
Archaeological Overview Assessment of the Cassiar-Iskut-Stikine LRMP

Volume I Final Report

Prepared for:

The Ministry of Forests, Bulkley/Cassiar Forest District

and

Tahltan First Nations

and

The Archaeology Branch

By:



Millennia Research Ltd.

May 28, 1998

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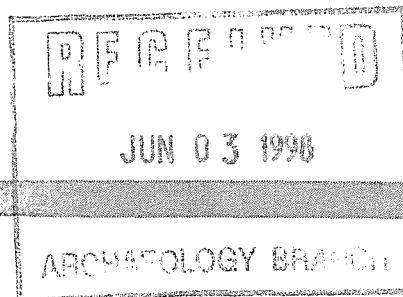
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Millennia Research Ltd.

May 28, 1998



Management Summary

This report presents the results of an archaeological overview assessment of the Cassiar-Iskut-Stikine LRMP region. The report includes two volumes: Volume I is the overall report; Volume II is the archaeological potential maps. The study area for this project is located in the Tahltan traditional territory and includes the entire Cassiar-Iskut-Stikine LRMP region.

The goal of this project was to create a model of archaeological potential from which archaeological potential maps could be created. Archaeological potential maps are tools designed for use in the management of heritage resources. The maps produced during the course of this project are intended to be of use to First Nations, industry, government agencies, the LRMP table, and others in strategic and operational planning. Such planning is necessary as archaeological sites which pre-date 1846, and several other site types regardless of age, 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. Millennia Research Ltd., Diaz-McIlwraith Cultural Services, and representatives from the Tahltan First Nation helped compile the background research for this project.

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 mapping component of this overview was restricted to 42 1:20,000 scale maps out of a total of 458 due to funding shortages. The Ministry of Forests, Bulkley/Cassiar Forest District and the Archaeology Branch selected the sample set of maps.

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 major water sources on well-drained relatively flat terrain. Document research and ethnographic interviews with Tahltan elders were used to help in defining these relationships. All variables for each site-type were then integrated into the GIS and an analysis was made of the predictive ability of each variable for archaeological sites compared to a random sample of locations. A variety of TRIM data, Watershed Atlas, and Wildlife information were used in the analysis. A model was constructed that used the most powerful predictors of the locations of known sites, combined with expected site locations missing from the archaeological inventory but predicted by ethnographic land and resource use patterns. Models were tested against the existing archaeological database to determine accuracy. The GIS then produced maps which detail polygons of high, moderate-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.

The modelling was limited by data gaps, especially the lack of archaeological survey in most biogeoclimatic zones of the study area. Other data gaps include an under-reported site type (Culturally Modified Trees) and the lack of detailed fisheries data. The lack of a GIS routine to identify ridges and bluff lookouts also restricts the accuracy of the model.

To refine the model, we recommend expanding the analysis and mapping to include all mapsheets in the CIS LRMP which would provide a much larger sample size of both archaeological sites and known areas of traditional Tahltan use.

To address many of the data gaps and test model assumptions, Archaeological Inventory Surveys (AIS) should be conducted with Forest Renewal B.C. funding.

As a result of our findings we recommend that high and moderate-high potential areas be subjected to Archaeological Impact Assessment (AIA) prior to any development activities. Areas of moderate potential should be given a reconnaissance level survey (RECCE) where developments are greater than 20 ha. Finally, a sample of low potential areas should be assessed through Archaeological Inventory Survey in order to test the validity of our model. The Tahltan First Nation should help determine the appropriate level of effort for further archaeological work or impact assessment.

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 and title should not be inferred from these maps or this report. These issues should be addressed through consultation with the Tahltan Nation.

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Acknowledgements

Many people helped in various capacities during the course of this project. We are in particular indebted to Kathy Bisset of the Bulkley-Cassiar Forest District, Dease Lake Field Office. Kathy facilitated and guided this project from beginning to end, and it is because of her hard work and long hours that this project was at all possible.

Many people from the Tahltan Nation were involved in various parts of this project. We are grateful to Norm Day, Rodney Day, Sally Havard, Eric Havard, and Gordon Frank for their help during the background research component. John Williams and Norm Day are also thanked for their participation and suggestions in a meeting discussing the variables being used in modelling. Chief Louis Louie and Chief Yvonne Tashoots and the Iskut and Telegraph Creek Band councillors are thanked for the time they spared to discuss this project with us. Several elders participated in interviews for this project including: Loveman Nole, Robert Quock, Charles Quock, Peggy Quock, James Dennis, Susie Tashoots, Myra Blackburn, Jack Clem, Rosie Dennis, Freddie Vance, and Opal Ball. We are extremely thankful to these people for sharing their knowledge with us.

We appreciate the guidance that Glenda Ferris, consultant to the Tahltan First Nation, provided with regard to the ethnography and its application to the modelling.

Rob Diaz of Diaz-McIlwraith Cultural Services conducted background and ethnographic research with the Tahltan participants in this undertaking. Together their work produced excellent results, which were invaluable to the modelling.

Joy Sinnett and Steve Lipscomb of Timberline Forest Inventory Consultants Ltd. were of great assistance to the modelling process. The high calibre of work they produced and their ability to generate maps and models quickly were greatly appreciated.

Doug Glaum of the B.C. Archaeology Branch helped facilitate this project at all levels. We are grateful for his involvement.

Many people at Millennia Research Ltd. helped to see this project through from beginning to end. We are grateful, in particular, for the contributions made by Donna Eckert, D'Ann Owens, and Rod Istace.

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1. Introduction

In the fall of 1997, the Ministry of Forests (Bulkley/Cassiar Forest District) contracted Millennia Research Ltd. to undertake an Archaeological Overview Assessment (AOA) of the Cassiar-Iskut-Stikine LRMP (CIS LRMP).

The purpose of this AOA was to predict archaeological site potential in the CIS LRMP. The assessment of archaeological potential was carried out to guide management decisions regarding heritage resources.

The CIS LRMP is located within the traditional territories of the Tahltan First Nations. Consultation with representatives from the Tahltan First Nation was undertaken during the course of this project.

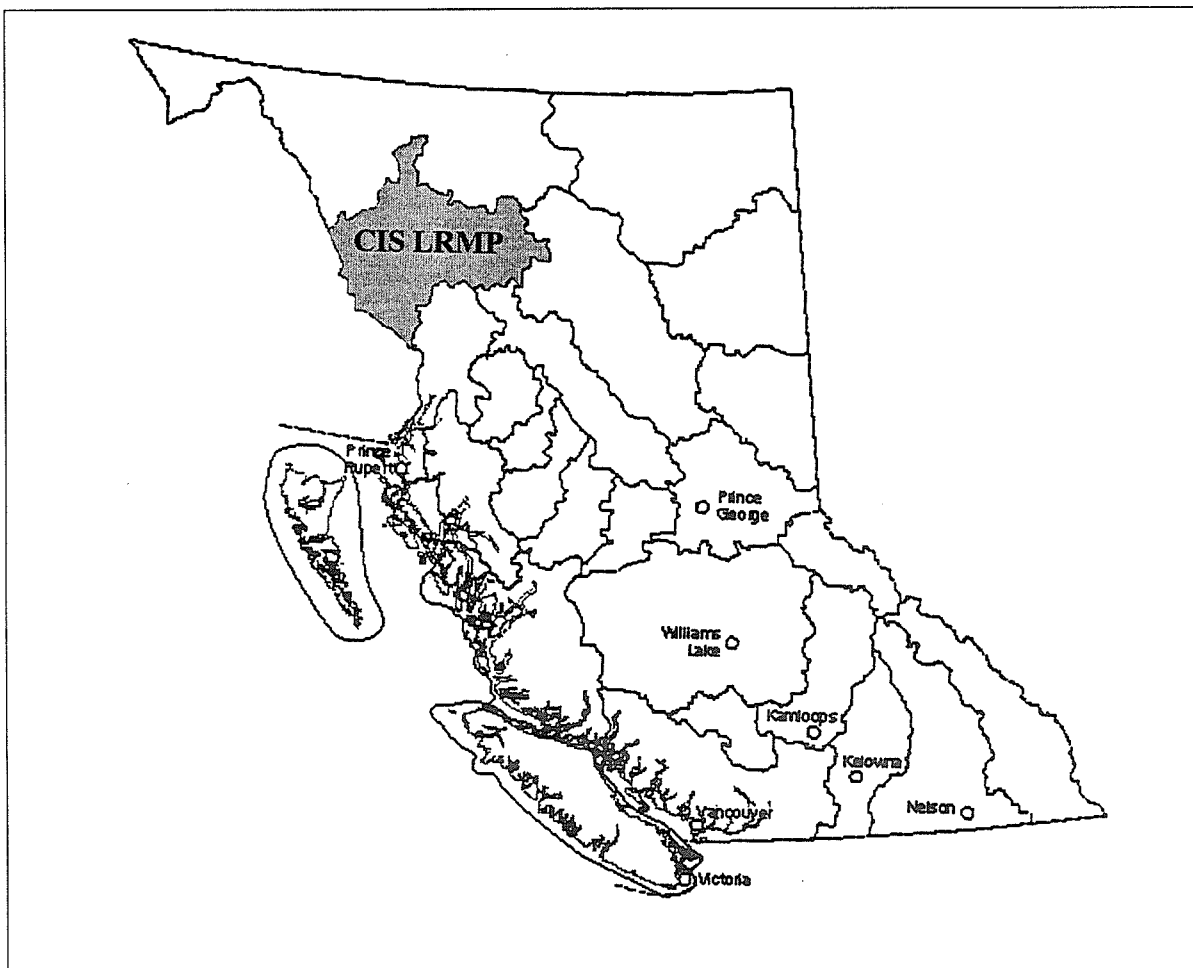


Figure 1. Location of Study Area.

The study area for this project is the CIS LRMP, which is located within the Bulkley/Cassiar Forest District, in the north-western interior of British Columbia (Figure 1). The Ministry of Forests selected two areas within the CIS LRMP for the assessment of archaeological potential that together constitute 42 1:20,000 map sheets (this

represents 9.5% of the entire CIS LRMP region). The first area is along the Stikine River near Telegraph Creek and the other along the Iskut River from Kiniscan Lake to the Nigansaw River. The Stikine River maps were selected as the majority of archaeological research in the CIS LRMP region has been conducted along the Stikine. The Iskut maps were chosen based on operational planning priorities.

1.1 Tasks

The results of this AOA of the CIS LRMP study area were made possible by representatives from the Tahltan First Nation, the Bulkley/Cassiar Forest District, Timberline Forest Inventory Consultants Ltd., Diaz-McIlwraith Cultural Services, the B.C. Archaeology Branch, and Millennia Research Ltd.

Millennia Research Ltd. was contracted to fulfil the requirements of three phases in order to obtain the end goal of this project. Initial startup was in late October 1997.

1.1.1 Phase 1: Background Research

Tasks

- Steering Committee Meetings
- Documentary research;
- Trail research;
- First Nations liaison;
- Acquire archaeological site locations;
- Verify site locations;
- Data gap analysis;
- Map areas of negative results;
- Verify archaeological site database accuracy;
- Tahltan component:
- Interview training and information sharing between researchers; and
- Elder interviews.

Our background research was oriented in finding relationships between geographical, cultural, and environmental features and archaeological sites. The study area was first sub-divided into biogeoclimatic regions. A review of literature on existing archaeological site locations and types was undertaken to gain an understanding of the present distribution of archaeological sites in the sub-regions of the study area. Site locations were verified by checking B.C. Archaeology Site Inventory forms, maps, and archaeological reports for accuracy. Areas that have been surveyed for archaeological sites were also evaluated and mapped. A review of ethnographic documents was conducted in order to gain a better understanding of the way in which archaeological sites are formed through traditional land use activities, and to elucidate generalised locations where specific land use activities take place. A thorough evaluation of historically recorded trails was completed. A bibliography of all the sources utilised for this project is included at the end of this report.

Millennia Research Ltd. sub-contracted Rob Diaz, of Diaz-McIlwraith Cultural Services, to travel to Dease Lake, Iskut, and Telegraph Creek to interview Tahltan elders. Interviews with several Tahltan elders were undertaken to gain insight into the local knowledge of heritage resources in the study area.

Independent of this project, the Ministry of Forests initiated a one-week training course for three Tahltan researchers in mid October, 1997. This week was spent in Victoria conducting background research in the Provincial; Archives, the Royal British Columbia Museum, the Surveyors General's Vault, and the B.C. Archaeology Branch.

1.1.2 Phase 2: Modeling

Task

- Steering Committee and LRMP meetings;
- Meetings with Tahltan re: model building, permits, and interviews;
- Analysis of site/non-site variable data;
- Initial model development;
- Running the models on selected pilot areas; and
- Model refinement.

A meeting was held with Doug Glaum and Heather Moon, representing the B.C. Archaeology Branch, to discuss details of the project. Following this, an initial set of variables was drawn up from the background research with Tahltan and Ministry of Forests participants. These variables were derived, primarily, from the results of the background research. The meetings, held in Dease Lake February 25-28, were used for brainstorming to check for missed or lacking variables, as well as discussing the project itself. The project was also explained to the CIS LRMP table at this time.

The initial model was tested comparing known archaeological site location data to our map of high, moderate-high, moderate, and low potential for archaeological remains. The results of this test were used to refine the model where the test found high percentages of known site locations in low or moderately low archaeological site potential areas. Refinement was not needed where high percentages of known site locations fell within high or moderate-high potential zones. Changes were also made to the model where ethnographic documents supported such changes.

1.1.3 Phase 3: Reporting and Review

Task

- Consultation and review with Tahltan;
- Preparation/editing of summary report; and
- Preparation/editing of final report.

A consultative meeting was held with Tahltan chiefs and councillors February 26, 1998. It was requested at this meeting that none of the ethnographic interview data compiled during this project be released to the CIS LRMP table until the project was

completed. Upon completion of the project the Tahltan will decide what information can be presented to the LRMP table.

A draft report was compiled for review by members of the Tahltan Nation, Ministry of Forests, and B.C. Archaeology Branch. Comments and edits were received from the Ministry of Forests and B.C. Archaeology Branch and are addressed in this final report.

1.2 Report Format

This report includes two volumes. In addition to this introduction section, Volume I, the final report, contains nine sections following. Section 2 defines the study area and provides study area setting information. Section 3 provides a brief description of the Tahltan interview process. Section 4 presents the ethnographic and documentary background research. Section 5 presents the archaeological background research. Section 6 presents a description of the development of the predictive model. Section 7 presents a discussion of the research while Section 8 presents the report recommendations. A bibliography and appendices are presented in Section 9 and Section 10 respectively. An overview map of the CIS LRMP is provided in Map Pocket 1. Volume II contains five 1:50,000 archaeological potential maps of those areas selected for archaeological potential analysis within the CIS LRMP.

2. Study Area

The following section provides a general introduction to the CIS LRMP as well as the areas selected by the Ministry of Forests for archaeological potential assessment. Physiographic and biogeoclimatic summaries of the CIS LRMP are also included.

2.1 Location of the CIS LRMP and Areas Selected for Assessment

The CIS LRMP (Figure 1) is located in the northern interior of British Columbia. The western boundary of the study area is the B.C. – Alaska border along the Coast Mountains, from a point east of Endicott Arm south to Mount White-Fraser. The southern boundary runs north from Mount White-Fraser and turns east at a point just south of Tumeca Lake to include Tumeca Lake and the headwaters of the Stikine River. The eastern boundary extends to include the headwaters of the Chukachida River. The northern boundary runs along the northern extent of the Pitman and Kehlechoa Rivers, and the Three Sisters Range, south below Dease Lake and runs north to include Tuya River and Tuya Lake (see Map Pocket 1).

The Ministry of Forests and the B.C. Archaeology Branch has selected two areas within the CIS LRMP for the assessment of archaeological potential (see Figure 2). The first area is along the Stikine River and the other along the Iskut River. The Stikine River maps were selected as the majority of archaeological research in the CIS LRMP region has been conducted along the Stikine River. The Iskut maps were chosen based on operational planning priorities. The first area is a 1296 km² section of the CIS LRMP along the Stikine River that consists of 9 1:20,000 map sheets including: 104G073, 074, 075, 083, 084, 085, 093, 094, and 095. The four corners of the area are: a point on the Stikine River just north of its confluence with the Chutine River (southwest), a point (southeast), a point on the Stikine River just south of its confluence with the Little Tahltan River (northeast), and a point on the Tahltan River just north of Tahltan Lake (northwest). The second area is a 4752 km² section of the CIS LRMP along the Iskut River that consists of 33 1:20,000 map sheets including: 104G008, 009, 010, 018, 019, 020, 028, 029, 030, 038, 039, 040, 048, 049, 050, 058, 059, 060, 068, 069, 070, 078, 079, 080, 104B078, 079, 080, 088, 089, 090, 098, 099, and 100. The four corners of the area are: a point south of the Iskut River just south of its confluence with Forrest Kerr Creek (southwest), a point just north of Unuk Lake (southeast) (not all of 104B080 is within the CIS LRMP), a point just west of Eddontenajon Lake (northeast), and a point northwest of Nuttlude Lake (northwest).

The end product was plotted at 1:50,000 scale following the NTS grid pattern. These maps are: 104G01, 104G08, 104G09, 104G14, and 104B16 are included in Volume II Map Pockets 1-5.

2.2 Physiographic Subdivisions

The CIS LRMP covers a broad geographical area with a number of distinct biophysical zones. The following describes the biophysical context as it pertains to the distribution of resources, as well as the location and preservation of archaeological and heritage features in the study area.

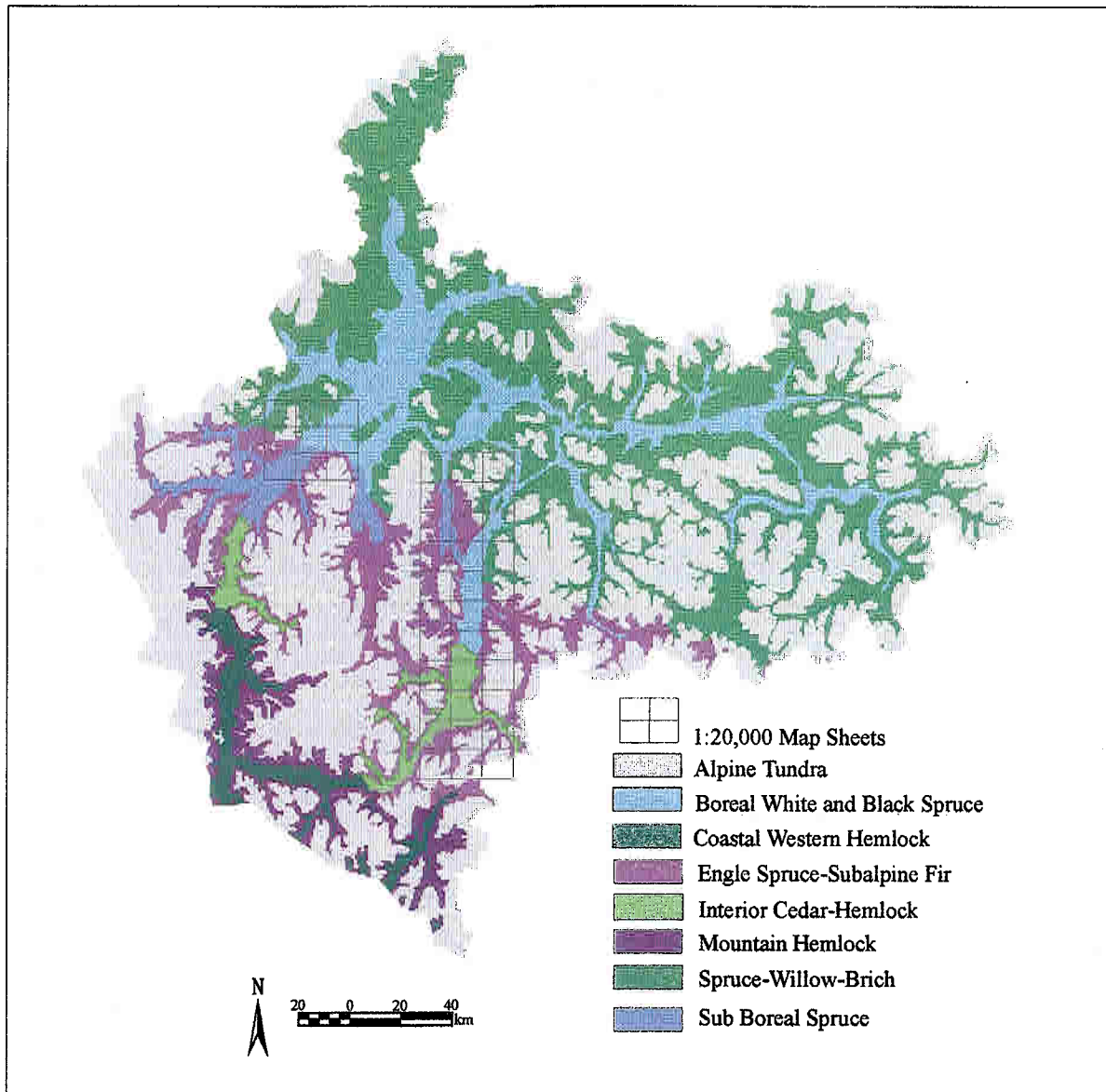


Figure 2. Location of the 42 1:20,000 Map Sheets that Constitute the Stikine and Iskut River Areas Selected for Archaeological Potential Assessment.

