *Bridge River Gold.* University Printers, Langley B.C. (2nd printing 1993).

Curtis, Edward S.

1911 Salishan Tribes of the Interior. *In The North American Indian: Being a Series of Volumes Picturing and Describing the Indians of the United State,s the Dominion of Canada, and Alaska.* Frederick W. Hodge, ed, 10 vols. Nor-wood, Mass.: Plimpton Press.

Dawson, George M.

1892 Notes on the Shuswap People of British Columbia. *In, Proceedings and Transactions of the Royal Society of Canada,* 9(2): *3-44.*

Debloois, Evan I.

1985 Predictive Modeling in the Forest *Service. In Archaeological Inventory and Predictive Modeling in the Pacific Northwest: Studies in Cultural Resource Management. No, 6,* edited by Richard F. Dorsie and James D. Keyer, pp. 5-l 1 United States Department of Agriculture Forest Service, Pacific Northwest Region.

Donahue, P.F.

1972 *Preliminary Report of Excavations at Texli (FgSd I), British Columbia.* Report submitted to Archaeological Sites Advisory Board of B.C., Victoria.

1975 Concerning Athapaskan Prehistory in B.C. *The Western Canadian Journal of Anthropology* 5(3-4): 21-64.

Duff, W.

195 1 Notes on Carrier Social Organization. *Anthropology in British Columbia* 2:28-34.

1952 *The Upper Stalo Indians of the Fraser Valley, British Columbia.* Anthropology in British Columbia, Memoir No. 1. B.C. Provincial Museum: Victoria, B.C.

1964 *The Indian History of British Columbia: The Impact of the White Man.* . 1st ed. Anthropology in B.C. Memoir No. 5 1. B.C. Provincial Museum: Victoria, B.C.

1969 The Fort Victoria Treaties. *B.C. Studies 3:3-57.*

Duff, Wilson. and Mike K. Rousseau

1978 *A Cultural Heritage Inventory and Impact Assessment of Provincial Parks in the Southern Interior of British Columbia.* Report submitted to Heritage Conservation Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Eldridge, M.

1976 *Survey Sampling on the Fraser Plateau. Permit 197.5-4.* Report submitted to Archaeological Sites Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1996 *Archaeological Impact Assessment of Paradise Creek Cutblocks in the Lillooet Forest District.* Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C. 1996-096.

Eldridge, M. and A. Mackie

1993 *Predictive Modeling and the Existing Archaeological Inventory in British Columbia.* Report prepared for Archaeological Task Group of Geology, Soils and Archaeology Task Force, Resource Inventory Committee. On tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C. Non-Permit Application.

Eldridge, Morley, and Anne Eldridge

1980 *An evaluation of the Heritage Resource potential of the Dean River Valley. Permit* 1979-21. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Eldridge, Morley, and Heather Moon

1992 *Archaeological Inventory in British Columbia. Report prepared for Archaeology Task Group of Geology, Soils and Archaeology Task Force, Resource Inventory Committee.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Ehrhart-English, C. L.

1994 The *Heritage Significance of the Fish Lake Study Area: Ethnography.* Report prepared for Taseko Mines Ltd. On file with the Culture Library , Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

Fan-and, L.

1899 The Chilcotin. In *Report of the 68th Meeting of the British Association for the Advancement of Science, 1898,* pp. 645-647, London.

1910 Tsilkotin. In *Handbook of American Indians North of* Mexico, edited by F. W. Hodge, pp. 826. vol. 1,2. 2 vols. Smithsonian Institution Press, Bureau of American Ethnology, (Bulletin #30), Washington, D.C.

Favrholdt, Ken

1994 "The Extraordinary James Teit", eds. Norton W. & W. Schmidt, in *Reflections: Thompson Valley Histories,* Plateau Press, Kamloops.

Fedje, D.W., A.P. Mackie, J.B. McSporran, and B. Wilson

1996 Early Period Archaeology in Gwaii Haanas: Results of the 1993 Field Program. In *Early Human Occupation in British Columbia,* (eds.) Roy Carlson and Luke Dalla Bona. Vancouver: UBC Press.

Fladmark, K. R.

1975 *A Paleoecological Model for Northwest Coast Prehistory.* Mercury Series, Archaeogical Survey of Canada Papers 43. National Museum of Man: Ottawa, Ont.