The study area encompasses four physiographic regions including: the Coast Mountains, the Stikine Plateau, the Cassiar Mountains, and the Skeena Mountains. The following section provides a brief description of each region and its areas and is after Holland (1964). Physiographic coverage was then compared to the archaeological potential coverage for that part of the study area selected for modelling. In this way, archaeological potential can be correlated to physiography.

2.2.1 Coast Mountains

The Coast Mountains are part of the Coast Mountain Area and run along the coast of British Columbia from the Fraser River in the south to the Yukon and Alaska borders in the north. The region is bordered on the west by the Coastal Trough region at the 610 m elevation level and on the east by the plateau and highland regions of the interior. The Boundary Ranges area is the subdivision north of the Nass River valley within the study area.

2.2.1.1 Boundary Ranges

The Boundary Ranges are located in the western part of the study area. The Tagish and Tahltan Highlands border the area on the east. The ranges show signs of heavy glaciation. The high peaks are matterhorn in shape as a result of cirque glaciation, while the peaks and ridges below 1980 m are rounded and subdued by the erosion of ice-sheet movement. The valleys are characterized by U-shape profiles with steep walls and truncated spurs.

2.2.2 Stikine Plateau

The Stikine Plateau is part of the Central Plateau and Mountain Area. The plateau region is bordered on the north by an arbitrary separation with the Yukon Plateau between Atlin and Teslin Lakes, on the south by the Skeena Mountains, on the west by the Boundary Ranges, and on the east by the Stikine Ranges and the northern Omineca Mountains. Six of the Stikine Plateau subdivisions are within the study area and include: the Tahltan Highland, the Kawdy Plateau, the Nahlin Plateau, the Tanzilla Plateau, the Klastline Plateau, and the Spatsizi Plateau.

2.2.2.1 Tahltan Highland

The Tahltan Highland is located in the western central part of the study area and is the transition zone between the Boundary Ranges of the Coast Mountains and the plateaus of the interior. The Iskut River borders Tahltan Highland to the south and the Taku River borders it to the north. The Tahltan Highland is divided into two main parts. The northern part between the Taku and Sheslay Rivers is gently sloping between 1520 m and 1830 m with a few higher peaks. Between the Sheslay and Iskut Rivers the landscape is less uniform with high peaks dominated by the Mount Edziza shield volcano with an elevation of 2787 m. The flow of the Sheslay River was at one time reversed into the Tahltan River, likely by isostatic rebound or glacial blockage.

2.2.2.2 Kawdy Plateau

The Kawdy Plateau is located in the northern part of the study area and is bordered by the Taku Plateau on the west and the Cassiar Mountains on the east. The plateau is on the west side of the Tuya River headwaters and is largely unwooded extensive flat summits at the 1520 m elevation level. West and southwest of Tuya Lake are “tuyas”, or steep-sided volcanoes built up on the plateau surface. At 1942 m, Kawdy Mountain is the highest tuya on Kawdy Plateau.

The Pleistocene glacial ice left behind a mantle of drift that formed a series of drumlin-like hills and small shallow lakes between Tachilta Lakes and Teslin Lake.

2.2.2.3 Nahlin Plateau

The Nahlin Plateau is located in the northwestern part of the study area and is bordered by the Tahltan Highland on the southwest, and an arbitrary separation with the Kawdy Plateau on the northeast, and the Tanzilla Plateau on the east. The plateau is on the east side of the Tuya and Nahlin Rivers, and the west side of Sheslay River. The low dome-shaped Level Mountain shield volcano dominates the plateau. A northward movement of glacial ice across the plateau during the Pleistocene has left a number of drumlin-like hills along the Sheslay Valley.

2.2.2.4 Tanzilla Plateau

The Tanzilla Plateau is located in the northeastern part of the study area, east of the Tuya River and north of the Stikine River and is bordered on the east by the Cassiar Mountains and on the west by the Kawdy and Nahlin Plateaus. The plateau is comprised of widely flaring valleys and rounded ridges and peaks. West of Dease Lake and south to Snow Peak is the French Range. Between the Tanzilla River and Stikine River is the Hotailuh Range with Thenatlodi Mountain. The Tanzilla River is thought to have reversed the direction of its flow since the late Pleistocene.

2.2.2.5 Klastline Plateau

The Klastline Plateau is located in the centre of the study area and is bordered on the west by the Tahltan Highland, on the north and east by the Tanzilla Plateau, and on the south by the Klappan Range of the Skeena Mountains. The plateau is on the south side of the Stikine River. The plateau is generally comprised of rolling upland landscape with peaks reaching 1828 m. Much of the plateau is either unwooded or sparsely covered with clumps of spruce or willow.

2.2.2.6 Spatsizi Plateau

The Spatsizi Plateau is located in the east central part of the study area and is bordered on the southwest by the Skeena Mountains, on the east by the Omineca Mountains, and on the north by the Cassiar Mountains. The plateau is an area of wide, drift-filled valleys and open, upland terrain from Mount Brock in the west to Thutade Lake in the southeast. The plateau spans the arctic divide and is drained by the Stikine and Finlay Rivers.

2.2.3 Cassiar Mountains

The Cassiar Mountains are bordered on the west and north by the Nisutlin Plateau, on the west and southwest by the Stikine Plateau, on the northeast by the Liard Plain, and on the east by the Rocky Mountain Trench. The region is divided into four areas including the Dease Plateau, the Stikine Ranges, the Kechika Ranges, and the Sifton Ranges. Of the four major areas that make up the region, only the Stikine Ranges is within the study area.

2.2.3.1 Stikine Ranges

The Stikine Ranges area is located in the eastern part of the study area and is bordered on the southwest by the Stikine Plateau and on the northeast by the Dease Plateau and Kechika Ranges. The Stikine, Finlay, Kechika, Turnagain, Dease, and Liard Rivers, whose valleys are wide and drift-filled, drain the Stikine Ranges. The highest peaks in the ranges are between Thudaka Creek and Turnagain River where the highest elevation is 2712 m. The peaks and ridges above 1830 m are sharply scalloped by cirque glaciers, while the peaks and ridges below 1830 m are more rounded.

2.2.4 Skeena Mountains

The Skeena Mountains Region is bordered on the west by the Tahltan Highland, the Boundary Ranges, and the Nass Basin, on the south by the Nechako Plateau, on the east by the Omineca Mountains, and on the north by the Stikine Plateau. The region is not split up into areas, but rather is a distinctive unit.

Only the northern part of the region is in the study area and is drained by the Stikine River and its tributaries. The northern part of the region is a transition zone from the mountainous peaks of the region proper to the Spatsizi Plateau and is characterised by gently sloping upland terrain.

2.3 Paleogeography

Palaeogeographical descriptions of the CIS LRMP focus on the terrain and changes over time in the general topography and landscape. For archaeologists, knowledge of paleogeographical information is essential since changes in environment not only affect where people can live, but also where archaeological sites will or will not be preserved.

During the Late Pleistocene 17,000-11,000 years before present (BP), an ice sheet covered virtually all of the plateau within the study area, rounding the ridges and summits below approximately 1830 m in elevation and depositing a layer of glacial drift (Holland 1964). Crossing the study area are a number of antecedent rivers that were formed before the Pleistocene, including the Taku, Whiting, Stikine, Iskut, Unuk, Bear, and Kitsault Rivers. These river valleys were the main drainage-routes for the westward movements of glacial ice (Holland 1964). When the ice sheets retreated, ice-contact features were formed, of which the most noticeable are the northwest oriented glaciers. Subsequent

glacial retreats and advances were less extensive, being restricted to mountain valleys (Miller 1976).

Pre-Pleistocene and Pleistocene lava and ash eruptions that poured out over an area of 80 x 16 km formed Mount Edziza. During the Pleistocene, Mount Edziza and the region as a whole, was covered with heavy glaciation. At its maximum, glacial ice reached an elevation of 1980 m to 2130 m, leaving the high peaks matterhorn in shape as a result of cirque glaciation. Some peaks may have been exposed during even the highest extent of the glaciers. Glaciers are still present on many mountains in the study area.

According to Miller (1976), deglaciation was likely well advanced in the northwestern part of the province by 10,000 B.P. and the region was potentially habitable for humans by at least 9,000 B.P. Prest (1969 in French 1980), however, dates deglaciation of the Stikine area at around 9,000 B.P. to 8,000 B.P. There is strong evidence for the existence of a deglaciation glacial lake in an area around the middle of the Stikine Valley and its three northern tributaries: the Tahltan, Tuya, and Tanzilla Rivers (Valentine *et al.* 1978). The Stikine River probably cut the Stikine Canyon after glaciers from Mount Edziza during the Pleistocene and more recent lava flows diverted it from its old channel (Holland 1964). As well, drumlin-like features in the topography of the plateau areas mark the northward retreat of glacial ice (Holland 1964) suggesting that the middle Stikine area was ice free earlier than the Atlin region (Albright 1984).

During the Holocene (11,000BP to present), volcanic activity has continued to effect the geography of the study area. In the Iskut Valley, Holocene lava flows have dammed both the Iskut River and Forest Kerr Creek during two volcanic intervals, one at 8780 ± 150 B.P. and another about 4000 to 5000 B.P. (Blake 1983 in Friesen 1985; Souther 1970). These events are important in terms of archaeological subsistence strategies in the Klastline Plateau area, as salmon may have migrated into the area prior to damming events (see Section 2.5). As well, along the eastside of the Coast Mountains from Telegraph Creek to Unuk River are a number of post-glacial lava flows and cinder cones. Numerous flows are evident along the flanks of Edziza, with some having reached Buckly and Nuttlude Lakes. Obsidian created during volcanic events has been an important source of raw material throughout the Holocene (see Section 5.1).

2.4 Biogeoclimatic Zones

The province of British Columbia is divided into areas of homogenous macro-climate areas called biogeoclimatic zones. Each zone has a particular series of climatic conditions, which facilitate the growth and establishment of certain plant, animal, and insect species.

Biogeoclimatic zone classifications are very important to archaeological predictive modelling as certain resources, and the economic activities associated with these resources, are only found in specific biogeoclimatic zones. Archaeological remains representing these particular economic activities will tend to be located in the biogeoclimatic zones where resources for that economy are available.

Fourteen biogeoclimatic zones have been identified in British Columbia (Meidinger and Pojar 1991), eight of which are represented in the CIS LRMP (Figure 3). These include Coastal Western Hemlock (CWH), Mountain Hemlock (MH), Interior Cedar-Hemlock (ICH), Sub-Boreal Spruce (SBS), Engelmann Spruce-Subalpine Fir (ESSF), Boreal White and Black Spruce (BWBS), Spruce-Willow-Birch (SWB), and Alpine Tundra (AT).

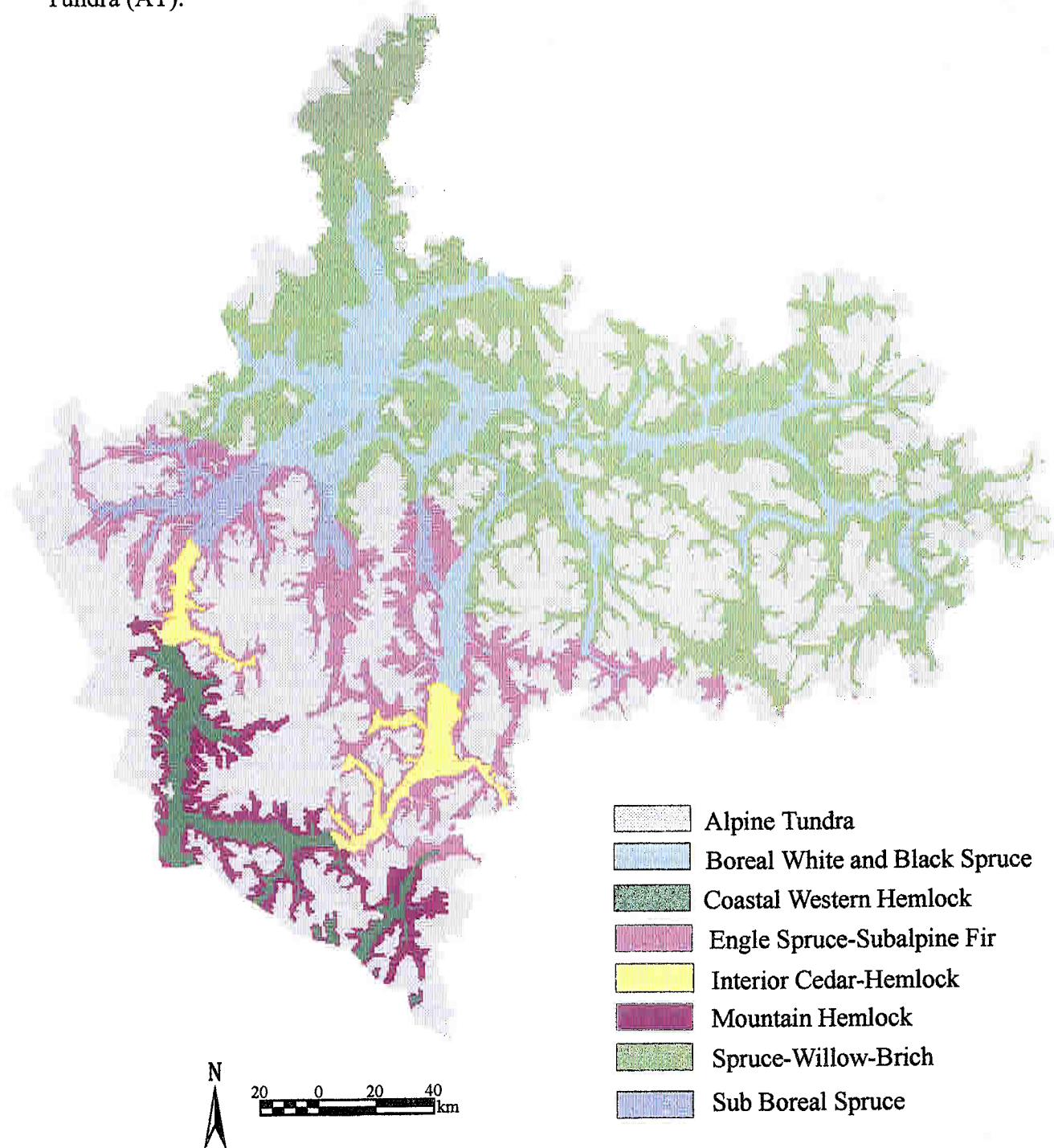


Figure 3. Biogeoclimatic Zones within the CIS LRMP.

The purpose of this section is to demonstrate the extent of resources in all biogeoclimatic zones of the study area. It also illustrates how specific resources are only available in particular zones or particular parts of zones.

There are limits to the extent of interpretation from an analysis of these zones, as zone types are subject to climatic changes through time. As the archaeological record in the area is thought to be at least 10,000 years old, then resource availability has likely varied widely. Environmental stabilisation in the area is thought to have occurred around 5,000 years ago (Fladmark 1975), although minor shifts in zone types have likely occurred in the interim as well.

2.4.1 Coastal Western Hemlock Zone

Information on the Coastal Western Hemlock (CWH) biogeoclimatic zone follows Pojar *et al.* (1991a). The CWH zone is found mostly along the coast of British Columbia at low to mid elevations. Within the study area, the zone penetrates the Coast Mountains along the major river systems and is found along the lower portions of the Stikine, Iskut, and Unuk Rivers. In northern British Columbia, the CWH zone occurs from sea level to 350 m. Above the CWH zone is the subalpine Mountain Hemlock zone.

The CWH zone as a whole is the rainiest biogeoclimatic zone in British Columbia. The zone is characterised by cool summers and mild winters. Nearly half of the annual CWH precipitation in the north can fall as snow. Western hemlock is the dominant species within the CWH zone in the study area, while lodgepole pine, black cottonwood, and Sitka spruce can also be found. The zone as a whole is characterised by a lack of herb coverage and the predominance of mosses such as step moss, and lanky moss.

2.4.2 Mountain Hemlock Zone

Information on the Mountain Hemlock (MH) biogeoclimatic zone follows Pojar *et al.* (1991b). The MH zone is found in the Coast Mountains all along the coast of British Columbia. It is found within the study area along the lower portions of the Stikine, Iskut, and Unuk Rivers from 350-1000 m elevation. In the coastal mountains, the MH zone is the subalpine zone above the Coastal Western Hemlock zone.

The MH zone is characterised by short, cool summers, and long cool, wet winters. Within the zone as a whole, snowfall ranges from 20 to 70 percent of the total annual precipitation. The winter snowpack covers the zone well into the year resulting in a short growing season. Spring and summer are relatively dry, while fall and winter are wet. Mountain hemlock, amabilis fir, and yellow cedar are the most common tree species within the MH zone. A variety of other trees can also be found within the zone including: western hemlock, Sitka spruce, lodgepole pine, subalpine fir. Forest coverage is sporadic throughout the zone. Coverage is more continuous at lower elevations, however at higher elevations forest cover occurs as isolated stands with subalpine heath, meadow and fen vegetation.

2.4.3 Interior Cedar-Hemlock Zone

Information on the Interior Cedar-Hemlock (ICH) biogeoclimatic zone follows Ketcheson *et al.* (1991). While usually found in southeastern British Columbia, the ICH zone is also found east of the Coast Mountains in the Skeena and Nass River drainages. Within the study area, the ICH zone is found along central portions of the Iskut and Stikine Rivers and occurs at elevations of 100-1000 m. Above the ICH zone is the subalpine Engelmann Spruce-Subalpine Fir zone.

The ICH zone is characterised by cool wet winters and warm dry summers. The zone is one of the wettest zones in the interior with between one quarter and half of the annual precipitation falling as snow. Upland coniferous forests consisting mainly of western hemlock dominate the ICH zone. More common secondary species also found in the ICH zone include white spruce, Engelmann spruce, and subalpine fir. While wetlands are not common, riparian and lakeshore marshes are associated with lakes, reservoirs, and waterways. Bogs and fens are generally non-forested and consist of sedges, willows, Labrador tea, bog-laurel, scrub birch, buckbean, bog cranberry, and mosses.

2.4.4 Sub-Boreal Spruce Zone

Information on the Sub-Boreal Spruce (SBS) biogeoclimatic zone follows Meidinger *et al.* (1991). Although normally found in the central interior of British Columbia, small areas of the SBS zone are also located in the study area. The SBS zone is found along the Stikine River at its confluence with Chutine River, along Chutine River, along the headwaters of Mess Creek, and along the Nuttlude and Kakiddi lakes system. The SBS zone occurs from the valley bottoms to 1100-1300 m elevation. In northern British Columbia, it adjoins the Boreal White and Black Spruce zone. Above the SBS zone is the Engelmann Spruce-Subalpine Fir zone.

The SBS zone is characterised by seasonal extremes of temperature. Winters are severe and snowy, but summers are warm, moist, and short. Anywhere from one quarter to one half of the annual precipitation falls as snow. The zone is dominated by upland coniferous forests consisting of hybrid white spruce and subalpine fir. Lodgepole pine is common, while trembling aspen, paper birch, and to a lesser extent, black spruce and black cottonwood, are also found within the SBS zone. In poorly drained areas, wetland vegetation includes sedge marshes, shrub fens consisting of scrub birch, swamp birch, and willows, treed fens and swamps consisting of black and hybrid white spruce, and black spruce-sphagnum bogs.

2.4.5 Engelmann Spruce-Subalpine Fir Zone

Information on the Englemann Spruce-Subalpine Fir (ESSF) biogeoclimatic zone follows Coupé *et al.* (1991). For most of British Columbia, the ESSF zone is highest elevation zone that is forested. It occurs primarily in steep, rugged mountainous terrain. The ESSF zone is found in the southwestern half of the study area from 900-1700 m elevation. The ESSF zone occurs above the Boreal White and Black Spruce zone and just below the Alpine Tundra zone.

The ESSF zone is characterised by a relatively cold, moist, and snowy climate so that summers are short and winters are long and cold. Most of the annual precipitation falls as snow. The zone has continuous forest coverage at its lower and middle elevations that are dominated by Engelmann spruce and subalpine fir. Lodgepole pine are also found within the zone. In upper elevations, the zone has subalpine park coverage that consists of isolated stands of trees interspersed with areas of heath, meadow, and grassland.

2.4.6 Boreal White and Black Spruce Zone

Information on the Boreal White and Black Spruce (BWBS) biogeoclimatic zone follows DeLong *et al.* (1991). In northwestern British Columbia, the BWBS zone occurs north of 56° from the valley bottoms to 1000/1100 m elevation. Within the study area, the BWBS zone is predominately found along the Stikine River drainage system. Above the BWBS zone is the subalpine Spruce-Willow-Birch zone.

The BWBS zone is characterised by long, cold winters and short growing seasons. Snow accounts for almost half of the annual precipitation. The forested portions of the zone are generally located in better-drained plateaus, foothills, and cordilleran sections. These areas are dominated by white spruce, trembling aspen, lodgepole pine, black spruce, balsam poplar, tamarack, subalpine fir, common paper birch, and Alaska paper birch. Above the Stikine River system grassland and scrub communities occur on steep, south facing slopes and are dominated by shrubs, herbs, and grasses.

2.4.7 Spruce-Willow-Birch Zone

Information on the Spruce-Willow-Birch (SWB) biogeoclimatic zone follows Pojar and Stewart (1991a). The SWB zone is the most northern subalpine zone that occurs in north central British Columbia from 1000 to 1700 m elevation. The SWB zone is found in the northeastern half of the study area, above the Boreal White and Black Spruce zone and below the Alpine Tundra zone.

The SWB zone is characterised by long, cold winters and short cool summers. One to two thirds of the annual precipitation falls as snow. White spruce and subalpine fir generally forest the lower elevations of the zone, while pine and aspen are also found. At higher elevations, subalpine fir is prevalent, while black spruce, lodgepole pine, and trembling aspen are also present. Tall deciduous shrubs including scrub birch and various willows predominate upper elevations of the zone. Ponding of cold air in high wide valleys results in a "double treeline" phenomenon where the valley floor is covered in shrub fields, fens and grassland, followed by a skirt of forest at the next layer of elevation, followed by a second shrub layer above the forested layer.

2.4.8 Alpine Tundra Zone

Information on the Alpine Tundra (AT) biogeoclimatic zone follows Pojar and Stewart (1991b). The AT zone is found throughout the study area above the tree line

where severe mountain climatic conditions prohibit tree growth. In this region of the province, the AT zone occurs above 1000 m elevation.

The AT zone is characterised by cold, windy, and snowy conditions. Snow accounts for most (70–80%) of the annual precipitation. Although rock, ice and snow dominates the landscape, various species of stunted trees and alpine vegetation such as shrubs, herbs, bryophytes, and lichens can be found at lower elevations. The most common stunted tree species include subalpine fir, Engelmann spruce, white spruce, and mountain hemlock.

2.5 Fish Resources

Fish resources within the CIS LRMP can be divided into two broad groups, anadromous fish and fresh water fish. The fish species occurring within the study area are listed in Appendix 4.

2.5.1 Anadromous Fish Species

The anadromous fish present in the region consist of various species of salmon and steelhead trout (Appendix 4). The anadromous salmon make annual runs up the major rivers within the study area and represent a predictable and significant subsistence resource. The salmon migrations up the Stikine River occur over a period from the end of May until October. Albright (1984) has noted that over 50% of the Stikine River drainage system is impassable to anadromous fish due to physical obstructions and areas with high water flow velocity (Figure 5). According to Souther (1970), many of the barriers are a result of volcanic activity in the Mt. Edziza and Iskut River areas during the last 10,000 years. Lava likely created barriers preventing salmon from moving up the Iskut River, to Kinaskan, Eddontenajon, and Kluacon lakes (Friesen 1985).

Chinook salmon are the first to run up the Stikine River and spawn in the tributaries of the Tahltan and Little Tahltan Rivers, as well as further up the Stikine River, and Tuka River. The Chinook run from the end of May, through June and July.

The next type of salmon to run up the Stikine River is sockeye. With a minimum of four major evenly spaced runs, the sockeye are the most important salmon resource in the study area. The major sockeye salmon spawning grounds are located at Tahltan Lake.

Pink and chum salmon follow the sockeye up the Stikine River in August, but only as far as the Tahltan River, and only in small numbers.

Coho salmon are the last to migrate up the Stikine River, in September and October. While small runs are made up the Stikine River as far the Tahltan River, the major spawning grounds for the Stikine River coho are up the Iskut River.

Anadromous steelhead trout make their runs up and down the Stikine River from mid-March through April and again in September.

2.5.2 Fresh Water Fish Species

Various fresh water fish (Appendix 4) are available year round in the lakes and streams within the CIS LRMP, but are generally most accessible during spawning periods. Whitefish and char spawn from October to November, while most of the other fresh-water fish species spawn from March to June.

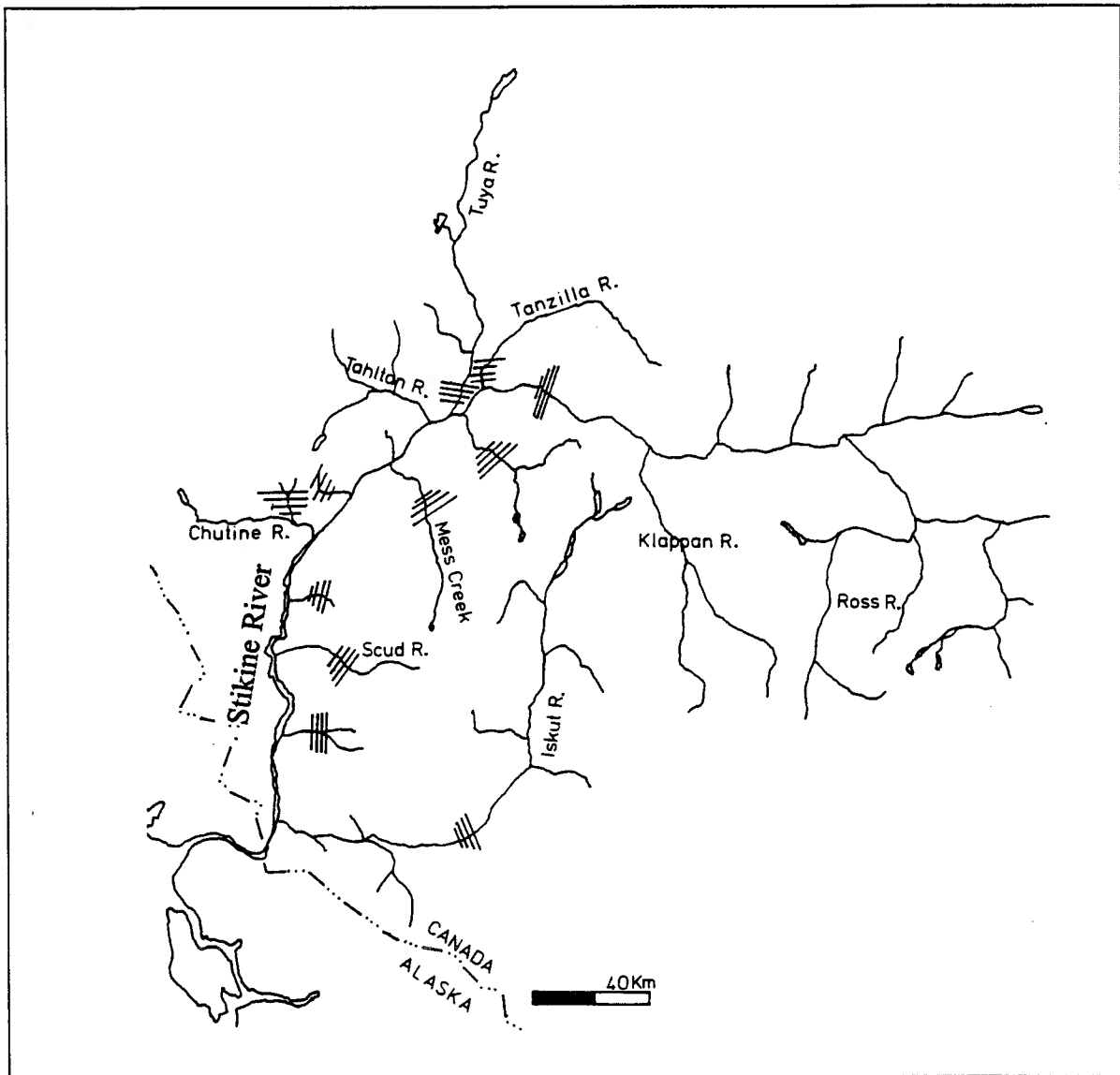


Figure 4. Locations of Barriers Impassable to Salmon within the Stikine Watershed (after Albright 1984).

3. Interviews

Ethnographic methods were used during the course of this study to interview Tahltan Elders regarding specific trail and site information. The results of this work are presented in Rob Diaz's report on 'Tahltan Local Knowledge' (Appendix 7). The goals of this work were to:

- Compile currently existing cultural heritage data;
- Interview Tahltan elders about archaeological sites and other traditional use information directly relevant to archaeological site locations; and
- Train Tahltan representatives in documenting local knowledge.

This information was collected to aid in building our archaeological site potential model and to test the model for possible problems. Refer to Appendix 7 for more information regarding these interviews.

4. Ethnographic and Documentary Background Research

The Duci'ne originated from a boy of evil disposition who killed people. His mother was an Indian woman, and his father unknown. He became completely wild now, and never returned to the people. He went into the mountains where the obsidian is abundant, and made many arrow-heads. Whenever he made one which did not suit him, he threw it away. He spent all his spare time making arrow and spear heads. All the unfinished arrow and spear heads found here and scattered over the country were made by him. They are the "heads" he discarded in his travels around the country and when hunting. He used no flaker of any kind. He flaked the arrow-heads with the palms of his hands, which were of bone. [Teit 1921:353, Origin of Duci'ne].

4.1 Introduction

This section evaluates ethnographic documents and other documents (with regard to trail research) to elucidate settlement patterns, transportation, land use strategies, and beliefs, which relate to the patterning of archaeological sites. References have been made to ethnographic documents in order to determine which types of archaeological sites would have resulted from generalised behavioural patterns that are recorded in the ethnographic record.

4.1.1 Sources

Ethnography refers to the study of the differences and similarities in cultures and human behaviours. A large part of this section is derived from the ethnoarchaeological work of Sylvia Albright. Her work on Tahltan culture "investigates the relationship between environmental variables, resource attributes, technology of exploitation, and details of subsistence activities derived from ethnographic data" (Albright 1984:5). This type of research is ideally suited for modelling purposes. Albright's work is useful for our purposes as she has collected cultural information and evaluated earlier ethnographic works for reasons similar to ours.

The works of other ethnographers have also provided insights relevant to archaeological site patterning. The Tahltan tales which Teit (1909, 1919, 1921a, 1921b) recorded elucidate land use and settlement patterns. In addition, specific tales refer directly to changing sea levels and isostatic rebound. Other works which were useful in evaluating archaeological site patterns from the ethnographic data include: Emmons (1911), Teit (1906, 1956), Thorman (n.d.), and MacLachlan (1981). A bibliography of all references accessed for this research is presented at the end of this report.

4.1.2 Focus

The majority of archaeological work in Tahltan traditional territory has been conducted along banks of the Stikine River and its tributaries. As seen in Table 1, the major fishing camps on these river systems were traditionally used for only a few months of the year. For this reason, there is a great gap in the archaeological study of Tahltan

settlement pattern. To remedy this gap, this section concentrates on areas located away from the major rivers.

4.1.3 Limitations

The evaluation of the ethnographic literature brings up an important issue. The literature discusses a wide range of activities including plant gathering and hunting, which leave little in the way of archaeological evidence. This is significant because the expressed purpose of this section is to assess archaeological potential from ethnographic data. Consequently, many land use practices and other specific cultural patterns are not represented archaeologically and cannot be included in this modelling exercise.

It is important to remember that the ethnographers who worked with the Tahltan employed specific research goals in the construction of their ethnographies. Their works may have been guided by factors that limit their usefulness for this study. Regardless of this, a great deal of excellent ethnographic work has been conducted in the region.

4.1.4 Section Structure

The following headings are used to organize this section:

- 1) Settlement patterns;
- 2) Transportation;
- 3) Economic activities;
- 4) Geographic and geological knowledge;
- 5) Ecological knowledge; and
- 6) Ceremonial practices.

Any key phrases, drawn from ethnographic sources, which have a bearing on the modelling of archaeological potential are underlined.

4.2 Settlement Patterns

Table 1 summarises group size, settlement type and resource gathering activity by season. The reader will be able to gain an understanding of the geographical scope of the seasonal rounds from this table and from Figure 7. This data describes the Tahltan seasonal rounds as semi-nomadic. While large groups of families met each summer for fishing and plant gathering along the banks of the Stikine, much of the rest of the year was spent away from the major river sources. "Nomadic" refers to a careful cycle of movements to traditional camps located in areas of abundant resources.

Emmons (1911:65) suggests that:

It seems very likely that with the abundance of salmon for winter consumption the Tahltan in former times were more sedentary than they are known to have been after the great demand for furs made itself felt, when the incentive to hunt was stimulated by the desire for European products.

However, the importance of the caribou in Tahltan subsistence and culture probably had an earlier and greater effect on the degree of sedentism than did the fur trade. The sub-Alpine forest base camps used by the Tahltan in the winter would likely have provided for many of their needs as they were located “where fire wood was abundant, and in the vicinity of caribou yarding areas or migration routes...” (Albright 1984:90). Furthermore, the trade in furs likely existed prior to the arrival of Europeans in the region (Teit 1912-15).

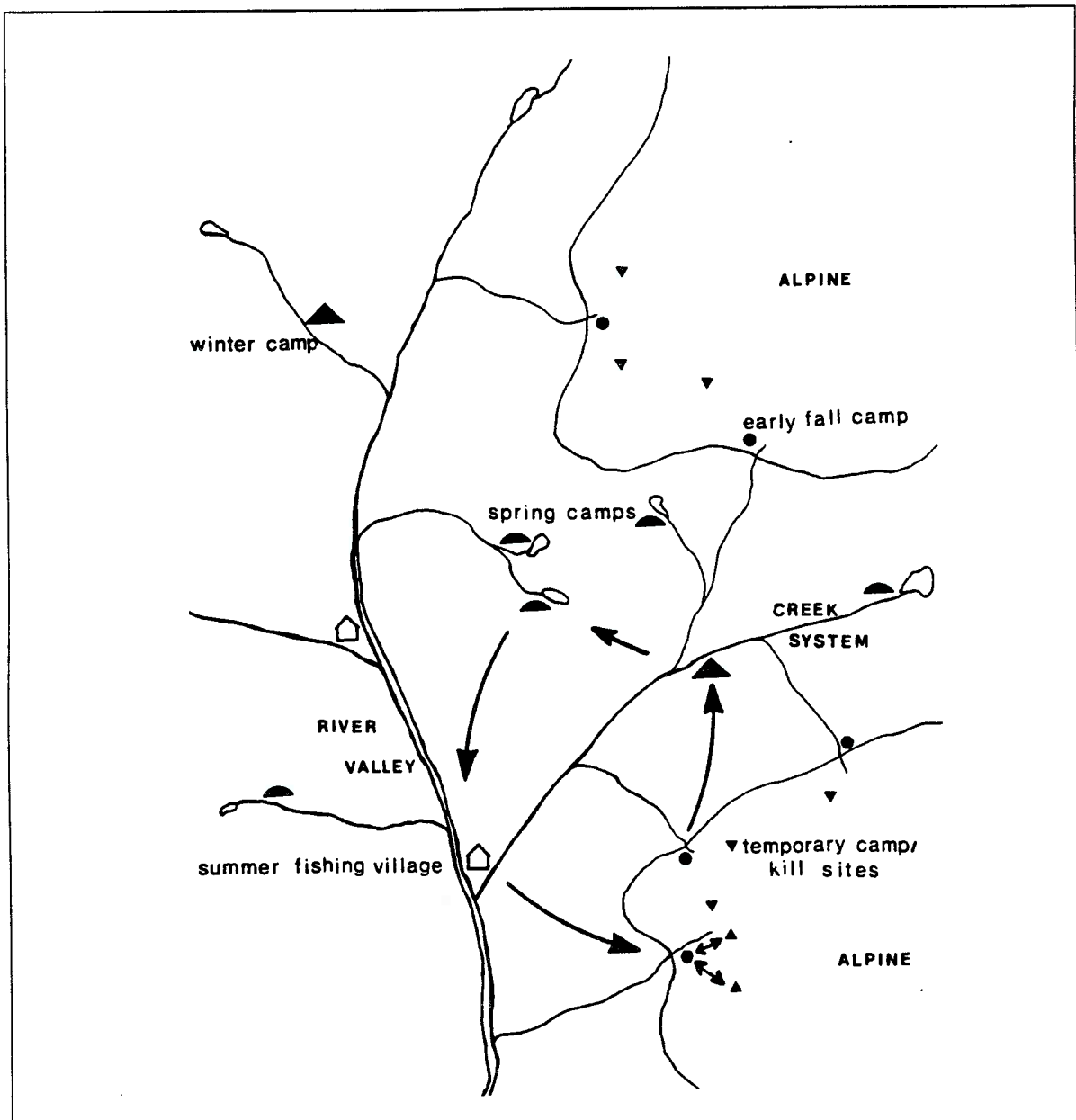


Figure 5. Schematic Representation of Major Seasonal Moves and Settlement Locations (after Albright 1984:89).

While economic factors such as resource availability and seasonality provided the Tahltan with limits on settlement patterns, individuals and families likely had some freedom to move and work within those limits. Some factors relating to settlement patterns, are, however, associated with the earliest times, and are a vital part of the Tahltan identity and culture:

Now Raven turned back from the country of the Mink People, and travelled North again. Now he showed the people the best places to fish, and made some fishing-places better for fishing. He built a house of timber like those the Tlingit use, and told the people to construct similar houses to live in. Before this they had used shelters and camps of various kinds, and some people had no houses at all. He established houses in the most suitable places for the obtaining of food and of shelter [Teit 1919:211, 'Raven in the Country of the Tahltan']

He [Raven] made a brush-house, and said to them, "You will live in this kind of house even when it is cold weather. Camp where there is plenty of dry wood, so that you can have good fires. There will always be plenty of dry wood in this country for you to use." This is why the interior Indians (Tahltan and others) use brush-lodges, and camp in a different spot each winter, according to the supply of fire-wood to be obtained. Much fire-wood is required to keep warm in brush-houses during cold weather [Teit 1919:212, 'Raven in the Country of the Tahltan'].

4.2.2 Environmental Factors and Settlement Patterns

Resource availability played an important role in the settlement patterns of the Tahltan. If resources in one area were scarce, their flexible lifestyle allowed for the quick mobilisation of the base camp into an area where conditions were better:

Men, women, and children, to the best of their ability, carry back packs, and the dogs saddlebags. Having selected a favourable locality, they make camp and hunt and trap thereabouts until the game has become scarce, then they shift their camp, and so continue throughout the winter; but it is now their custom to return to the village about Christmas, and to go out again later for the early spring hunting, after which they come in with their stock of furs, and the trading begins [Emmons 1911:40].

In addition to resource availability, the ethnographic record describes several other environmental factors, which affect the locality of settlements. One factor that is most often mentioned, is the proximity of camps to water. The following represents just a few examples:

A man with his wife and children were camped near a large lake. Here they had set snares for caribou, and nets for fish [Teit 1921a:227, 'The Blind Man and the Loon' version 'b'].

A man lived with his wife and children near the head of a creek; and near by, at the head of another creek on the opposite side of the mountain, lived his sister and her husband. [Teit 1921a:238, 'The Man and His Sisters'].