1986 *British Columbia Prehistory.* National Museum of Man: Ottawa, Ont.

Franck, I. C.

1997 *Archaeological Data Gap Analysis Williams Lake Forest District.* Report prepared for the Williams Lake Ministry of Forests. On tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

Franck, Ian C., Peter S. Merchant, and Mike K. Rousseau

1993 *An Archaeological Impact Assessment for a Proposed Residential Subdivision on the North Shore of Williams Lake, B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Fraser, S.

1960 *The Letters and Journals, 1806-1808.* MacMillan of Canada: Toronto, Ont.

Friesen, D.E.

1980 *Heritage Resource Assessment of the Proposed Westcoast Transmission Company Limited Vancouver Island Gas Pipeline Williams Lake to Comox and Squamish Lateral.* Report submitted to Westcoast Transmission Company Limited, Vancouver. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Furniss, E.

1993a *Changing Ways: Southern Carrier History,* 1793-1940. Quesnel Forest District: Quesnel, B.C.

1993b *Dakelh Keyoh: The Southern Carrier in Earlier Times.* Quesnel Forest District: Quesnel, B.C.

Germann, C.

1979a *Report of the Cariboo Regional Archaeological Impact Survey - 1978.* Report submitted to Heritage Conservation Branch, Victoria. On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1979b *Report of the Cariboo Regional Archaeological Impact Assessment - 1979.* Report submitted to Heritage Conservation Branch, Victoria. On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Glavin, T.

1992 *Nemiah: The Unconquered Country. New* Star Books: Vancouver, B.C.

Goldman, I.

1941 The Algatcho Carrier: Historical Background of Crest Prerogatives. *American Anthropologist.* Vol. 43, No. 3, pp. 396-418.

1953 *The Alkatcho Carrier of British Columbia.* Unpublished Manuscript on file with the British Columbia Provincial Museum. Victoria, B.C.

Grabert, G.

1974 Okanagan Archaeology. *Syesis 7,* Supp. 2.

Ham, L.C.

1975 *Shuswap Settlement Patterns.* Unpublished M.A. thesis, Department of Archaeology, Simon Fraser University, Bumaby. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.v

Harmon, D. W. (editor)

18 16 *Sixteen Years in the Indian Country. The Journal of Daniel Williams Harmon.* MacMillan Co., New York, N.Y.

Hebda, R.

1983 *Postglacial Environment History, Highland Valley and Surrounding Areas. In Bethlehem Copper Lake Zone Development Heritage Mitigation Study, By A.H. Stryd and S. Lawhead (Arcas Associates), Appendix II.* On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1995 British Columbia Vegetation and Climate History with Focus on 6 KA BP. *Geographie Physique et Quatemaire* 49(1):55-79.

Helmer, James W.

1976 *Results of the 1976 Nazko-Kluskus Archaeological Site Survey. Report submitted to Archaeological Sites Advisory Board of B. C., Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Hewer, Tony

1995 *Archaeological Inventory and Impact Assessment Forestry Cutblocks, East of Fraser River, Williams Lake Forest District (Permit 1995-176). On* file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1996 *Archaeological Inventory and Impact Assessment Timber West Forest Ltd., Beetle Kill Salvages and Cut Blocks H.C.A. (Permit 1995-112).* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Hewes, G.W.

1995

Howe, G.

1980 *Report of the Vancouver Island, Lower Mainland, Cariboo Regional Archaeological Impact Assessment:* 1980. Report submitted to Heritage Conservation Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1982 *Report of the Vancouver Island Lower Mainland Cariboo Regional Archaeological Impact Asessment:* 1981. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1992 *Highway 97 North-South Interconnector Archaeological Site Inventory Quesnel, B.C.* Report submitted to the Archaeology Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Hudson, D. R.

1972 *The Historical Determinants of Carrier Social Organization: A Study of Northwest Athabascan Matriliny.* Unpublished M.A. thesis, McMaster University.

Jenness, D.

1929 *The Ancient Education of a Carrier Indian..* National Museum of Man, (Bulletin #52): Ottawa, Ont.

1934 Myths of the Carrier Indians. *Journal of American Folklore* 47:97-257.

1943 *The Carrier Indians of the Bulkley River: Their Social and Religious Life.* Anthropology Papers 25. Smithsonian Institution Press, Bureau of American Ethnology, (Bulletin #133): Washington, D.C.

Keddie, Grant

1972 *The Chilcotin Archaeological and Ecological Survey Report.* Report submitted to Archaeological Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Kennedy, D. and R. Bouchard

1985 Native People: Plateau. In, *The Canadian Encyclopedia,* Vol. 2: 1208-1210. Hurtig Publishers, Edmonton.

1987 *Notes on Sahhaltkum Ethnography and History* Report prepared for Arcas Associates, Port Moody, B.C.

1992 Stl'atl'imx (Fraser River Lillooet) Fishing. *In A complex Culture of the B.C. Plateau: Traditional Stl'atl'imx Resource Use,* edited by Brian Hayden, pp. 266-354. U.B.C. Press, Vancouver.

Kenny, R.

1972 *Preliminary Report Deep Creek Site (FbRn 13).* Report submitted to Archaeological Sites Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Kew, M.

1974 *Nazko and Kluskus: Social Conditions and Prospects for the Future.* Report on file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

Klassen, Micheal A.

1996 *An Archaeological Impact Assessment of 82 Proposed Timber Harvesting Blocks and Associated Access Roads Conducted for Riverside Forest Products Ltd. in the Chilcotin Forest District, Southwestern B.C.* On File, Archaeology Branch, Victoria, B.C.

Kohler, T. A.

1985 Predictive Models in Archaeology: What Are They and How Are They Being Used? In *Archaeological Inventory and Predictive Modelling in the Pacific Northwest: Studies in Cultural Resource Management,* edited by R. F. Darsie and J. D. Keyser, pp. 13-19. vol. 6. United States Department of Agriculture, Forest Service, Pacific Northwest Region.

Krajina, V.

1969 Ecology of Forest Trees in British Columbia. *Ecology of Western North America* 2(1): 1-144.

Krauss, M. E. and V. K. Golla

1981 Northern Athapaskan Languages. In *Subarctic,* edited by J. Helm, pp. 67-85. Handbook of North American Indians. vol. 6. Smithsonian Institution Press, Washington, DC.

Lamb, W. K.

1970 *The Letters and Journals of Sir Alexander MacKenzie.* The Macmillan Company Canada Ltd.: Toronto, Ont.

Lane, R. B.

1953 *Cultural Relations of the Chilcotin of West Central British Columbia.* Unpublished Ph.D. dissertation, University of Washington.

1981 Chilcotin. In *Subarctic,* edited by J. Helm, pp. 402-412. The Handbook of North American Indians. vol. 6. Smithsonian Institution Press, Washington, D.C.

Lawhead, S.

1979 *Salvage Archaeology Project, May - August,* 1978. Report submitted to the Heritage Conservation Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1980 *Salvage Archaeology Project, May 15 - September* 30, *1979.* Report submitted to the Heritage Conservation Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Mackenzie, A.

1970 [1793] *The Journals and Letters of Sir Alexander McDonald.* 2nd ed. Hakluyt Society: Cambridge.

Magne, M., P.R.

1984 *Taseko Lakes Prehistory Project: Report on a Preliminary* Survey. Report prepared for the British Columbia Heritage Trust and Nemiah Valley Indian Band Council. On file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1985a *Taseko Lakes Prehistory Project, Phase II: Preliminary Excavations.* Report prepared for the British Columbia Heritage Trust and Nemiah Valley Indian Band. On tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1985b *Lithics and Livelihood: Stone Tools Technologies of Central and Southern Interior British Columbia.* Mercury Series, Archaeogical Survey of Canada Papers 133. National Museum of Man: Ottawa, Ont.

1985c Taseko Lakes Prehistory Project: A Preliminary Report. *The Midden* Vol. XVII (3), pp. 10-12.

Magne, M. P. R. and R. G. Matson

1982 Identification of "Salish" and "Athapaskan" Side-Notched Projectile Points from the Interior Plateau of British Columbia. In Approaches to *Algonquin Archaeology,* edited by M. G. Hanna and B. Kooyman. The Archaeology Association of the University of Calgary, Calgary, Alta.