A man had a wife who fell in love with a water-being who lived in a lake near their camp. The husband noticed that his wife was always sick and could do little work. When she went for fire-wood, she brought only a little [Teit 1921a:242, 'The Water-Being as a Lover'].

Table 1. Seasonal Mobility and Land Use (modified after Albright 1984)

Season/Time	Location	Site Type	Social Unit	Structures	Tools	Resources Utilized
Mid June through Mid Aug., 8 weeks	"Village sites were generally located at major creek and river confluences and at the outlets of lakes where large runs of salmon passed on their way to spawning grounds and could be easily caught in weirs and basket traps" (Albright 1984:85)	Fishing Villages	Several extended families: 100-150 people	Smokehouse foundations: post molds, hearths, pits for cooking, smoking, processing, and storage. Weirs, netting stations	Axes, hammerstones, choppers, adzes, obsidian flakes, knives, boiling stones	Salmon, beaver, trout, hare, deer
-	General vicinity of village	Plant Gathering Sites	Several women and children	Berry pits?	Digging sticks	Primary berry season, limited floral remains: black current, saskatoon, raspberry species, strawberry, gooseberry, soapberry, silverberry, yarrow (flowers/leaves), mugwort (leaves)
Mid Aug. to Mid Sept., 3-4 weeks	At timberline "near the heads of many small tributary creek valleys ... located at the ecotone between alpine meadow and subalpine forest" (Albright 1984:88)	Camps	Extended family: 15-25 people	Outlines of lean-to shelters, post molds of drying racks, smudge pits, hearths, storage pits	Axes/adzes, hammerstones, obsidian flakes, knives, boiling stones	Marmot, gopher, sheep, goat, bear, caribou, ptarmigan, dried salmon (scales and bones left)

Season/Time	Location	Site Type	Social Unit	Structures	Tools	Resources Utilized
1 day, several days	Hunting/Alpine Meadows	Kill sites, trap sites, butcher sites, isolated finds, retooling, lookout sites.	Men and older boys: 2-8 people	Drive lane fences and blinds, hearths	Projectile points, bifacial knives, spear heads, dead fall trap remains, knapping detritus.(See Emmons for hunting kit)	Marmot, gopher, sheep, goat, bear, caribou, ptarmigan
Several hours a day	Berry gathering, vicinity of camps	Resource Use	Women and children: 6-10 people	-	Digging sticks	Mountain Ash, thimbleberry, chokecherries, giant vetch (seeds), soapberry, silver berry, dogwood, bunchberry, elderberry, yarrow (leaves)
Several hours, days	Alpine ridges	Obsidian quarries	-	-	Hammerstones, extensive lithic scatters	-
Sept.-Oct. 4-6 weeks	Subalpine valleys, "within the protection of forested valleys, where firewood was abundant, and in the vicinity of caribou yarding areas where fences were constructed" (Albright 1984:90)	Base Camps	1-2 extended families	Outlines of lean-to shelters, post molds of drying racks, hearths, pits for soaking and smoking hides, storage pits	Axes, adzes, hide dressing tools, fleshers, obsidian flakes and knives, boiling stones, hammer stones, grinding stones, awls	Caribou, bear, moose, sheep, goat

Season/Time	Location	Site Type	Social Unit	Structures	Tools	Resources Utilized
Several hours/day	Subalpine valleys	Caribou fences	Men and women of several families	Fence lines	Axes, obsidian knives, spear points	Caribou
one-several days	Alpine meadows, ridges	Caribou drives, kill sites, temporary camps, retooling sites, temporary caches	2-8 men	Cairns, hearths, cache pits	Obsidian knives, projectile points	Sheep, goats, bear, caribou
One-several days	Sub-Alpine forests	Kill sites, temporary camps, temporary caches, retooling sites	2-8 men	Hearths, cache pits, dead fall traps, snares, trap trees	Obsidian knives, projectile points	Bear, caribou, moose
2-4 weeks	Lakes, streams	Fish camps	1-2 extended families	Lean-to shelters, drying racks, hearths, fish weirs	Net weights	Salmon, whitefish, char
Nov. - early April	Forested valleys, close to caribou fences	Winter Village	2-4 extended families, 50-100 people	Outlines of double lean-to shelters/post molds of drying racks/hearth/pits for soaking and smoking hides/ storage pits	Axes, adzes, hide dressing tools, fleshers, obsidian flakes and knives, boiling stones, hammer stones, grinding stones, awls	Caribou, moose, fish, hare, birds, beaver, lynx, porcupine, marten

Season/Time	Location	Site Type	Social Unit	Structures	Tools	Resources Utilized
One-several days	Sub-alpine and boreal forests	Temporary camps, kill sites, trap sites, temporary, retooling sites, cache sites	2-8 men	Hearths, trap trees, deadfall traps, cache pits	Obsidian knives, Projectile points, axes	Moose, caribou, hare, beaver
Mid-April-late May, 4-6 weeks	Located near "good fishing lakes and streams" (Albright 1984:90)	Camps	Extended family, 15-25 people	Lean-to shelters, drying racks, hearths, roasting, cooking pits, fish weirs, bark stripped pine	Axes, adzes, net weights, obsidian flakes, knives, boiling stones, bark peelers, sap scrapers	Trout, grayling, waterfowl, hare, grouse, beaver, bear, lodge-pole pine
One-several days	Boreal forest, sub-alpine forests	Temporary camps, kill sites, trap sites, temporary, retooling sites, cache sites	2-8 men	Hearths, trap trees, deadfall traps, cache pits, bark stripped pine	Obsidian knives, Projectile points, axes, bark peelers, sap scrapers	Bear, beaver, waterfowl, lodge pole pine

Season/Time	Location	Site Type	Social Unit	Structures	Tools	Resources Utilized
May-June	Vicinity of camps	Plant gathering	6-10 women and children	Bark stripped pine	Flake knives, digging sticks, bark peelers, sap scrapers	Shaggy manes, horsetails, lady fern, bracken fern, wild onion, rice root, fairy slippers, poplar cambium, nettles, pine cambium, cattail, burreed, Arrow grass, lupine, milk vetch, skunk cabbage, bullrush, dock, mt. sorrel, bistort, strawberry blite, spring beauty, pond lily, rockcress, sweet vetch, fireweed, sweet cicily, water parsnip, wild rhubarb, monkey flower, elephant head, sweet coltsfoot
Several hours/ days	Vicinity of camps and villages	Bark gathering for material use	Several men, women and children	Bark stripped spruce	Flake knives, antler wedges	White and black spruce

Topographical shelter from the elements seems to have also been an important factor in settlement location, particularly at higher elevations or during the winter months. Albright refers to such areas as tributary creek valleys and protected forest valleys in this regard (1984:88, 90). These areas may also be frequented by certain types of game:

The chief told him, that, if he would do as he directed him, he would obtain plenty of food. He said, "Near your camp is a deep canyon. Make your house there between two steep rocks. Make it with sharp goat horns." (fn. The inference is not clear. It is thought that they used sharp goat horns for cutting the rocks or in some manner in the construction of the house, and perhaps in digging it.), but first abstain from food and drink for eight days [Teit 1921a:231, 'The Deserted Orphan and the Goat Chief'].

Dca'ndui was a celebrated hunter who killed and trapped all kinds of game. Once he went trapping marmots, but he could not catch any because his traps were sprung. Although he watched, he could not find out what sprung them. He fasted three days and then made his traps heavier ... Now he said to his grandmother, "We will move up the mountains, and make a house in the canyon there." ... They went to the canyon in the mountain near by. He told his grandmother what to do, and she built a house. [Teit 1921a:224, 'Story of Dca'ndui'].

One type of settlement that is not often mentioned in the ethnographic literature are forts, constructed out of logs. These were undoubtedly for protection from warring marauders but are mentioned only in one story. No locational data is given with the exception that this one is located in a forested area:

The old woman was surprised to see him run out, and went to see her daughter. When she found her lying dead in a pool of blood, she gave chase. The man ran to a strong fort in the forest. The old woman, who was in a great hurry, ran straight through the forest, cutting a wide swathe of trees and brushes with the large knives on her forearms. When she reached the log fort, she attacked it with her arms, the knives cutting slices out of the logs [Teit 1921a:241-242, 'The Cannibal Women who Lured Men'].

It is possible that such forts existed near major fishing villages, and served as places to retreat to during times of neighbourly dispute.

4.3 Transportation

One of the most important factors relating to site locations in Tahltan territory is the trail systems which connect and use areas to each other. This trail system also facilitated trade, particularly between families. Trails were such an integral part of Tahltan life that they play an important role in their cosmology.

The importance of trails in the Tahltan way of life was mirrored in their beliefs concerning death:

The chief and possibly the only object in singing the death chant was to assist the soul of the dead person to find the trail to the sunrise land, and therefore some thought the

singing of the chant at the time of the death rather than afterwards, gave him all the more chance of easily finding the trail [Teit 1912-15:153].

While there are many rivers and lakes in Tahltan Traditional Territory, the ethnographic record suggests that:

...the Tahltan are trail men and land travellers. Their rivers are swift and treacherous, flowing through rock canyons, and are dangerous and impossible to navigate, hence they have little knowledge of the water, and seldom trust themselves upon it except to cross a lake or stream on rude, improvised rafts [Emmons 1911:50].

The use of a pedestrian mode of transportation prevented the accumulation of property: "The nomadic life of the Tahltan, which necessitates the carrying of all burdens on their back compels them to dispense with everything superfluous, hence the lack of utensils" (Emmons 1911:63).

There are times during land travel that a barrier of water must be crossed. Rafts, fords and bridges were used when trails crossed rivers, lakes or creeks. These areas are important archaeologically because they are zones of transition from one mode of transportation to another.

In the time that Teit worked in the area they "still used [rafts] for crossing streams back in the mountains" (Teit 1912-15:83). These rafts were made of poles lashed together with withes (Teit 1912-15:82).

4.3.2 Documentary Trail Research

As trails are important features in the patterning of archaeological sites, considerable effort was geared towards historical trails research. This section discusses the results of an extensive documentary search for trail data within the CIS LRMP. Although the documentary search was extensive, it was not exhaustive and there will likely be gaps in the data. The primary sources included:

- Original maps from the Surveyor General's Office - Map Vault;
- Original maps from the Royal British Columbia Museum - Archives;
- First edition and 'Provisional' NTS maps (1:50,000) of the study area;
- Current 1:600,000 maps of Northern British Columbia which include the study area;
- Archaeological reports from the study area; and
- Archaeological texts.

The data gathered during this documentary research was used in the development and application of the predictive model set out in this report. The trails were drawn onto 1:50,000 NTS maps of the study area. These source maps were then digitised by Timberline Forest Inventory Consultants Ltd. to produce the maps that accompany this report (see Map Pocket 1 and Figure 6). A database accompanies the line work to give sources for the information.

4.3.2.1 Results of the Documentary Search

The results of the trail research are presented in Appendix 1 and Figure 8. All trails that were identified from documentary sources are noted as "T#". Those trails that were identified from ethnographic interviews are noted as "E#" and are not included in Appendix 1 due to issues of confidentiality (see Appendix 7). Appendix 1 presents the assigned trail number, the 1:50,000 NTS map the trail is located on, the name of the trail (if there is one), the geographical description of the trail, the sources of the trail data (often there are more than one), and any further information about the trail that might be applicable. A total of 79 trails were identified from the documentary search within the CIS LRMP, the majority of which were located in the northeastern half of the study area.

4.3.2.2 Trails and the Seasonal Round of Subsistence Activities

Friesen (1983, 1985), Emmons (1911), and Teit (1906, 1956) have argued that trails, especially the Hyland Post Trail system, represent an integral component of the Tahltan seasonal round of subsistence activities (see Section 4.3). As water transportation was not used extensively by the Tahltan, trails were the primary source of transportation allowing the Tahltan to move from one resource area to the next. As such, the trail systems provided peoples access between all resource areas including from the summer fishing villages on the Stikine River, to the obsidian quarries and hunting areas on Mt. Edziza in late summer and fall, to the fall and winter hunting areas on the Spatsizi and Klastline Plateaux. Large moose populations are found in both summer and winter on the Spatsizi Plateau, and from July to November in the Klastline Valley and by Buckley Lake. Friesen (1985) also noted that the location of the Hyland Post Trail is in significant proximity to caribou rutting areas on both Tomias and Caribou Mountains and interception points in the valleys below. Other large ungulate resources along the trail system include mountain sheep in what is now the Gladys Lake Ecological Reserve, and mountain goats south of Cold Fish Lake and along the Dawson and Klappan Rivers. Smaller mammal resources, such as marmot in the alpine areas, are also found along the trail system. Edible plants are also found along the trails.

Friesen (1983, 1985) has noted that the location of trails and archaeological sites are a function of similar ecological and environmental factors. Therefore a close correlation should exist between the two.

4.3.2.3 Seasonality of Trails

Trails within the CIS LRMP were used seasonally. Four trails with seasonal references were identified. Two were summer trails, the Hyland Post Summer Trail (T5) and another trail named the "Summer" Trail (T55), while two were winter trails, the "Dease Lake to Teslin Winter Trail" (T2) and the "Winter" Trail (T56) (See Appendix 1). Winter trails take a more direct route between two destinations, traversing swampy marshy areas adjacent to the largest rivers that would be frozen during the winter. Summer trails would have to follow the edges of relatively dry open terraces or across alpine terrain (Friesen 1983).

4.3.2.4 Aboriginal Trails and Historical Development

Previous archaeological work in the CIS LRMP has determined that many archaeological sites are located on well-travelled trails and therefore a high percentage of present-day trails within the CIS LRMP were initially aboriginal (Fladmark 1982; French 1980; Friesen 1983, 1985).

When the first Euro-Canadians entered the study area, they travelled overland on existing aboriginal trail systems. Both John McLeod in 1834 (Ball 1983) and Robert Campbell in 1838 (Wilson 1970) make references to the existing trails and bridges they utilised during their visits to the area. Many of the existing aboriginal trails that were used by the arriving settlers and miners were later developed into historical trails, wagon roads, and modern roads. Much of the early use and development by the newcomers would have been in association with trade and gold mining activities.

Trail T26 from Glenora to Dease Lake was an existing aboriginal trail when the first settlers began to travel the route in the 1800s. In 1873 Captain William Moore surveyed the existing trail as part of a government contract to upgrade the trail for wagon traffic from Glenora to Dease Lake (Ball 1983). This road was subsequently developed for automobiles in the 1900s.

Trail T4 (the Hyland Post Trail) from Telegraph Creek east to Metsantan was an existing aboriginal trail that the Hyland brothers developed in the early 1920s. The Hyland Post was abandoned in the 1930s, but the trail system continued to be used by the by local First Nations and the RCMP (Friesen 1985).

Trail T15 (the Telegraph Creek Trail) from Stewart through Telegraph Creek and further north was a major aboriginal trade route that moved obsidian south and Russian trade goods from Fort Dionysius into the Upper Skeena and Nass River areas (MacDonald and Cove 1987). As part of the Klondyke Gold Rush, which began in 1897, the trail was used from Telegraph Creek north to Atlin as a major transportation route to the Yukon. The trail was developed from 1899 to 1901 as a telegraph communications route from southern B.C. to Atlin (Richeson 1982). The telegraph line was abandoned in 1936 with the successful laying of a transoceanic line. The trail is currently used for hunting and recreation.

4.3.2.5 Bridges

The trail research identified three aboriginal bridges crossing the Tahltan, Tuya, and Tanzilla Rivers respectively. It is most likely that other bridges existed as well.

Tahltan River

In 1873 William Moore packed supplies from the Miller trading post at 4-Mile up the aboriginal trail to Dease Lake. He described a 23 m long Indian bridge across the Tahltan River that was constructed of poles bound with withes (Ball 1983).

Tuya River

In 1834, John McLeod of the Hudson's Bay Company travelled overland from Dease Lake with the intent of making contact with the Tahltan Indians. McLeod's party made it as far as the Tuya River and the "Indian Bridge" crossing it which he termed "Terror Bridge" (Ball 1983). In 1838, Robert Campbell, also of the Hudson's Bay Company, reached Terror Bridge, overland from Dease Lake. Campbell described the bridge as a:

rude rickety structure of pine poles spliced together with Withes and stretched high above a foaming torrent; the ends of the poles were loaded down with stones to prevent the bridge from collapsing. This primitive support looked so frail and unstable and the rushing waters below so formidable that it seemed well nigh impossible to cross it [Wood 1958:38-39].

Campbell also noted that the place where a bridge crossed the Tuya River was called "Thomas's Falls" (Wilson 1970). Although the location of Thomas's Falls could not be determined, Terror Bridge was likely where trail T26 from Telegraph Creek to Dease Lake crossed the Tuya River (see Appendix 1).

In 1873, William Moore had to construct a new bridge across the Tuya River as the old 12 m (Terror) Bridge was in such poor condition.

Tanzilla River

In 1838, Campbell recorded an "Indian bridge" across the Tanzilla Gorge. Campbell noted that the bridge was constructed from five tree trunks, measured 7m in length, and was 5m above the river (Wilson 1970:12). George Dawson's map from 1888 (Ball 1983) shows an "Indian Bridge" across the Tanzilla River in the location where William Moore's map from 1873 (5T1 Misc) shows a trail (T33) crossing the river. Trail T33 was the other trail from Telegraph Creek to Dease Lake (see Appendix 1).

4.3.2.6 Fords

The specific locations of two fords are listed in the ethnographic literature. Fords would have been important places to know about as bridge and raft building could be foregone: "They forded the river at 'The Three Sisters,' a little above Glenora" (Teit 1921a:250, *The Girl Who Married the Dog Man*). Another ford is mentioned crossing the Chesley River near the mouth of Salmon Creek (Teit 1909:6).

4.3.3 Trails and Trade

Trade in Tahltan territory was facilitated by the trail networks. Trade with the Kaska to the east was in goods, which could be hauled on the backs of traders to the Dease Lake area. Trade with the Tlingit could involve greater volumes as the Tlingit travelled from the coast upstream in the large dug out canoes in order to trade goods with the Tahltan in the area around Telegraph Creek. The major trade arteries in Tahltan territory are best described by Teit (1912-1915):

As in other parts of British Columbia and the Pacific slope all the main arteries of trade ran east and west across the mountain ranges and not north and south between them. All of them reached across the Cascades and Rockies, thus connecting the Pacific Coast with the Plains. The main trade routes in the Cassiar Region passed up the Stikine River to the Tahltan, thence across country to Dease Lake and to the Kaska on Dease River, thence following the Liard to the Mackenzie. A branch crossed Tahltan country to the Liard at the mouth of the Rancheria, its influence extending north and east. A trade route of some importance skirted Tahltan territory on the north. It followed the Taku and Nakina Rivers across Teslin Lake, where it divided, one branch going up to the Nisutlin and over to the head of the Liard, and the other or main branch going down the Teslin River.