1984 *Athapaskan and Earlier Archaeology at Big Eagle Lake, British Columbia.* Report prepared for the Social Sciences and Humanities Research Council of Canada. On file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

Magne, M.-P. R. and R. Tyhurst

1984 Chilcotin Ethnography. In *Athapaskan and Earlier Archaeology at Big Eagle Lake, British Columbia,* edited by M. P. R. Magne and R. G. Matson, pp. 26-45. Report prepared for Social Sciences and Humanities Research Council of Canada.

Matson, R.G. and L.C. Ham

1974 *Shuswap Settlement Pattern Project.* Report submitted to Archaeological Sites Advisory Board of B.C., Victoria. On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Matson, R.G.M., M. Magne and D. Ludowicz

1979 *The Eagle Lake archaeologicalproject; the 1979 field season. Permit 1979-14. On* file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Matson, R. G., M. P. R. Magne, D. Ludowicz and D. L. Pokotylo

1980 *The Eagle Lake Project: Report on the 1979 Season.* Report on tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C. Permit 1979-14.

May, Joyce

1975 *Archaeological Impact Assessments of Proposed Department of Highways Projects. Summer* 197.5. Report submitted to Archaeological Sites Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Meidinger, D. and J. Pojar (editors)

1991 *Ecosystems of British Columbia.* Research Branch, Ministry of Forests and Lands, Victoria, B.C.

Merchant, Peter

1995 *Results of 1994 Archaeological Investigations Conducted on behalf of Timberwest Forest Limited, within the Williams Lakes Forest District, south-central B.C. Permit No. 1994-100.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1996 *Results of Archaeological Investigations Conducted within the Traditional Territory of the Nazko Indian Band on Behalf of West Fraser Mills Limited, Quesnel Operations, for Thirteen Proposed Timber Harvesting Blocks and their Asssociated Access Roads Within CP308 (Blocks A, B, C and D), CP340 (Blocks A,B,D and E), and CP344 (Block A), and CP341 (Blocks A, B, C and D), and one Proposed Road Access to CP227, Near the Blackwater River, Central, B. C. Report prepared for West Fraser Mills Ltd.* On *file* with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Merchant, Peter and Michael Rousseau

1993 *An Archaeological Impact Assessment of Lignum Limited's Proposed 1993-1994 Access Roads and Selected Timber Salvage Sites within CP 699 near Chimney Creek, South-Central B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Ministry of Small Business, T., and Culture,

1995 *Archaeology Branch Annotated Bibliography.* Archaeology Branch: Victoria, B.C.

1996 Heritage Conservation Act. In *British Columbia Archaeological Impact Assessment Guidelines, Archaeology Branch,* Victoria, B.C.

Mitchell, D. N.

1970 Archaeological Investigations on the Chilcotin Plateau, 1968. *Syesis*, Vol. 3, pp. 45-65. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Mohs, G.

1972 *EkRo 28: A Preliminary Site Report. Report submitted to the Archaeology Sites Advisory Board of B.C., Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Montgomery, P.

1978 *The Blackwater Drainage Study. A Heritage Inventory Project in the Vicinity of Quesnel, B.C.* Report on tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

Morice, A. G.

1890 The Western Denes: Their Manners and Customs. *Proceedings of the Canadian Institute, 3rd Series* 25(152):109-174.

1892 Are the Carrier Sociology and Mythology Indigenous or Exotic? *In Proceedings and Transactions of the Royal Society of Canada, 1st Series*, pp. 109-126. vol. 10(2), Montreal, Que.

1893 Notes Archaeological, Industrial, and Sociological on the Western Denes with an Ethnographical Sketch of the Same. *Transactions of the Canadian Institute 4:* l-222.

1905 *The History of the Northern Interior of British Columbia (Formerly New Calcedonia), 1600-1880.* 3rd ed. William Briggs: Toronto, Ont.

1906 The Canadian Denes. *Ontario Department of Education, Report to the Minister, Appendix: Annual Archaeological Report* : 187-2 19.

1910 *The* Great Dene Race. *Anthropos* 5:113-142, 419-443, 643-653, 969-990.

1930 *Fifty Years in Western Canada.* Ryerson Press: Toronto, Ont.

Muir, Robert J. and Michael K. Rousseau

1991 *Results of the 1991 Heritage Resource Inventory and Impact Assessment Study Conducted for Weldwood of Canada Limited's Timber Harvesting Blocks BC9, BC1 0a, BC10b, LCN1, LCN2, LCN3 and LCN4, Within the Quesnel-Barkerville Corridor Near Wells, Central B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1992 *Results of the 1991 Cqwoywytem Heritage Resource Invento y, Dog Creek Locality, Mid-Fraser River Region, South-Central B.C.* Report submitted to the Canoe Creek Indian Band, Dog Creek, Union of B.C. Indian Chiefs, Vancouver and Archaeology Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Musil, R.R.

1988 Functional Efficiency and Technological Change: A Hafting Tradition Model for Prehistoric North America. In Early Human Occupation in Far Western North America: The Clovis-Archaic Interface. J.A. Willig, C.M. Aikens, and J.L. Fagan eds. *Nevada State Museum Anthropological Papers* 21. Carson City.

Palmer, G.

1975a Cultural Ecology in the Canadian Plateau: Pre-Contact to Early Contact in the Territory of the Southern Shuswap Indians of B.C. *Northwest Anthropological Research Notes* 9:199-245.

Palmer, G.

1975b Shuswap Indian Enthnobotany. *Syesis* 8:25-81.

Palmantier, Shawnee and Arlene J. Yip

1997 (unreviewed by the Archaeology Branch) *An Archaeological Impact Assessment of Lignum Limited Forest Liscence A20018, and Timberwest Forest Product Limited Forest Licences A20019 and A20025 on the Chilcotin Plateau, 1996.* On file, Archaeology Branch, Victoria, B.C.

Pike, Jim

1974 Heritage Resource Investigations Along Proposed B.C. Hydro and Power Authority Transmission Line Right-of Ways - Summer 1974. Report submitted to Archaeological Sites Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Rafferty, P.

1976 *Northwest Regional Survey Cariboo Skeena Region.* Report submitted to Archaeological Sites Advisory Board of B.C., Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Ray, V. F.

1939 *Cultural Relations in the Plateau of Northwestern America.* The Southwest 3. Frederick Webb Hodge Anniversary Publication Fund: Los Angeles, CA.

Ray, V. F.

1942 Cultural Element Distribution: XXII Plateau. *University of Califoria, Anthropological Records* 8(2):99-262.

Richards, T. H. and M. K. Rousseau

1987 *Late Prehistoric Cultural Horizons on the Canadian Plateau.* Department of Archaeology Publications 16. Archaeology Press, Simon Fraser University: Burnaby, B.C.

Romanoff, Steve

1992 The Cultural Ecology of Hunting and Potlatches Among Lillooet Indians. In *A Complex Culture of the B.C. Plateau: Traditional Stl 'atl'imx Resource* Use, edited by Brian Hayden, pp. 470-505. U.B.C. Press, Vancouver.

Rousseau, M.K.

1989a *An Inventory, Impact Assessment and Management Plan for Heritage Resources Within Cariboo Fibreboard Plant Development Project Area.* Report submitted to Cariboo Fibreboard Limited, Vancouver and Archaeology and Outdoor Recreation Branch, Victoria. On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1989b *An Inventory, Impact Assessment and Management Plan for Heritage Resources Associated with Pacific Energy Corporation's Proposed Williams Lake Power Station Development Project Area. Report submitted to Inland Pacific Energy Corporation, Vancouver.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1990a *An Inventory, Impact Assessment, and Management Plan for Heritage Resources Associated with the proposed North and End Truck Route Right-of- Way Corridor, Williams Lake, B.C.* Report submitted to McElhanney Engineering Services Ltd., Surrey and the Archaeology and Outdoor Recreation Branch, Victoria.

1990b *A Heritage Resource Inventory and Impact Assessment for a Proposed Residential Subdivision Development on Little Horsefly Lake, South-Central British Columbia.* Report submitted to Mr. Walter Notter, Switzerland, Exton and Dodge B.C. Land Surveyors, Williams Lake and Archaeology Branch, Victoria.