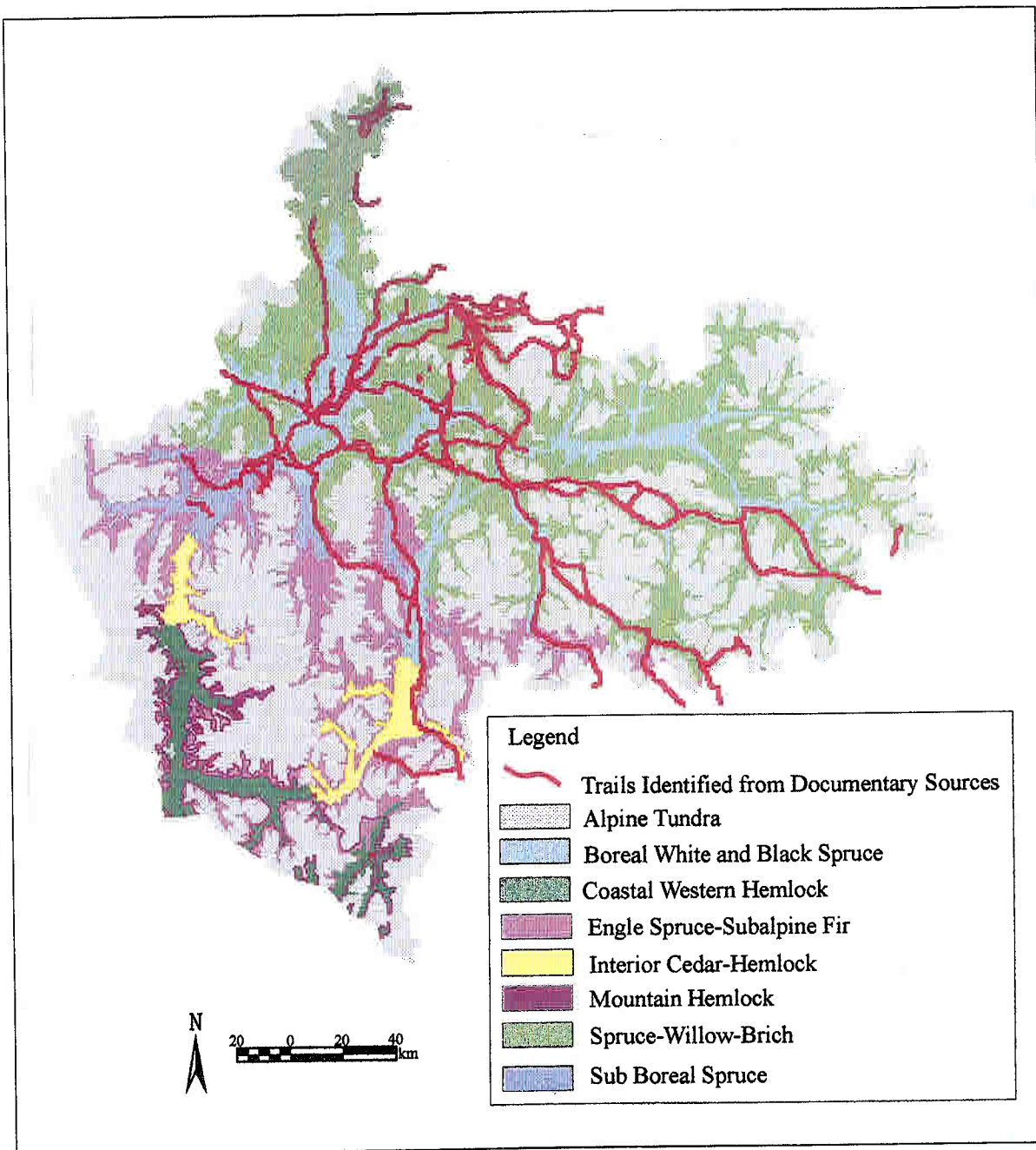


Figure 6. Trails within the CIS LRMP Identified from Documentary Sources.

4.4 Economic Activities

4.4.1 Introduction

The Tahltan economy was based on hunting, fishing, plant gathering, and trade. The Tahltan participated in this economic system by moving from one resource procurement area to another. Thus, the economy, and environment from which that economy was derived, figure greatly in settlement patterns and trail routes. Table 1 summarises seasonally based economic activities and the localities in which these land uses were undertaken.

4.4.2 Hunting

Hunting for present purposes includes trapping activities; in the case of Tahltan subsistence strategies, they are not easily divisible.

Hunting was an important part of the Tahltan economy. Teit (1912-15:81) lists the following as animals regarded as food by the Tahltan: caribou, moose, woodland buffalo, sheep, goat, bear (all kinds), lynx, beaver, marmot, porcupine, ground squirrels, and hare or rabbit. Tree squirrels and muskrats are also mentioned. Albright (1984) gives the same list, but includes deer. Grouse, ducks, geese, swans, and a few other birds were eaten. Thorman (n.d.) lists the following fur bearing animals, which were eaten: lynx, beaver, wolverine, and marten. This reference contradicts Tahltan taboos associated with fur bearing animals as noted by Teit (1956 in Albright 1984). Some fur bearing carnivores, such as river otter, weasel, and mink, are associated with supernatural power, which could only be controlled and used by the shaman. Albright (1984) states that of the fur bearing animals available to the Tahltan only beaver and lynx were eaten. According to Albright (1984), both the martin and wolverine were taken for their fur only and for wolverine, was clearly not eaten as "Tahltan tradition indicates that wolverine was once a cannibal, but today only eats corpses" (after Teit 1919 in Albright 1984:33). Trapping beaver and lynx would have served a dual purpose, as both would have been a source of fur pelts and food. Although carnivores associated with shamanism would have been taken on a selective basis, they were exploited and are included in Appendix 2 as a mammal resource.

Hunting was an important activity in terms of one's social order and status:

Hunting rights are the most important inheritance. The whole country is divided among the families, and sub-divided among households and individuals; and while in traveling through another's territory one might kill an animal for food, the pelt would be given to the land owner [Emmons 1911:28].

Although many different animal species were sought during hunting season, the caribou was among the most important:

Each animal has its peculiar economic value in the life of the people ... But the caribou has always had first place in the economic life of the Tahltan ... The great value of the caribou made its hunting a matter of first importance, and several different methods were employed for its capture. The bow and arrow were not very effectual in the open

country, hence driving and snaring devices were resorted to in the late fall and winter when the caribou traveled in herd [Emmons 1911:69].

... the marmot, next to the caribou, was possibly the most important animal found here, from an ecological point of view [Emmons 1911:76].

The importance of caribou to the Tahltan economy meant that much time and effort went into the entrapment and hunting of these animals. Emmons (1911) recorded caribou hunting techniques in detail:

Frozen lakes, and in particularly Dease Lake, which is long and narrow, were obstructed at favorite points of crossing with brush barriers connected with wide mouthed corrals on each shore. These obstructions were built of stakes driven in the ground, interlaced with branches, and terminating in long narrow passages into which the frightened animals crowded, with no room to turn, thus falling easy prey to the thrusts of the spear and the knife in the hands of hunters concealed on each side. Caribou are fond of the open, and the wall of brush on the ice was sufficient to turn them when pursued by shouting men and barking dogs [Emmons 1911:70].

A similar form of game barrier consisted of fences of stakes and boughs built across low divides or well traveled trails, with frequent narrow openings in which simple noose snares of twisted rawhide were set and which caught the branching antlers as the animals attempted to pass. When a herd was located nearby, it was partly surrounded and driven toward the ambush, behind which the hunters with bows and spears were concealed. Many caribou were killed by this means [Emmons 1911:70].

When snow covered the ground to a depth of two feet or more, caribou were hunted systematically. The natives, having found a herd of animals, made arrangements to drive them to some point at a distance, generally a valley or pocket, where the snow was of sufficient depth to impede their movements, and where the swiftest runners secreted themselves. Others were stationed on each side. The old men and the boys with the dogs served as drivers, and with their cries and the beating of drums started the herd and kept it moving. When traveling in the snow the caribou follow in a line, the leader breaks the trail and when the leader tires he steps aside, gives place to the next in succession, and falls in at the rear. When the animals reached the deeper snow the concealed hunters rose on all sides, and the frightened animals broke into confusion and were easily run down and speared by the swift-footed runners on snowshoes [Emmons 1911:70].

Again the people drove caribou, this time into a narrow place between two lakes. [Teit 1919:244, 'The Bad Dog').

They acted as if to drive caribou off the hill into their snares [Teit 1919:244, 'The Bad Dog].

One of the most effective technologies used by the Tahltan in hunting was the deadfall trap and the snare. Many different species could be trapped using these devices:

Bears are speared or shot in their hibernation holes, which are scented by the dogs, and during the salmon season they are killed about streams. But deadfalls and snares are most effectual. The former are constructed of heavy tree trunks weighted with others and baited with fish or meat; the latter are set in trails and attached to a tossing pole [Emmons 1911:72].

Snares and deadfall traps were placed in the vicinity of storage pits to trap scavengers. These were set by the caretakers [Thorman n.d.].

The beaver was hunted with arrow spear, and trapped with the deadfall in the milder seasons, but was not pursued during the summer months. [Emmons 1911:74].

4.4.3 Plant Gathering

There is very little ethnographic data on the gathering of plants in Tahltan Traditional Territory. This may be the result of several factors. Women tended to be the plant gatherers and access to knowledge regarding plant gathering by male ethnographers was likely limited.

Some tales recorded by Teit (1919, 1921), involved plant gathering as a theme. For example (Teit 1921a:242-243, From The Water-Being as a Lover, version 'b'):

A man's wife always went to the shores of a certain lake to gather roots, and brought back hardly any. She would not go to any other place. Her husband became suspicious."

This tale is of interest as it suggests that if roots crops could not be obtained in one location, that it was important to seek these crops in another.

Despite the lack of ethnographic information regarding plant foods, Albright (1984) lists all of the plants which are considered edible which grow in Tahltan territory, and Teit's field notes indicate that a variety of plants were used for food and medicine (Thorman n.d., cf. Albright 1984). It is important to note that plant use is often ignored in archaeology as this type of resource use tends to leave very little material evidence, however, some archaeological remnants of plant gathering activities may be found. Archaeoethnobotanical analysis of deposits excavated from archaeological sites can provide some insight into past dietary patterns and pits used for roasting roots are highly visible archaeological sites. Roasting pits were used to bake fern rhizomes:

Fern rhizomes were gathered in early spring or fall. They are found along the lower Stikine, the Iskut River and other damp habitats at low elevations. These starchy rhizomes were baked in small pits dug in sandy soil, and lined with bark. The rhizomes were placed in the bottom and covered with bark and earth. A small fire made on the top and the rhizomes were baked or roasted for several hours overnight [Albright 1984:66].

The manner in which root crops were processed is not discussed in the reviewed ethnographic sources.

Tree cambium served as an important food source:

The sap or cambium, inner bark saturated with sap, of pine, poplars, and sometimes spruce and alpine fir, was collected in May and early June. Bark priers of caribou antler tines were used to remove bark from trees ... Cambium was an important spring time food and is still enjoyed today. The scars on older trees, from which sap has been scraped, are clearly visible in many wooded areas [Albright 1984:67].

Plants were used both as food sources and for technological uses. Spruce bark was particularly important for the construction of a smoke-house:

So necessary was the bark to the efficiency of the lodge, fish smoke-house, and pit storage, that the short season that lent itself to this occupation had to be taken full advantage of. The time of procurement had close at its heels the arrival of the fish. The season of stripping usually occurred between the end of May and the first part of June. Trees selected were spruce or balsam, only occasionally jack pine, the latter being increasingly brittle with age. The bole of the trees usually selected were of eight to fourteen inches in diameter and as free of lower limbs as could be found. This type of material usually found within the forest protected from the winds and procuring a more even bark with a straight grain and lacking in gnarled limbs. The ideal tree must have a smooth bole arising from ten to fourteen feet to the first encircling limbs. Encircling incisions were made at the base and at a point of height from which the bark was to be removed, then applying a wooden tool at this incision the bark was eased from the bole. The removed bark came from the bole as a long cylinder with one side open, this piece of bark was layed open and trodden upon to flatten then folded into a convenient length for a back pack. The bark being saturated with sap suffered no harm from the cross folding...Other barks were taken at the same season of willow, birch, and cottonwood and fashioned when green into receptacles for berries, grease, and other purposes." [Thorman n.d.].

From this description it is unclear whether a strip of bark was left on one side of these trees to enable the continued growth of the tree. Examples of spruce CMT do exist in the archaeological record (McLaren 1996). Albright (1984) demonstrates that spruce cambium served several functions in Tahltan society.

4.4.4 Fishing

The Tahltan used a variety of methods for catching anadromous fish species (see Albright 1984:60-62). The large settlements along the major salmon bearing rivers and creeks are a testament to the importance of fishing to the Tahltan economy. These settlements are large permanent structures used for both curing fish and as residences during the summer (Albright 1984: 70). A list of ethnographically recorded locations and names of fishing villages is given in Albright (1984:86-87).

Non-anadromous fish also served as important food sources, particularly in the spring when trout and grayling were caught in lakes and creeks. Over a thousand of these fish would be dried on racks and stored for later use during this season (Albright 1984:90).

4.4.5 Storage and Preservation

An important part of the Tahltan economy was the storage of foods for later use. One researcher was particularly fascinated by the ingenuity of this strategy:

They did leave an enduring sign of their occupation of the country and a seasonal industry, which later was marked by no small skill, to which must be added ingenuity, for the "DU'WEGED" is certainly both of these. Some of these pits are undoubtedly centuries old, trees have grown up, and not a few of them to the diameter of 20 inches have been burned down and replace in time by trees of equal girth. The du'weged

excavated in the talus at the foot of cliffs where hundreds of pieces of rock were removed by hand, many of these rocks weighing up to seventy pounds, will endure for centuries to indicate the industry of a vanished people ... As a result of the storage pit the precarious winter hunt became less of a nightmare for the household provider [Thorman, n.d.].

To built a DUWE'GED: "A desirable and well drained area was chosen, a pit scraped out, rectangular in shape of various sizes, to a rectangular and level floor ... [Thorman, n.d.].

These storage pits are likely to be found near any base camp area, and in particular in the vicinity of summer villages and winter camps. Thorman (n.d) records that many of these pits were be found along the major rivers:

There are not less than fifteen hundred of these pits from CHICH'AN AHDA to the Tuya River, all not far removed from the banks of the river. In the CHICH'AN AHDE area there are as many, along the first Tahltan River Canyon up to and including Tahltan Lake they are equally numerous.

Caches for storing food for winter use and for containing household belongings have always been a necessity for protection against the ravages of wild animals and the dogs. These are substantial log cribs built on posts well above the ground, and are entered by means of notched tree trunks which are removed when not in use. On old village sites, and sometimes at a distance away in the woods, one may still see square excavations that resemble cellars. These were the salmon caches, in which the fish were stored in the late fall for winter and early spring, for both people and dogs. They were covered with logs, boughs, and earth, so that if the village should be sacked by an enemy there would still remains this hidden source of supply [Emmons 1911:38].

Cache pits were also used for the temporary storage of animals killed during hunting expeditions. These pits were used to hide food from other predators until enough people or time could be gained to move the food from the butchering station or kill site back to a base camp: "They killed a moose and cached all of the meat themselves, excepting a little that they packed home" (Teit 1919:248 'Wolverine and the Brothers').

4.5 Geographic and Geological Knowledge

4.5.1 Introduction

The patterning of archaeological sites is linked to environmental factors. The environment is not, however, a static entity. Changes in environments can result in changing subsistence and settlement patterns. For example:

The history of the occurrence of the moose in this section can not well be accounted for. It is believed to have been a habitant of all this region in the early days, but for some unexplained reason the animal completely disappeared early in 1800, to make its appearance again in 1877, when several were killed in the Dease country. Since then they have steadily increased their numbers, and have extended their range along the Stikine to below Telegraph Creek. They are most abundant in the willow country toward Teslin, along the headwaters of the Tuya, and the tributaries of the Taku. The belief prevails among the natives that the return of the moose was due to the coming of the white men, as this occurred soon after the Cassiar gold excitement. [Emmons 1911:71].

As this story demonstrates, one of the best sources on environmental change in Tahltan traditional territory is Tahltan Oral History. Records of environmental upheavals are preserved in the social memory of the Tahltan people. Teit (1919) managed to record on paper a few such stories.

4.5.2 Sea Levels

The following stories may relate to events which geologists refer to as changing sea level and isostatic rebound:

... The whole earth was covered by water excepting the highest peaks. Only two peaks in Tahltan country were not covered by the deluge, - Takistsitla (Shesley Mountain), on the west side of Chesley River; and Tse'toxtle (Cone Mountain), on the south side of the Stikine River. Some people tried to save themselves on rafts, large and small. In the darkness the wind and sea drove them hither and thither. They all became separated and lost. They did not know where they were. Some saw mountain peaks and tried to reach them. Some succeeded, and others did not ... [Teit 191:233, The Great Flood].

After the flood "two women, one from the sources of the Nass and the other from Tagish Lake, wandered from their homes and met on the banks of the Tahltan River at its mouth. The women from the south said she had journeyed over a great sand country and that she was worn and tired, and that now she had met her sister from the north they would stop and make their home, and that they would call themselves, from the region of travels, Tuck-claw-way-tee, 'back-sand family' [Emmons 1911:14].

After the Great Flood, people were afraid that the earth might tip again, and cause another flood. The earth was very light in those days, and rolled up and down, displacing the ocean. Water would thus rush to one place and stay for a while. Then the earth would tip, and the water would rush back again. This is said to have happened several times; and some people say that the great Flood that destroyed people came about in this way. Therefore, to make the earth secure and steady, Raven put a large piece of ice on the earth to weigh it down and keep it from tipping. Since then the earth has not tipped, and has been steady. [Teit 1919:219, 'Raven Ballasts the Earth'].

4.5.3 Place Names

An important feature in oral traditions is their links to the landscape: "The place names around the Tahltan vicinity read like a ... directory. Every nook and cranny had its descriptive name. Names enduring to the present time" (Thorman n.d). While these culturally important landforms are not considered to be archaeological site types, they are often highly visible and sometimes suggest archaeological remains that are associated with the named place. There are many examples of the landforms in Tahltan territory. The following have been recorded in the ethnographic literature.

4.5.3.1 Stikine River

The girl then looked at her brothers, who at once became transformed into stone in the positions they occupied in the water. Then she and her mother and her pack also changed into stone; and all of them may be seen as rocks at this place. These rocks are called the "The Three Sister Rocks" by the whites, because of the three large rocks in the river close together. The Indians call the upper rock Aske'tleka; the middle one, KaskEtl; and the one next to the lowest, Tsexhuxha'; and the lowest one, Tlkaia'uk. These rocks are the

four brothers. The rocks known as the girl and the mother are on the shore, and the mouth which stands out at the mouth of the little creek near by is known as their pack [Teit 1921a: The Girl Who Married the Dog-Woman].

After a while he came up the Stikine River, and made a house or camp for himself on the south side of the river, just opposite the mouth of Tahltan River. The remains of Raven's house may be seen there now as a cave in the cliff. It was changed into stone. He put up his robe as a large wind-break for his camp-fire, so that the smoke would ascend right; and this wind-break may now be seen in the form of a long cliff on the opposite or north bank of the river, west of the mouth of the Tahltan. Raven tried to make a large, fine, level place opposite his house on the north side of the river, just east of the mouth of the Tahltan, and attempted to build a bridge across the Stikine from this level tract to his house. The bridge always fell down or broke, and all that remains of it now is a rocky point extending out into the river. He tore up and destroyed all his work. The level place he had made with considerable labour he also tore up. This place is now all rough and cracked, and is known to the whites as the "Lava Flows"... To the West of the mouth of the Tahltan, near the trail, may be seen Ravens tracks, and also the place where he urinated, both transformed into stone [Teit 1919:211-212, 'Raven in the Country of the Tahltan'].

4.5.3.2 Iskut Area

Big-man treated him well all the time. Now they came to the end of lower Iskut Lake. The lad said he saw something dark moving near the other end of the lake. He thought it must be the wind or a storm-cloud. Big-Man looked and said, "A bad man lives there" ... "Big-Man then lifted up the giant's body and threw it into the lake, and the splash of the water almost reached the place where the boy was standing. The remains of the body may be seen there now as islands in the lake [Teit 1921b:348-349, 'Big-Man and the Boy'].

4.6 Ecological Knowledge

Knowledge of the local ecology was necessary for the survival of the Tahltan. Knowledge of where and when game, plants, and fish were available and the best seasons to harvest these resources was essential to maximise caloric returns and to acquire necessary nutrients. This knowledge was thus necessary for their well-being and their vitality. The knowledge of animal behaviours was essential to the success of hunting ventures.

She told each one of her children what he should eat. She told moose that he should browse on willows, and Caribou that he should eat moss [Teit 1919:231, 'ATSENTMA, or the Meat-Mother'].

The mountain sheep, the most graceful of the species, is still found in abundance on the mountains across from Telegraph Creek, along the upper reaches of the Iskoot, and about the Narlin, Sheslay, and Teslin [Emmons 1911:71].

"Because Dog men hunted throughout the Tahltan country on the north side of the Stikine, and killed off so much game, marmots are scarce their now, while they are plentiful throughout the country on the south side of the river, where they did not hunt [Teit 1921a:250, The Girl who married the Dog-Man].

The Tahltan also ensured that over-harvesting of resources did not occur. For example Thorman (n.d) states "They had good knowledge of game conservation and rotation for taking game."

4.7 Ceremonial Practices

Beliefs and ceremonial practices can have a bearing on settlement patterns, economic practices, and thus archaeological site formation. These practices are not necessarily linked to environmental factors. For example, the land otter was viewed with great superstition, and for this reason, before the fur trade, it was never hunted (Teit 1921a:239, Emmons 1911:75). Perhaps the best example of the effect of beliefs on archaeological site formation is the disposal of the dead:

...People left on the ground or buried have a bad smell, and their ghosts smell also. The spirits of cremated people do not smell. They are purified by the fire." Now people know all about the spirit-lands, and since that time people have burned their dead [Teit 1919:241, 'The Four Ghost Brothers; or The Origin of Cremation'].

The failure to deal with peoples' bones in a sanctioned manner can result in the misuse of those remains:

He went home, and said to himself, "I wish I could do something to kill them!" He tried to bewitch them with every kind of thing, including dead people's bones, but did not succeed [Teit 1921a:243].

The cremation of human remains formed only a part of the customs surrounding death that the Tahltan participated in:

After the funeral fire had burned out, the charred bones of the deceased were collected and wrapped in skin. They were then placed on the top of a small crib of logs up a few feet from the ground on the top of a post erected for the purpose, within a small house or kind of box built on the ground or built some height above the ground. In later days small trunks were secured from the Whites and used instead of boxes and grave houses of their own manufacture. Sometimes, at least in later days, the bones were put in a box, and a house erected over all. Sometimes they were placed in a kind of house or vault built on the ground in the shape of a house roof or a V tent or occasionally the roof was of this shape and the sides were of sort light logs laid close together as in a log cabin. [Teit 1912-15:160].

Cemeteries or graveyards were generally situated on prominent points and edges of terraces near the main camp or villages ... Some of them overlook, streams and villages. Not all are in prominent or high places; some are to be met with on low or flat land, especially near trails [Teit 1912-15:160-161].

While cremation and interment of the dead represent one Tahltan right of passage which creates archaeological remains, other rights of passage (birth, puberty, and marriage) may also be visible in the archaeological record. Some possibilities include girls' puberty seclusion huts, and some spirit questing (fire-cracked-rock, hearths, and possible postholes):

Whilst seeking their manitous lads went off alone on trips in the mountains, remaining away from two or three to upwards of ten days at a time. The beginning of trading was ushered in by a fast, usually four days duration, on the first trip to the mountains. some fasted again on later trips for shorter periods. Some lads washed and bathed to a considerable extent whilst others did not. In the same way some lads sweat-bathed and others not [Teit 1912-15:135].

4.8 Summary Ethnographic and Documentary Background Research

This section has attempted to derive a generalised picture of archaeological site location data from the ethnographic documentation of Tahltan culture and historic trail information. Much of the data described and discussed in this section will be of use in the modelling of archaeological site potential. This section has also discussed cultural features which may not appear in the archaeological record, and thus, in the modelling of site potential. The ethnographic record is also useful in demonstrating some of the limitations of this study such as environmental changes and research biases.

5. Archaeological Background Research

5.2 Previous Archaeological Investigations

The following is a summary of the past archaeological work conducted in the CIS LRMP. This data helped define the model for determining cultural heritage potential within that area selected for development within the CIS LRMP.

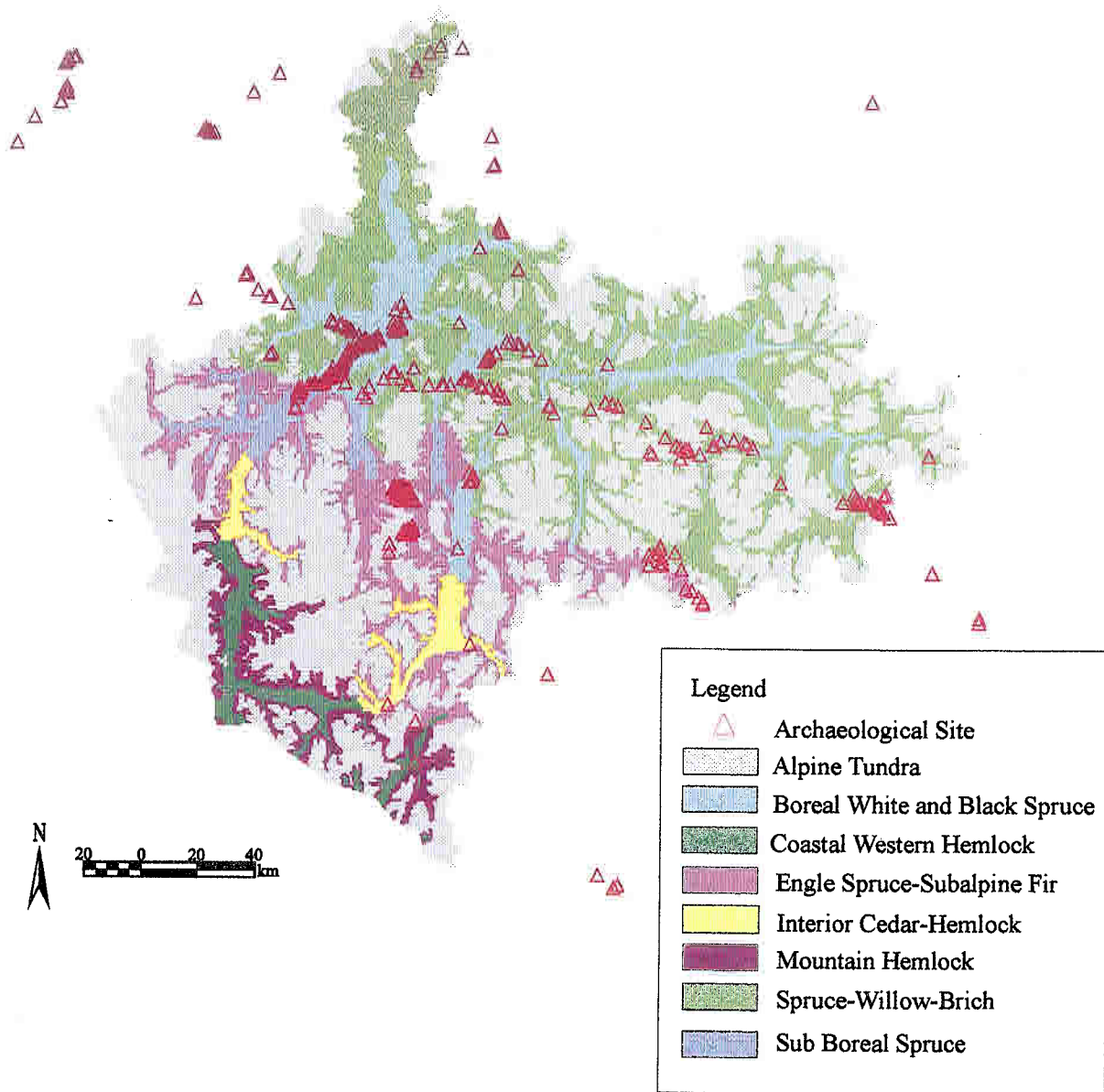


Figure 7. Distribution of Archaeological Sites in the CIS LRMP.

The Archaeology Branch Annotated Bibliography (Ministry of Small Business, Tourism and Culture 1995) was accessed to determine the number of archaeological investigation permits, which have been issued within the study area. The reports for these projects were then acquired and the relevant data collated (see Appendix 8).

Each archaeological site within B.C. has a siteform that contains all relevant data regarding the site and is listed on the Canadian Heritage Inventory Network (CHIN). A total of 482 sites have been recorded within the study area and their distribution in the study area is presented in Figure 7 (see also the Overview Map in Map Pocket 1). In portions of the study area with a high density of sites the symbols have coalesced to form what appears to be a polygon. The archaeological site information for the study area was downloaded from CHIN and reviewed to summarise all archaeological investigations within the study area.

5.2 Documentation of Previous Surveys

Where possible, all previous archaeological investigations were classified according to their survey methodology as an **Intensive** survey, **Reconnaissance** survey, or neither. If the survey type could not be classified, the survey information could not be included in this study.

An **Intensive** survey was defined as having systematic subsurface testing; a **Reconnaissance** ("Recce") survey was defined as having systematic surface coverage, with little (for the size of the study area being surveyed) or no subsurface testing. It should be noted that these definitions do not necessarily reflect the methodologies of defined intensive and reconnaissance survey.

To enable categorisation, reports must clearly map the boundaries of the areas that were studied; they must include an explanation of the methodology of fieldwork actually employed (and that methodology must meet the criteria for inclusion as listed above); and they must state the Borden numbers of any sites located during that fieldwork. By categorising an area as either intensive or reconnaissance survey we could be confident that both site and non-site data could be accurately plotted on 1:50,000 scale maps.

The Intensive and Reconnaissance surveyed areas were drawn on 1:50,000 scale maps as coded polygons. Trails were drawn on a separate set of maps; then all maps were sent back to Timberline Forest Inventory Consultants Ltd. and digitised into their database.

5.3 Accuracy of Archaeological Site Plots

Digitised maps (1:50,000 scale) were obtained from Timberline Forest Inventory Consultants Ltd. These maps included plots of known archaeological sites and their respective Borden numbers. The location of each mapped site was then checked with the map from its siteform; and where they disagreed, the location of the site on the digitised map was changed to agree with the siteform. Where the maximum dimension of a site (recorded on the siteform) was at least 100 m in any direction, the site was remapped as a

polygon. Sites that were in CHIN or recorded on siteforms, but not in the Provincial Heritage Resource Dataset (PHRD) were added to the maps at this stage.

5.4 Regional Cultural Sequences

5.4.1 Introduction

The following is a summary of the cultural historical sequences that has been proposed for northwestern British Columbia. The section summarises the patterns of prehistoric culture as interpreted by archaeologists. Table 2 presents a summary of prehistoric sequences within the CIS LRMP.

While archaeological fieldwork within the study area began in the late 1960s, the regional cultural sequences of the study area, and northern British Columbia as a whole, are still poorly understood. Most of the existing archaeological data has been recovered from various impact assessments and surveys which tends not to produce the data required for recreating regional cultural sequences. The data which has given insight into the regional cultural sequences of the study area is largely from a limited number of sites and is the result of the work of Smith (1969, 1970, 1971, 1974), Smith and Calder (1972), Smith and Harrison (1978), and Fladmark (1982, 1984, 1985). Other works which add to this data include that by French (1980), Aresco (1982a), I.R. Wilson Consultants Ltd. (1984) and Rousseau (1990).

5.4.2 Evidence of Early Occupation

The earliest indication of human occupation of the study area is, in part, found outside the study area. During the Prehistoric Period, Mt. Edziza was a rich source of obsidian for the manufacturing of lithic tools. Edziza obsidian has a wider geographical distribution than that of any other obsidian source in Western North America (Carlson 1994). Edziza obsidian has been recovered from archaeological sites in the Queen Charlotte Islands in the west, Alaska and the upper Yukon drainage in the north, western Alberta in the east, and Kwatna Inlet on the central coast of British Columbia in the south (Carlson 1994). The earliest Edziza obsidian from a dateable context has been recovered from Component 1 (9500 B.P.) of the Hidden Falls Site, Alaska (Carlson 1994). Edziza obsidian has also been recovered from the Ground Hog Bay Site, Alaska, although with a range of dates from 8800 to 4000 B.P. (Carlson 1994). The recovery of Edziza obsidian in Alaska from this time period indicates that Mt. Edziza was being exploited as a lithic source from a very early time and demonstrates that people must have been searching for lithic resources at extreme elevations as soon as glacial ice sheets retreated.

Other support for early occupation in the area comes in the form of a chert lanceolate biface with moderate basal edge grinding recovered by Little Tom Mackay Lake in the high alpine. Although the biface was recovered as an isolated find, stylistic attributes resemble other bifaces from northwestern North America dating from ca. 9000 to 7000 B.P. and likely represents summer alpine hunting activity (Rousseau 1990).

5.4.3 Ice Mountain Microblade Industry

As a result of excavations conducted in the Mt. Edziza - Telegraph Creek area, Smith (1969, 1970, 1971, 1974; Smith and Calder 1972; Smith and Harrison 1978) identified the "Ice Mountain Microblade Industry" (IMMI), distinguished by distinctive bifacial core preforms, and postulated that, based on the results of obsidian hydration analysis, human occupation of the study area began prior to 10000 years ago (Smith 1971). Smith (1971) further postulated that the IMMI reduction sequence is similar to East Asian microblade complexes. Fladmark (1985:44) has noted that as a dating technique, obsidian hydration analysis is problematic and that Smith's dates are largely suspect. As well, Fladmark (1985:174) analysed a larger sample of lithic material and concluded that there was no similarity between IMMI and Asian obsidian complexes.

Ice Mountain Microblade Industry assemblages have, to date, been recovered from sites along the Stikine River (Smith 1969; French 1980) and the Mt. Edziza area (Fladmark 1985). The IMMI assemblage is characterised by unique and specialised attributes that distinguish it from other microblade industries in northwestern North America. Ice Mountain Microblade Industry cores are characterised by a constant 30 - 60° edge-angle, relatively consistent 15mm thickness, distal crushing, possibly for hafting modifications, and the straightness of fluted surfaces (Fladmark 1985). Fladmark (1985:195) has tentatively associated very large biface preforms, wide-edged end-scrapers, side-scrapers, retouched flakes, nondescript flake cores, and a variety of medium-sized bifaces with the IMMI. Artefacts that Fladmark (1985:196) noted as never co-occurring with IMMI assemblages include incipient stem and expanding stem projectile points. IMMI assemblages appear to be confined to the Telegraph Creek - Mt. Edziza area as there are few close comparisons in northwestern North America (Fladmark 1985:181). Within IMMI assemblages, microblades and cores appear to be negatively associated indicating that cores were being carried from place to place and worked when microblades were needed (Fladmark 1985:197). While there is the possibility that a single IMMI assemblage may predate 5000 B.P., the majority of IMMI dominated tool assemblages occur between 4900 to 4000 B.P. (Fladmark 1982). From 4000 to 3500 B.P. the IMMI component of the assemblage decreases and is non-existent with the exception of one assemblage after 3000 B.P. (Fladmark 1982).

5.4.4 Non-Microblade Industries

At ca. 4000 B.P. IMMI assemblages were being rather suddenly replaced by non-microblade assemblages in the Mt. Edziza area as well as the Skeena Valley (Fladmark 1985:197). While little is known about this new complex, it appears to be associated with lanceolate, incipient stem and expanding stem points, and possibly also notched points similar to those of the Late Period in southern British Columbia (Fladmark 1985:198). This shift from IMMI assemblages is possibly due to increased volcanism along the Ediza-Spectrum Ranges and the beginning of a cooling climate trend resulting in decreased access to the obsidian sources at Mt. Edziza (Fladmark 1985:200).

5.4.5 Late Period

From 1300 B.P. to the period of Euro-Canadian contact, the lithic assemblages recovered from most of British Columbia including north central British Columbia, the upper Peace River area, and the southwest Yukon, are largely typified by the presence of small side-notched and stemmed projectile points associated with the bow and arrow (Fladmark 1985). While small side-notched projectile points have been recorded in assemblages from the Telegraph Creek area (French 1980) and along the Stikine River (dated to 200 to 700 B.P.) (I.R. Wilson Consultants Ltd. 1984) they are notably absent from the Mt. Edziza area lithic assemblages (Fladmark 1985). Assemblages composed of relatively high numbers of biface resharpening flakes and an overall lack of tools and cores have been recovered from five sites at the confluence of the Stikine River and Tanzilla River (Aresco 1983) and two sites further east along the Stikine River (Aresco 1982b).

Very little information exists concerning prehistoric subsistence strategies as seen through the archaeological record. During her survey along the Stikine River, French (1980) recorded a variety of site types including a number of cultural depressions, which she associates with fishing and fish storage activities.

Table 2. Summary of the Prehistoric Sequences in the CIS LRMP

Date	Location	Regional Sequences
10,000	Hidden Falls, Alaska	Edziza Obsidian Trade
9,000		
	Little Tom Mackay Lake	Lanceolate Biface
7,000		
5,000	Stikine Valley, Mt. Edziza	IMMI Assemblages
4,000	Mt. Edziza	Non-microblade Assemblages
1,300	Stikine Valley	Small Side-notched Projectile Points
Present Day		

5.5 Archaeological Correlates

Archaeological correlates are one of the most important sources of information for potential model development. Archaeological correlates attempt to summarise the relationship between distinct environmental zones and the types of archaeological sites, which might be found within each of those zones. Thus, knowledge of the faunal and floral resources available in each biogeoclimatic zone combined with ethnographic information and First Nations knowledge concerning aboriginal resource use, aids archaeologists in predicting the type and distribution of archaeological sites within different environmental zones.

5.4.1 Environmental Correlates

It is generally recognised that climate is the overall controlling environmental factor determining forest cover, vegetation, and fauna. Within distinct environments, archaeologists can expect to find different types of archaeological sites, as faunal and floral resources specific to each area were utilised differently. Table 3 presents the number of individual sites in the various biogeoclimatic zones used for the modelling part of this study.

5.4.2 Site Types

The typology used for archaeological sites is based upon that outlined in the Archaeology Branch Archaeological Site Recording Guide (Ministry of Small Business, Tourism and Culture 1989). The original Archaeology Branch typology was also maintained in a text field. Table 4 provides field names, and the corresponding Archaeology Branch typology.

Table 3. Distribution of Site Types by Biogeoclimatic Zone within those Areas Selected for Assessment

Zone	Total Sites	Lithic	Habit_depr	Cache	Trail	Cairn	Burial	Rockart	Fish	Historic	Food_other	Total Site Components
AT	21	20	0	0	0	0	0	0	0	0	0	20
BWBS	105	88	0	20	4	1	5	1	10	7	0	136
ESSF	6	6	0	0	0	0	0	0	0	0	0	6
ICH	1	0	0	0	0	0	0	0	0	0	1	1
SBS	14	5	2	2	0	1	2	1	0	5	0	18
Total	147	2	22	4	2	7	2	10	12	1	1	181

Table 4. 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
habit_depr	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]
habitation	habitation, other [not to include historic features such as cabins]
food_depr	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_trap	subsistence feature, land mammal [or depression] [pitfall or deadfall or blind or drive lane or deer/Caribou fence or corral, etc.]. Also check for 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. Also check Historic, subsistence, etc.]
food_other	other subsistence features, including trapping [not including large animal hunting pitfall or deadfall traps, which should go under hunting]
trail	Trail [or Earthwork, trail].
burial	Human Remains [burial, or cairn, talus, etc.]. Also check for aboriginal burial places in 'Historic, Human Remains'.
rockart	Pictograph; Petroglyph
cairn	Petroform, cairn
cmt	Cultural Material, surface, culturally modified tree [also just modified tree, without the '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. Do not include for sites with both prehistoric and historic components, or it will be very difficult to exclude historic only sites from analysis of all prehistoric 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. We should probably also flag automatically protected pre-1846 Historic sites (e.g., early HBC posts) under this field.

6. Predictive Model Development

6.1 Predictive Modelling in Cultural Resource Management

The appropriate role of predictive modeling 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 on its capabilities and limitations.

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 modeling assists in the standardisation of methodology, producing more consistent results, however predictive modeling does not always imply the use of statistical techniques.

The sophistication and accuracy of a predictive model is dependent on the quantity and quality of available data. A representative sample of archaeological survey coverage is as important (or more so) than accurate mapping of salmon streams. Ethnographically described land-use patterns must be used to “fill in” for types of locations which are not well represented by archaeological survey. In many parts of the province, we may not know enough about site distributions to successfully employ complex models with many variables. However, modeling can still be an effective tool for identifying sensitive areas requiring further archaeological investigation prior to land-altering development. 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 modeling is a means of focusing the management of heritage resources on locations that are believed to have the greatest cultural and archaeological significance. Modeling 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). In addition, the types of sites missed by models are often the ‘exception to the rule’ which have the highest scientific significance (Altschul 1990). Some archaeological sites will be missed by any sampling method, and some of them may be destroyed by development. This limitation is inherent in modeling

and overview assessments, and it cannot be avoided without complete survey of all potential development.

6.2 Introduction to Predictive Modelling

Methods for obtaining traditional resources involved the use of the surrounding environment. Trade complimented the traditional use economy of the surrounding or available resources. As environments can vary considerably in the resources that they offer, different environmental zones have different traditional uses associated with them. 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. To gain an understanding of the relationship between resource availability and the material remnants of human behaviour in Tahltan territory it was necessary to bring together detailed information from:

- 1) Historic, ethnohistoric, and ethnographic sources;
- 2) Previous archaeological research; and
- 3) Biophysical characteristics of an environment.