Rousseau, M.K. and R.J. Muir

1990 *Results of the 1990 Heritage Resource Inventory and Impact Assessment Conducted Within District Lot 4941 and Block A, District Lot 8846, Cariboo District, Near Williams Lake, B.C.* Report submitted to NW Energy Corporation, Vancouver and Archaeology Branch, Victoria. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1991a *A Heritage Resource Inventory, Impact Assessment, and Management Plan for Six Ministry of Transportation and Highways Development Projects (1990-l 991) Within Cariboo Regional District, South-Central British Columbia.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1991b *Archaeological Investigations at Site FaRm 23: An Early Shuswap Horizon Deer Hide Preparation Focus, Williams Lake, South-Central B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Rousseau, M.K. and A. Stryd

1988 *Five Referrals, Williams Lake and Quesnel Highways Districts: Detailed Heritage Resource Impact Assessment. Report submitted to the Archaeology and Outdoor Recreation Branch and Ministry of Transportation and Highways, Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Ryder, J. M.

197 1 Some Aspects of the Morphometry of Paraglacial Alluvial Fans in South-Central British Columbia. *Canadian Journal of Earth Sciences* 8(10): 1252- 1264.

Sanger, David

1969 Cultural Traditions in the Interior of British Columbia. *Syesis*, Vol. 2, Part 1 and 2. The British Columbia Provincial Museum, Victoria.

1970 The Archaeology of the Lochnore-Nesikep Locality, British Columbia. *Syesis*, Vol. 3, Supplement 1. The British Columbia Provincial Museum, Victoria.

Spafford, Jim, Jeff Bailey, Martin Handly and Mike K. Rousseau

1995 *Report on* Several *Archaeological Impact Assessment Studies for Riverside Forest Products Ltd. in the Williams Lake Forest District, south central British Columbia. Permit No. 1994-064.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Sneed, P.

1970 *Cariboo Survey - 1970. Report submitted to the Archaeology Sites Advisory Board of B.C., Victoria.* On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Steward, J.

1955 *Theory of Cultural Change.* University of Illinois Press, Urbana

1960 Carrier Acculturation: The Direct Historical Approach. *In Culture in History: Essays in Honor of Paul Radin.* Edited by S. Diamond. Columbia University, New York.

Stryd, A.H.

1972 Housepit Archaeology at Lillooet, British Columbia: The 1970 Field Season. *B. C. Studies* 14: 17-46.

1973 *The Later Prehistoy of the Lillooet Area, British Columbia.* Unpublished Ph.D. dissertation, Department of Archaeology, University of Calgary.

Stryd, Amoud R. And Micheal K. Rousseau

1996 The Early Prehistory of the Mid Fraser-Thompson River Area. In *Early Human Occupation in British Columbia,* (eds.) Roy Carlson and Luke Dalla Bona. Vancouver: UBC Press.

Teit, J. A.

1906 The Lillooet Indians. *In The Jesup North Pacific Expedition Publications,* pp. 193-300. vol. 2(5). American Museum of Natural History, New York, N.Y.

1909 The Shuswap. *In The Jesup North Pacific Expedition Publications,* pp. 447-789. vol. 2(7). American Museum of Natural History, New York, N.Y.

1975 [1900] Part IV: The Thompson Indians of British Columbia. In The *Jesup North Pacific Expedition Publications,* edited by F. Boas, pp. 163-392. 2nd ed. vol. 1. American Museum of Natural History, New York, N.Y.

Thomas, L.

1977 *Archaeological Salvage Investigations at Dragon Lake (FfRo 4).* Report submitted to the Heritage Conservation Branch. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Tobey, M. L.

1981 Carrier. *In Subarctic,* edited by J. Helm, pp. 413-432. Handbook of North American Indians. vol. 6. Smithsonian Institution Press, Washington, D.C.

Turner, N.J.

1992 Plant Resources of the Stl'atl'imx (Fraser River Lillooet) People: A Window into the Past. In, *A Complex Culture of the B.C. Plateau: Traditional Stl 'atl 'imx Resource Use,* edited by Brian Hayden, pp. 405-469. U.B.C. Press, Vancouver.

Tyhurst, R.

1984 *The Chilcotin: An Ethnographic History.* Unpublished Ms. in possession of the author.

1992 Traditional and Contemporary Land and Resource Use by Ts'kw'aylaxw and Xaxli'p Bands. In, *A Complex Culture of the B.C. Plateau: Traditional Stl 'atl 'imx Resource* Use, edited by Brian Hayden, pp. 355-404. U.B.C. Press, Vancouver.

1994 *Fish Lake Heritage Resource Study: Report on the 1993 Archaeological Survey of the Fish Lake Mine Project and Access Corridor in South Central British Columbia.* Report prepared for Taseko Mines. On file with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

Weinberger, D.