This predictive model 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 from the Tahltan First Nations, both through documentary research and directly during the course of this project, provided an important source of data for understanding how the Tahltan people used their local environment. This information aided in ensuring the accuracy of our predictions, since it provides an understanding of cultural information on the availability of resources that were available in various areas at various times.

Trail information from the documentary research is an important factor in this predictive model. As noted in Section 4.3.2, the location of trails and archaeological sites are a function of similar ecological and environmental factors and a close correlation should exist between the two (Friesen 1983, 1985).

Previous archaeological work is critical to predictive models, since this work provides direct and physical evidence of the occupation and use of the land. Factors such as seasonal resource availability influence site location and density of habitation or use.

There are many direct correlations between specific ecological and geological contexts and the occurrence of certain site types. In previous research involving predictive modeling in archaeology, environmental characteristics such as elevation, slope, drainage, aspect, and availability of faunal and floral resources have been identified as factors influencing site location (Eldridge and Mackie 1993). These factors are useful because they describe specific and consistent attributes of the locations where sites may occur. It is important that these characteristics be mapped as accurately as

possible. Biophysical data requires mapping to a scale of 1:50,000 or better in order to provide useful information for archaeological modeling.

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 modeling is to bring together and use these types of data to develop models that may be used to accurately predict where sites occur. Reliable prediction will greatly assist appropriate land use and development planning and help in protecting the cultural material heritage of the Tahltan people.

6.3 The Present Study

With the above methodological limitations in mind, this study uses available lines of evidence to predict, as accurately as possible, the archaeological potential of the Stikine River and Iskut River Selected Areas within the CIS LRMP so that more detailed investigations can be focused on those areas prior to development.

The research design aims to evaluate the Stikine River and Iskut River Selected Areas in terms of the probability that archaeological sites would be a) present, b) preserved, and c) could be located in the field. The assessment is focused on archaeological sites (i.e., places with physical evidence of human occupation or use), and in a limited sense traditional use sites (i.e., any site that has been traditionally used by one or more groups for some type of activity and which is usually documented with the assistance of oral historical and archival sources). Many aboriginal activities did not leave physical evidence of their occurrence, and much of the material culture that was left behind has not been preserved. Therefore, the material evidence that archaeologists may find in the archaeological record provides only a glimpse of the true nature of past cultural systems. By including some traditional use site types into the assessment, a greater understanding of pre-contact occupation can be achieved.

This study does not include field investigations and the accuracy of the results is limited by the amount of relevant oral and documentary information available for assessing site potential.

The preceding discussion sets the stage for this project. 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 Cassiar Iskut Stikine LRMP 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 CIS LRMP study area 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). 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 would contribute greatly to our understanding of pre-contact occupation and use of the study area.

6.3.1 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 predictive model include:

- **Factors (variables) that affect where sites are located must be clearly identified.** Known sites should be used to identify the environmental characteristics of known site locations. These characteristics should be assessed in terms of their relative importance in affecting site locations. Ethnographic information was a major factor in deciding the importance of these factors;
- **Factors that are thought to affect the location of sites should be more strongly associated with sites than areas without sites.** In other words, sites (or areas with sites) must be associated with a factor to a greater extent than areas without sites to be of predictive value. 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, using statistical analysis, if the factors we have identified as important for site location are in fact good predictors of site locations on their own;
- **For factors that influence site locations, we need to estimate 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 1500 m away, is it still legitimate to say the lake is affecting the location of that site? It may be, but decisions about cut-off distances need to be carefully thought out for the model to work at its best. These decisions should be made by considering the distances of all sites and non-sites from a variable;
- **The predictive model must be useful for predicting the location of sites for the 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 area;
- **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 very few 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 be used by humans or for archaeological remains to be preserved. Some locations are, of course, better suited to human use than others;

- **When site potential results are produced, we need to make management and protection of archaeological data 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 stands to be lost by alteration or development.
- **The model must be able to be evaluated with actual ‘in-field’ investigations.** The correspondence between the model and the real world, 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 fieldwork can also serve as a means to refine the model; and
- **The model needs to be replicable.** Others should be able to use the same data to determine if the same results can be obtained. The model commands or steps should be clearly presented. This can be achieved by presenting actual commands used in the database running of the model. The model should be easy to update when further information becomes 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.

6.4 Data Sources

Relevant geographical information was gathered by plotting the following “points” in GIS format:

- 1) Archaeological site locations (both points and polygons) (see Section 5.5 for more information on the site types and locations of these sites within the CIS LRMP);
- 2) One hundred meter grid of points covering all surveyed areas which were further than 200 m from any site; and
- 3) One kilometre grid of points covering the entire study area including unsurveyed sections.

The gathering of this data provided, respectively:

- 1) A set of known locations for sites;
- 2) Known locations where sites were absent; and

- 3) A random sample of specific and labelled points within the Stikine and Iskut areas selected for archaeological potential assessment.

Field surveys are used to locate and identify archaeological and heritage sites. Field surveys have produced most of the data upon which predictive models are based. It is therefore necessary to evaluate the quality of data obtained through archaeological surveys, and to be aware of how data of variable quality may affect the results of predictive models.

Two types of archaeological survey are used to build an inventory of sites. These are (1) probabilistic surveys that examine a specified sample of the area of interest, and (2) surveys known variously as complete, intensive, or systematic, which examine the entire area of interest. In addition to locating archaeological sites, both types of survey provide indications of where sites are not located. Knowing where sites **are** located (positive data), and where they **are not** located (negative data) are both critical for predictive modeling and making informed land management. Recording where sites are not found during archaeological survey was generally ignored in the large, regional inventory surveys of the 1970s, which recorded over half of the current site inventory in the province (Eldridge 1992).

Probabilistic surveys are the most useful from a modeling perspective, since these normally include survey of different environments with different site potential. A few such surveys were conducted in the study area (see Section 5.1).

In developing the model, primary comparisons were made between the one kilometre grid points and the site locations. The one kilometre grid data is representative of the study area as a whole. It is normally preferable to compare sites to non-site surveyed areas, however, the survey data was strongly biased toward a single biogeoclimatic zone (Interior Cedar-Hemlock zone) and was thus not representative of the study area as a whole.

The differences between the one kilometre grid points and the site locations formed the basis for developing a “predictive model.” The one kilometre grid was also used to test the model developed and to identify biases in the surveyed areas. Variables were collected for each point (for sites, surveyed areas without sites and for the one kilometre grid points). Although many of the variables reflect known archaeological correlates, many simply reflect available GIS data. In order to discover previously unknown relationships it is preferable to use the greatest number of variables as possible and to develop methods to determine if they are important rather than simply rely on variables that we already know are important.

6.4.1 Variables for Archaeological Sites, Survey Grid and One Kilometre Grid Points

Table 5 presents the variables used to describe the ecology in which the site or point was located.

Table 5. Variables Describing Ecology

Variable	Description	Unit of Measure
Ecosection	ecosection in which the point is located	-
Zone	biogeoclimatic zone in which the point is located	-
Subzone	biogeoclimatic subzone in which the point is located	-
Variant	biogeoclimatic variant	-
Ecotone	nearness to biogeoclimatic zone boundary	meters
Timberline	nearness to alpine tundra biogeoclimatic zone boundary	meters

Table 6 presents the variable used to discover any possible relationship between surficial geology and site location preference.

Table 6. Variables Describing Surficial Geology

Variable	Description	Unit of Measure
Esker	nearness to eskers	meters
Lavaflows	nearness to lavaflows	meters
Icefield	nearness to icefields	meters
Cliffs	nearness to cliffs	meters
Moraine	nearness to moraines	-

Table 7 presents the variables used to determine the proximity of sites or points to water sources. Water sources are considered to be important resources necessary for human habitation.

Table 7. Variables Describing Proximity to Water Sources

Variable	Description	Unit of Measure
Lakevs	nearness to very small lakes (< 5ha)	meters
Lakesmall	nearness to small lakes (5ha < 100ha)	meters
Lakemed	nearness to medium sized lakes (100ha < 1000ha)	meters
Lakelarge	nearness to large lakes (> 1000ha)	meters
Meltlarge	nearness to meltwater areas	meters
Meltsmall	nearness to meltwater lines	meters
Rapids	nearness to rapids	meters
Waterfalls	nearness to waterfalls	meters
Wetsmall	nearness to size class 1 wetlands (< 5ha)	meters
Wetlarge	nearness to size class 2 wetlands (> 5ha)	meters
Streamothr	nearness to any stream not in fisheries values below	meters

Table 8 presents the variables used to determine the proximity of sites and points to fish resources. The watershed cut-offs listed below were chosen to approximate whether the stream was capable of containing fish, since fisheries data was not available. The large, double line streams, such as the Stikine and Iskut are known to contain salmon.

Salmon and other fish species were very important resources (see Section 4 and Section 2).

Table 8. 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 magnitude of 25 or greater	meters

Table 9 presents the variable used to compare the location of known archaeological sites to each other and their proximity to trails and ethnographically documented sites recorded during the course of this project (see Appendix 7).

Table 9. Variables Describing Proximity to Known Human Activity

Variable	Description	Unit of Measure
Trails	nearness to identified trails	meters
Sites	nearness to identified archaeological sites	meters
Ethnoline	nearness to ethnographically documented trails	meters
Ethnpoint	nearness to specific locations documented in ethnographic research	meters

Table 10 presents the variables used to describe the forest cover that the sites or points were located in. All of the identified species were used in technology or as food or medicinal sources.

Table 10. Variables Describing Forest Cover

Variable	Description	Unit of Measure
Lpine_id	identifies whether point is within lodgepole pine forest coverage	-
Lpine_perc	proportion of lodgepole pine in forest coverage	Percent
Lpine_age	Age class of lodgepole pine in forest coverage	-
Lpine_hght	Height class of lodgepole pine in forest coverage	-
Lpine_cl	crown closure of lodgepole pine in forest coverage	Percent
Cottn_id	identifies whether point is within cottonwood/balsam poplar forest coverage	-
Cottn_perc	proportion of cottonwood/balsam poplar in forest coverage	percent
Cottn_age	Age class of cottonwood/balsam poplar in forest coverage	-
Cottn_hght	heightclass of cottonwood/balsam poplar in forest coverage	
Cottn_cl	crown closure of cottonwood/balsam poplar in forest coverage	percent
Heml_id	identifies whether point is within hemlock forest coverage	

Variable	Description	Unit of Measure
Heml_perc	proportion of hemlock in forest coverage	percent
Heml_age	ageclass of hemlock in forest coverage	
Heml_hght	heightclass of hemlock in forest coverage	
Heml_cl	crown closure of hemlock in forest coverage	percent
Sprce_id	identifies whether point is within spruce forest coverage	
Sprce_perc	proportion of spruce in forest coverage	percent
Sprce_age	ageclass of spruce in forest coverage	
Sprce_hght	heightclass of spruce in forest coverage	
Sprce_cl	crown closure of spruce in forest coverage	percent
Openrng_nr	nearness to openrange forest coverage	meters
Openrng_id	identifies whether point is within openrange forest coverage	

Table 11 presents the variables used to determine wildlife suitability. High suitability would indicate that the location of the site or point is a potential hunting territory.

Table 11. Variable Describing Wildlife Capability

Variable	description	unit of measure
Caribou	caribou suitability measure (values 1 – 6; 1 = high, 6= low)	ordinal
Moose	moose suitability measure (values 1 – 6; 1 = high, 6= low)	ordinal
Sheep	mountain sheep suitability measure (values 1 – 6; 1 = high, 6= low)	ordinal

Table 12 presents the slopes and aspects of the points recorded. Sites are usually, according to traditional archaeological wisdom, located on flat ground. The aspect, or the direction of the slope, can be important for vegetation patterns and sunlight exposure.

Table 12. Variables Describing Topography

Variable	Description	Unit of Measure
Slope	slope	percent
Aspect	aspect	degrees

6.4.2 Variables for Archaeological Sites

In addition to these variables, Table 13 presents the other variables included for sites, survey points, and a one kilometre grid respectively.

Table 13. Additional Variables for Archaeological Sites

Variable	Description	Unit of Measure
zbn	Unique Borden number	-
location	Location of site from site inventory form	-
type_archb	Site type according to Archaeology Branch Site Recording Guide	-
sitearea	Area of site	Square meters
feature	Features present at site from site inventory form	-
fe_details	Feature details from site inventory form	-
remarks	remarks from site inventory form	-
permit	permit number	-
lithic	whether or not site contains lithic artifacts *	-
quarry	whether or not site contains/is a quarry	-
habit_depr	whether or not site contains/is a habitation depression	-
cave	whether or not site contains/is a cave site	-
habitation	whether or not site contains/is a habitation other than those above	-
food_depr	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_trap	whether or not site contains/is the remains of hunting or trapping activity	-
fish	whether or not site contains/is a fishing feature	-
food_other	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	-
cairn	whether or not site contains/is a cairn	-
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	-

6.4.3 Variables for Survey Grid Points

For the surveyed points (negative data), Table 14 presents the information collected so that each surveyed area could be accurately identified. In addition to the fields Tables 3-11, permit number, surveyor and type of survey, a unique identification was given to each point.

Table 14. Additional Variables for Survey Grid Points

Variable	Description
grid_id	unique id. for each point in surveyed area
surveytype	type of survey (intensive or reconnaissance)
surveyor	name of surveyor
permit	permit number

6.4.4 Variable for One Kilometre Grid

For the one kilometre grid, a unique identification was given to each point in addition to the geographic data (see Table 15).

Table 15. Variables for One Kilometre Grid

Variable	Description
km_grid_id	unique id. for each point in 1km grid

6.4.5 Sources of Data for Incorporating Variables into the Model

Timberline Forest Inventory Consultants Ltd., using ARC/INFO with the following digital data, calculated the geographic information:

TRIM (at 1:20, 000) was used for lakes, streams and wetland boundaries, slope, aspect, eskers, lavaflows, icefields, cliffs, moraines, rapids, and waterfalls;

Watershed atlas (at 1:50,000) data was used to calculate the order and magnitude of double and single line streams and these 'fisheries' values placed on the corresponding TRIM features:

- Forest Cover maps (at 1:20,000) were from the Ministry of Forest data;
- Biogeoclimatic zones came from the B.C. Environment FTP site;
- Caribou suitability from MoE Smithers (Joanna Fhalz);
- All sites from CHIN;
- Ethnographic data from fieldwork (see this report); and
- Trails from documentary sources (see this report).

Because of financial and time restrictions, geographic data was only available for 42 1:20,000 map sheets. Certain site types and certain geographic variables were not available for modeling because of the limited number of map sheets used for modelling.

6.5 Modeling Methodologies

The nearness functions were limited to values less than or equal to 2000 m for all calculations with the exception of nearness to trails, sites, streamsalmon and streamfish (as defined above). These "set limits" limited the computer processing time for the GIS calculations.

The variables used for this study are of three basic types:

- Continuous: based on distance of the feature to any data point (site, survey, or grid) (e.g., distance in meters to a salmon stream);
- Ordinal: based on the ranked suitability in a given area (e.g., caribou suitability); and
- Nominal: based on presence or absence of variables or classification type (e.g., biogeoclimatic zones).

The data was stored using FoxPro in three database files (dbf format), 1) sitelist, 2) survlist and 3) kmgdlst.

6.5.1 Continuous Variables used for Modeling

The nearness of data points (sites, surveys, grid) to each continuous variable was measured using a nearness function. Variables that were found to be too far from these points were discounted. The distance at which variables were discounted changes with each variable, but most were set at 2000 m. Variables over the set limits were statistically treated as missing data.

Values were not available for a variable if the point or site did not fall within two kilometres of the geographic feature that the variable represents. Many variables, such as eskers, had too few values to calculate these tests or to use in the modeling. Many variables were found in proximity to km grid points but not to 'known archaeological points'. As there could be no correlation made between site locations and certain variables, the following variables were not used for modeling purposes: eskers, lavaflows, iceflows, cliffs, moraine, waterfalls, meltsmall, meltlarge, lake medium, all forest cover except cottn_id, sprce_id, lpine_id, and heml_id. Sheep data and aspect were also excluded. TRIM provides only limited information on these features. For example, surficial geology mapping would be preferable, if it was available.

The sample populations for the univariate statistical tests were limited to those cases which fell within the limits stated for each variable. The goal of this initial analysis was to develop a buffering type model using the "near to" functions and other geographic data (such as forest cover) outlined above. 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.

The next step of the model was to determine which variables were important in predicting the locations of sites. This was done by comparing the archaeological site data to the one kilometre grid on a variable by variable basis for the entire data set as a whole and for each biogeoclimatic zone. Two sample t-tests were calculated to see if there were significant differences between the means (averages) of the continuous variables. The purpose of the t-tests was to assess our hypothesis that the mean of the variable was less than the mean of the variable for the one kilometre grid ($\mu X_{\text{site}} = \mu X_{\text{km}}$ vs. $\mu X_{\text{site}} < \mu X_{\text{km}}$ where X is the variable in question).

Table 16 shows whether the continuous variables were significant overall and by zone (probability < 0.1). For example, a "Yes" for timberline in the following tables

signifies that sites are on average closer to the timberline than the points in the one kilometre grid.

In addition to calculating these measures of significance, histograms were created to compare the one kilometre grid points and sites for each variable over all cases and by zone. The histograms showed the distributions of the values for the variables. This was used both to determine whether buffers were suitable for that variable and what size of buffer would be useful. The nature of the distribution was important. For sites, a strong left skew was sought, signifying a strong tendency for the sites to be near the geographic feature (see Figure 9).

Table 16. Significance of Continuous Variables

Variable	Overall	AT Zone	ESSF Zone	SBS Zone	BWBS Zone
timberline	Yes	No	Yes	†	†
ecotone	No	No	Yes	Yes	No
rapids	No	†	No	†	No
streamsalm	Yes	Yes	†	Yes	Yes
streamfish	Yes	Yes	Yes	Yes	Yes
streamothr	No	Yes	Yes	No	No
wetsmall	No	Yes	No	No	No
wetlarge	No	No	†	†	No
lakevs	No	Yes	Yes	No	No
lakesmall	Yes	Yes	†	†	No
lakelarge	Yes	†	†	†	Yes
trails	Yes	No	No	Yes	Yes
ethnoline	Yes	No	Yes	Yes	Yes
sites	Yes	Yes	Yes	Yes	Yes

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

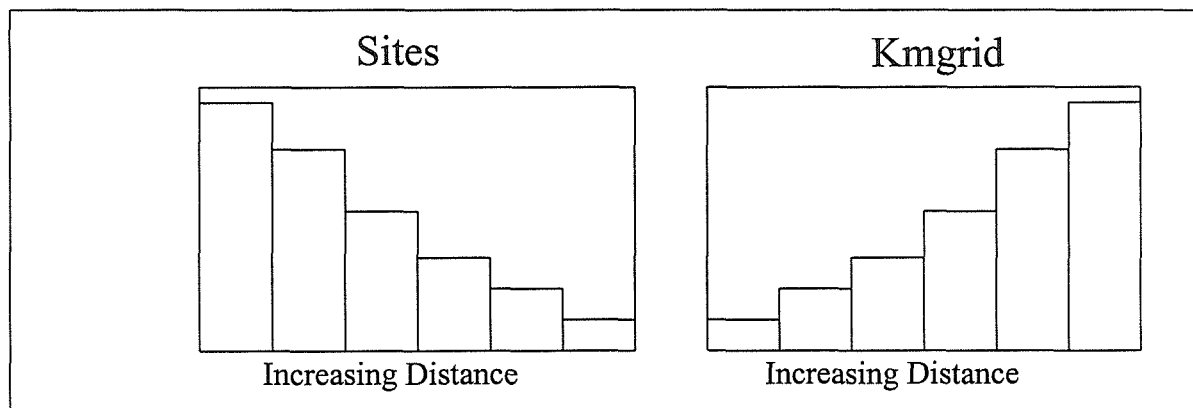


Figure 8. Ideal Distribution of a Significant Variable.

In addition, however, the nature of the skew for the sites needed to be significantly different from the surveyed points to be of predictive value.

6.5.1.1 Ethnographic Discussion of Significant Continuous Variables

The variables described as significant are discussed in relationship to important ethnographic sources.

Timberline.

Albright discusses the importance of the timberline (1984:88). Extended family camps were constructed here from mid-August to mid-September. These areas were associated with hunting activities for smaller game and Caribou.

Streamsalmon.

Salmon bearing streams are an obviously important economic resource extraction area. The banks of these large streams are the primary location for large summer villages. The confluences of minor creeks (streamfish) and salmon streams appear to be favored locations (Albright 1984:85). These were given higher values because of the additive process.