1996 *Archaeological Inventory and Impact Assessment Lots 687, 1 1G.1, 23, 1101, 1100,* 2288, Dog *Creek.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Whitlam, R.

1976 Archaeology in the Williams Lake Area, British Columbia. *Occasional Papers of the Archaeological Sites Advisory Board, No.* 1.

Williams, J.

1974 *Preliminary Report: Salvage Archaeology at the Boitanio Park Site FaRm 8. On file,* Archaeology Branch, Victoria, B.C.

Wilmeth, R.

1969 *Excavations at Anahim Lake, British Columbia. Report submitted to the Archaeological Sites Advisory Board of B.C., Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1971 *Field Season of 1971 at Anaham Lake. Report submitted to the Archaeological Sites Advisory Board of B.C., Victoria.* On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1973 *1973 Survey at Anaham Lake.* Report submitted to Archaeological Sites Advisory Board of B.C., Victoria.

1975 The Proto-Historic and Historic Athapaskan Occupation of British Columbia: The Archaeological Evidence. *In, The Western Canadaian Journal of Anthropology,* vol 5, No. 3-4, pp. 4-20.

1978 *Anahim Lake Archaeology and the Early Historic Chilcotin Indians.* National Museum of Man Mercury Series, *Archaeological Survey of Canada Paper No. 82.* Ottawa.

1979 *1979 Field Work Near Anahim Lake, British Columbia.* On file, Archaeology Branch, Victoria, B.C.

Wilson, I.R.

1986 *Heritage Resource Inventory Alexander Mackenzie Heritage Trail Fraser River - Punchaw Lake; Tsacha Lake - Blackwater River.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1993a *Archaeological Resource Overview Big Creek Forestry Program.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1993b *Archaeological Resource Inventory and Impact Assessment Bald Mountain Forestry Area, Permit 1993-100.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1994 *Archaeological Resource Inventory and Impact Assessment CP 946, FL A45024 Gay Lake, Permit 1994-7.5.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1995 *Archaeological Inventory and Impact Assessment: Williams Lake M.O.F. Cut Blocks, Salvages and Silvicultures, Permit 1995-149.* On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Wilson, I.R., Scott McNab, and Kevin Robinson

1994 *Archaeological Inventory and Impact Assessment, Williams Lake Forest District, 1994 Program, East Side Fraser River (Permit 1994-124).* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Wilson, R.R., B. Smart, N. Heap, J. Warner, T. Ryals, S. Woods, and S. MacNab

1992 *Excavations at Baker site, EdQx 43, Monte Creek, Permit 91-107. R. R. Wilson Constultants Ltd.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Wilson, Patricia

1977 *The Nazko-Kluskus Archaeological Survey 1977 Field Season. August 1977.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Winram, P. and L. Thomas

1977 *Northwest Regional Survey Cariboo Skeena Region. Report submitted to Archaeological Sites Advisory Board of B. C., Victoria.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Yip, Arlene J.

1994 *An Archaeological Resource Impact Assessment of Cutting Permit 801, West Churn Creek Area, Williams Lake Forest District.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Yip, Arlene J., and Wayne Choquette

1996a *Report of an Archaeological Impact Assessment of Forest Licence A20018, Cutting Permit 803, Big Basin Forest Service Road and Red Mountain Forest Service Road Permit 1361 (Gravel Pit 1) in the Churn Creek Area.* Report on tile with the Culture Library, Ministry of Small Business, Tourism, and Culture. Victoria, B.C.

1996b *A Report on a Post Harvest Archaeological Impact Assessment and Archaeological Impact Assessment of Imberwest Forest Product LTD. 's F.L. A20019, Cutting Permits 06H, 09X Access Road, 1 IH, 24H, 70H, 699, ;and Gravel Pits 2 and 3 in the Gaspard, West Churn Creek, Empire Valley and Mucking Creek Geographic Areas.* On tile with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1996c *An Archaeological Impact Assessment of West Fraser Mills Limited's Proposed 1995/96 Logging and Associated Development Activities within Forest Licence A20020, Cutting Permits 613, 617, 618, 623, 624, 625, 626, 699, 741, 743, 748/773 and 749 Near Riske Creek B.C.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.