Streamfish.

Although salmon are the predominant fish resource used by the Tahltan, other fish such as trout and grayling served as important food sources (Albright 1984:90). These fish were likely found in larger creeks and rivers as well as lakes large enough to sustain fish.

Streammothr.

Smaller streams were only significant in higher elevation biogeoclimatic zones. This appears to correspond to the ethnographic record. The heads of small creeks and valleys (associated with small streams) in the mountains are specifically mentioned as camping areas in myths recorded by Teit (1921a:224,238) and in Albright (1984: 88).

Lakelarge.

Large lakes, like salmon bearing streams appear to be important resource extraction areas. Migrating salmon pass through some of the larger lakes that were connected with major rivers (Albright 1984: 85). Lakes were also important for non-anadromous fish species that were caught in large quantities in the spring (Albright 1984: 90).

Lakesmall/Lakevs.

Smaller lakes have higher significance only in higher elevations. This suggests that where larger resource areas were present, they were preferred. This suggests a logical adaptive strategy: larger lakes likely provided more resources (both water and fish) and where they were available they were likely preferred.

These classes of data represent direct evidence of past human occupation. It is important to note that the ethnolines documented during interviews with Tahltan Elders are significantly associated with sites in a statistical sense. This provides empirical support for the use of ethnographic material in predictive modeling.

6.5.2 Nominal and Ordinal Variables used for Modeling

For the nominal and ordinal variables, chi square tests were used to test whether or not the distributions of variables were significantly different from random (Table 17). Those variables that showed non-random distributions and showed higher observed values for sites than expected (random) values for sites were considered significant. For example, on the Caribou variable, a “Yes” signifies that site locations are more common in areas of high caribou suitability.

Table 17. Significance of Nominal and Ordinal Variables

Variables	Overall	AT	ESSF	SBS	BWBS
cottn_id	No	No	No	No	No
sprce_id	No	No	No	No	No
lpine_id	Yes	No	No	No	No
heml_id	No	No	No	No	No
caribou*	Yes	No	Yes	No	Yes
Moose	Yes	No	No	No	Yes

*comparisons were made between values of 1 or 2 (high caribou) versus 3 or greater (low caribou) for the chi-square contingency table.

Based upon an examination of the histograms and the ethnographic correlates outlined above, certain variables were considered to be highly predictive, either overall or by zone. These variables were given greater weight in the development of the model and include (Table 18).

Table 18. Highly Predictive Variables

Variable
lakemed
lakelarge
caribou
streamsalm
streamfish

Other variables were also given greater weight by zone. If a variable was not present for a particular zone in the surveyed area (i.e., greater than the set limit), but significant overall, it was given weight as if it were significant.

It was also observed that the ICH biogeoclimatic zone had only one site in it, despite being well surveyed (over 1000 ha of intensive survey). This zone was

considered to have little archaeological potential. This consideration was reflected in the modeling.

6.5.2.1 Ethnographic Discussion of Significant Nominal and Ordinal Variables

The variables described as significant are discussed in relationship to important ethnographic sources.

Lpine_id.

Lodgepole pine is specifically mentioned as an important resource (Albright 1984: 67). The cambium from this tree was harvested around the month of May.

Caribou.

According to Emmons, "...the caribou has always had first place in the economic life of the Tahltan..." High caribou suitability (scores of one or two) are more strongly associated with sites than randomly spaced points. This is not surprising considering the obvious importance of this animal in the economic life of the Tahltan.

Moose

Teit (1912-15:81) and Albright (1984) mention moose as one of the animals that the Tahltan regularly used as food. It appears that in many areas, high moose suitability and high caribou suitability are correlated.

6.5.3 Development of the Model

In developing the model, the potential for the occurrence of archaeological sites was evaluated using an additive model. It was used primarily for efficiency. Additive models assume that if a location has a number of features that are likely to attract human habitation, it should have a higher potential. In an additive model, the number of significant features in an area reflects its potential. Adding (or subtracting) points for each significant variable increases or decreases the potential value. The additive ratings used for the present model are presented in Table 19.

Table 19. Potential Ratings

Potential	Additive Value
Low	1
Moderate	2
Moderate to High	3
Highest	4+

Initial buffer sizes were chosen based on the frequency histograms for each significant variable by sites and surveyed areas (non-sites). For the preliminary model, only biogeoclimatic zone, forest cover data, slope and data derived from TRIM was used (water features, eskers, etc.). The buffers for the model were selected using an *iterative*

process. In other words, the preliminary model presented below was generated several times using different buffer sizes. After each iteration, a table that assessed overall accuracy of the model was generated (see Table 20). For each iteration, the buffer sizes were changed by a relatively small amount (usually 50 m), then the model was again run on the data. The accuracy of the model was calculated and the buffers were again modified. This process was repeated until most known archaeological sites fell into high or moderately high potential categories and the model resembled the basic pattern underlying the ideal model. The goal was to 'catch' almost all of the known sites in potential zones greater than 'low'.

6.6 Preliminary Model

Three stages of modeling were chosen for the preliminary model

- 1) Buffers which reflected the variables which were significant overall;
- 2) Buffers which reflected the importance of highly significant variables; and
- 3) The removal of significance for areas on extremely steep slopes.

Nearness of sites to other sites, trails and ethnographic features was not included in the initial model to test the accuracy of the environmental variables used in the study. Sites, trails and ethnographic features are direct evidence of previous human occupation and increase the accuracy of the model regardless of the environmental variables used.

Buffers were created so significant variables would have transitional zones of potential around them. By initially placing a large buffer around these features then placing a smaller additive buffer around them, transitional buffers were created. Such buffering is represented in Figure 9.

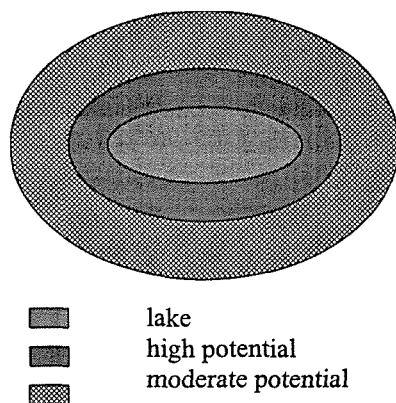


Figure 9. Transition Buffers.

6.6.1 Application of the Preliminary Model

6.6.1.1 First Stage

The first stage in the application of the model was to create buffers around each variable that showed significance. 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 two. The buffers were defined as follows:

- 200 m around the following:
timberline in all zones except AT (in other words 200 m below the timberline)
lakemed in all zones except ICH
lakelarge in all zones except ICH
- 150 m around the following:
lakevs in ESSF, SWB and AT
lakesmall in all zones except ICH
streamothr in ESSF, SWB and AT
- 500 m around the following:
streamfish in all zones except ICH
- 1200 m around the following:
streamsalm in all zones except ICH

Areas within lakes, wetlands and streams were not included in the buffering.

6.6.1.2 Second Stage

In the second stage of the preliminary model, the potential value of the buffer was increased by one point for areas that met the following conditions (the addition of values at this stage was cumulative):

- everything within 200 m of streamsalm in all zones;
- everything within 200 m of streamfish in all zones;
- everything within 150 m of stream other in AT;
- everything within 100 m of lakemed in all zones;
- everything within 100 m of lakelarge in all zones;
- everything with a Caribou suitability variable of 1 or 2; and
- everything within Lodgepole pine forest coverage.

6.6.1.3 Final Stage

The final stage removed a point of potential for areas with a slope greater than 45 percent. Although no statistical studies were used in choosing this cutoff, most sites are generally not found on steep, inaccessible locations.

Timberline Forest Inventory Consultants Ltd. produced the preliminary model on the following map sheets: 104G09 and 104G14.

6.6.1.4 Applying the Model to the Data Points

In FoxPro, the model was tested using the following set of commands:

Replace all potential with 1

Replace potential with potential + 1 for ((zone <> 'AT' and timberline < 200) or streamsalm < 1200 or streamfish < 500 or ((zone = 'ESSF' or zone = 'SWB' or zone = 'AT') and streamothr < 150) or ((zone = 'ESSF' or zone = 'SWB' or zone = 'AT') and lakevs < 150) or lakesmall < 150 or lakemed < 200 or lakelarge < 200) and zone <> 'ICH'

Replace potential with potential + 1 for streamsalm < 200

Replace potential with potential + 1 for streamfish < 200

Replace potential with potential + 1 for zone = 'AT' and streamothr < 150

Replace potential with potential + 1 for lakemed < 100

Replace potential with potential + 1 for lakelarge < 100

Replace potential with potential + 1 for caribou < 3

Replace potential with potential + 1 for lpine_id = 'LPINE'

Replace potential with potential - 1 for slope = 5 or slope = 6

These commands were run for the sitelist and kmgdlist databases. These values were used to assess the model and to locate any gaps or errors in it and to generate the tables presented below.

6.6.2 Assessment of the Preliminary Model

Table 20 presents the assessment of accuracy of the model using the FoxPro commands given above. Table 20 presents summary statistics on the effect of the model on both site capture (% of known sites captured by different potential zones) and on the area of land base taken up by the potential zone. These tables provide a quick alternate to querying the GIS on the model performance. The model is assessed 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 low to high (1 to 4+) and the proportion of one kilometre grid points should progressively decrease.

6.6.3 Discussion of Preliminary Model by Zone

6.6.3.1 Overall

Overall, the preliminary model showed considerable accuracy. The proportion of sites increased as the potential rating increased, and the proportion of one kilometre grid points decreased as the potential rating increased. Thus, over all of the zones, the preliminary model approximated the ideal model discussed above.

6.6.3.2 Alpine Tundra Zone

In the Alpine Tundra zone, the model appeared to place too many sites and one kilometre grid points in the third potential rating (Moderate to High). There should be more sites in the high potential rating and fewer one kilometre grid points.

Table 20. Assessment of the Preliminary Model

Overall	Site		Kmgrid	
potential	n	%	n	%
1 (low)	4	2.72	2194	38.98
2 (moderate)	18	12.24	1958	34.79
3 (moderately high)	60	40.82	1144	20.33
4+ (high)	65	44.22	332	5.90
total	147		5628	
AT	Site		Kmgrid	
potential	n	%	n	%
1	1	4.76	705	43.95
2	4	19.05	384	23.94
3	14	66.67	441	27.49
4+	2	9.52	74	4.61
total	21		1604	
BWBS	Site		Kmgrid	
potential	n	%	n	%
1	2	1.90	249	27.82
2	19	18.10	379	42.35
3	45	42.86	205	22.91
4+	39	37.14	62	6.93
total	105		895	
ESSF	Site		Kmgrid	
potential	n	%	n	%
1	0	0.00	668	43.38
2	2	33.33	579	37.60
3	3	50.00	237	15.39
4+	1	16.67	56	3.64
total	6		1540	
ICH	Site		Kmgrid	
potential	n	%	n	%
1	1	100.00	292	58.05
2	0	0.00	175	34.79
3	0	0.00	32	6.36
4+	0	0.00	4	0.80
total	1		503	

Overall	Site		Kmgrid	
SBS	Site		Kmgrid	
potential	n	%	n	%
1	0	0.00	130	33.33
2	4	28.57	149	38.21
3	3	21.43	77	19.74
4+	7	50.00	34	8.72
total	14		390	
SWB	Site		Kmgrid	
potential	n	%	n	%
1	0	n/a	204	35.17
2	0	n/a	257	44.31
3	0	n/a	105	18.10
4+	0	n/a	14	2.41
total	0		580	

6.6.3.3 Boreal White and Black Spruce Zone

In the Boreal White and Black Spruce zone (BWBS), the model again placed more sites in the third zone of potential than in the highest zone of potential. In the one kilometre grid, there were more sites in the second zone of potential than in any other. Although this pattern does not match that in the ideal model, considering the relative abundance of sites in this zone, this is not a serious problem. Overall, this zone should have the highest potential rating because 105 of the 147 sites in the modeling study area are in this zone.

6.6.3.4 Engelmann Spruce-Subalpine Fir Zone

Again, the Engelmann Spruce-Subalpine Fir zone showed a similar pattern to that in the previous zones for the distribution of sites across the zones of potential. The bulk of the sites are in the moderate-high potential category. However, for this zone, the distribution of one kilometre grid points approximates the ideal model.

6.6.3.5 Interior Cedar-Hemlock Zone

In the Interior Cedar-Hemlock zone, the only site recorded was in the lowest zone of potential. Although, based on the extensive survey done in this zone and the paucity of sites, this zone is considered to have minimal potential, the model ideally would catch sites if they were present.

6.6.3.6 Sub-Boreal Spruce Zone

The pattern for sites in the Sub-Boreal Spruce zone approximated the model, however the pattern in the one kilometre grid did not. As with the BWBS zone, this zone is considered to have relatively high potential considering the number of sites and the small amount of survey work done there.

Table 21. Assessment of Preliminary Model by Site Type

Potential	n	%	n	%	n	%
	Lithic		Habit_depr		Cachepit	
1	3	2.52	0	0.00	0	0.00
2	18	15.13	0	0.00	2	9.09
3	48	40.34	0	0.00	7	31.82
4+	50	42.02	2	100.00	13	59.09
total	119		2		22	
	Cairn		Trail		Burial	
potential	n	%	n	%	n	%
1	0	0.00	0	0.00	0	0.00
2	0	0.00	0	0.00	1	14.29
3	1	50.00	1	25.00	3	42.86
4+	1	50.00	3	75.00	3	42.86
total	2		4		7	
	Rockart		Fish		Historic	
potential	n	%	n	%	n	%
1	0	0.00	0	0.00	0	0.00
2	0	0.00	1	10.00	0	0.00
3	0	0.00	3	30.00	6	50.00
4+	2	100.00	6	60.00	6	50.00
total	2		10		12	
	Food_othr					
potential	n	%				
1	1	100.00				
2	0	0.00				
3	0	0.00				
4+	0	0.00				
total	1					

6.6.3.7 Spruce-Willow-Birch Zone

It is difficult to assess the accuracy of the model for the Spruce Willow Birch zone because there are no sites on the map sheets modelled. Sites do exist in this zone in the CIS LRMP, however they are outside of the 42 map sheets studied.

6.6.3.8 By Site Type

With the exception of the food_other category, the distribution of sites by site type approximates the ideal model. The only food_other site in the study area is also the only site in the ICH zone, where known sites and inventoried ethnographic use sites are both rare. Unique sites are always difficult to model for. Thus any improvements to the model in this zone might also improve the distribution of sites by site type.

6.7 Distribution of Site Types by Zone

The following is a description of known archaeological site types by zone (see Table 3). This section provides evidence concerning the types of site that will tend to occur in a particular biogeoclimatic zone. A high potential in a specific zone indicates that there is a high potential for sites however this information suggests the types of sites to expect to find in the different biogeoclimatic zones. Information for the SWB zone is not available because of the lack of sites in that zone in the 42 map sheets modelled for.

6.7.1 Discussion of Site Location

In general, the bulk of the sites recorded tend to be found in the BWBS zone. This pattern may be related to survey biases. Several judgmental or undocumented surveys, which were not incorporated in the mapped survey areas concentrated on sites along the major rivers in the CIS LRMP. The number of sites in other areas, with the exception of the ICH zone, likely represents a lack of survey.

Despite the lack of survey, certain patterns are observed in the distribution of sites by biogeoclimatic zone. Proportionally, there are more lithic sites in AT and ESSF zones than in any other zone. The important Mt. Edziza lithic quarrying area is immediately adjacent to the study area. High altitude, exposed areas represent important areas for lithic procurement and utilisation. We expect sites to be found in such areas. The distributions of BWBS and SBS sites are similar. This suggests a division of the study area into two general patterns with certain sites associated with higher elevations and others with lower elevations. This is likely related to the seasonal rounds of the Tahlitan as discussed in Albright.

6.7.2 Review of the Preliminary Model in Relation to the Ethnographic Record

Table 22 presents an evaluation and recommendation of the initial model in terms of seasonal movements, land use, and settlement pattern information that was collected in the background research (see Section 5) for this report. Recommendations are given so that the model provides a greater representation of this type of data.

Table 22. Discussion of Preliminary Model

Location (See Table 1 for more information)	Site Type	Variables used in Modeling	Comments
“Village sites were generally located at major creek and river confluences and at the outlets of lakes where large runs of salmon passed on their way to spawning grounds and could be easily caught in weirs and basket traps” (Albright 1984:85)	Fishing Villages	Streamsalmon	The preliminary model accounts for this type of site.
General vicinity of village	Plant Gathering Sites	Streamsalmon, nearness to known archaeological sites.	There is a lack of physical remains associated with plant gathering sites. The use of sub-zone data could be used in future studies to gain an understanding of the potential for specific plant gathering activities. This type of data is not available at this time.
At timberline “near the heads of many small tributary creek valleys ... located at the ecotone between alpine meadow and subalpine forest” (Albright 1984:88)	Camps	Timberline, biogeoclimatic zone, ecotone, streammouth.	The preliminary model accounts for this type of site.
Hunting/Alpine Meadows	Kill sites, trap sites, butcher sites, isolated finds, retooling, lookout sites.	Biogeoclimatic zone	Increasing buffers on the Alpine Tundra side of the ecotone boundary could increase confidence.
Berry gathering, vicinity of camps	Resource Use	None	Berry patches may be some distance from the camps. There tends to be a lack of physical remains left in berry gathering activities.

Location (See Table 1 for more information)	Site Type	Variables used in Modeling	Comments
Alpine ridges	Obsidian quarries	Nearness to sites, Biogeoclimatic zone	<p>Obsidian quarry sites have been thoroughly investigated in the region. Alpine ridges should be included as variable to account for other raw lithic material gathering areas and lookout sites.</p> <p>Digital information of alpine ridge was not available at the time of this study and this information could not be included in the draft final model.</p>
Subalpine valleys, "within the protection of forested valleys, where firewood was abundant, and in the vicinity of caribou yarding areas where fences were constructed" (Albright 1984:90)	Base Camps	Streamoth, Caribou suitability, forest cover, biogeoclimatic zone	<p>Subalpine valleys should be high in site potential where caribou suitability is high.</p> <p>The model accounts for this scenario.</p>
Subalpine valleys	Caribou fences	Caribou, Biogeoclimatic zone	<p>Subalpine valleys should be high in site potential where caribou suitability is high.</p> <p>The model accounts for this scenario.</p>
Alpine meadows, ridges	Caribou drives, kill sites, temporary camps, retooling sites, temporary caches	Caribou suitability, biogeoclimatic zone.	<p>No variables account for alpine ridges. This should be considered for the final model. Buffers should be extended on the AT side of the timberline.</p> <p>Digital information of alpine ridge was not available at the time of this study and this information could not be included in the draft final model.</p>

Location (See Table 1 for more information)	Site Type	Variables used in Modeling	Comments
Sub-Alpine forests	Kill sites, temporary camps, temporary caches, retooling sites	Biogeoclimatic zone, caribou suitability	Data on bear and moose suitability should be incorporated into the model. Moose data will be incorporated. Bear data is not available.
Lakes, streams	Fish camps	Lakesmall, Lakemed, Lake large, Streamfish.	The preliminary model accounts for these types of sites.
Forested valleys, close to caribou fences	Winter Village	Caribou suitability, forest cover, streamofth, stream fish, lake variables.	All forest valleys with high Caribou suitability should be considered high potential. The preliminary model accounts for this.
Sub-alpine and boreal forests	Temporary camps, kill sites, trap sites, temporary, retooling sites, cache sites	Caribou suitability, Biogeoclimatic zone.	Moose and beaver data should be incorporated into the model in sub-alpine and forested areas. Moose data will be included in the final model. Beaver data was not available.
Located near "good fishing lakes and streams" (Albright 1984:90)	Camps	Streamfish, Lakes variables.	The preliminary model accounts for this.

Location (See Table 1 for more information)	Site Type	Variables used in Modeling	Comments
Boreal forest, sub-alpine forests	Temporary camps, kill sites, trap sites, temporary, retooling sites, cache sites	Pine variables, biogeoclimatic zone	Bear and beaver data should be incorporated into the model. Neither type of data is available.
Vicinity of camps	Plant gathering	Pine variables	CMTs are modelled for. Other plant gathering activities will leave little in the way of physical remains. Use of sub zone data would help in modeling for specific plant use zones
Vicinity of camps and villages	Bark gathering for material use	Streamsalm (restricts model to area where villages expected)	Spruce trees were girdled and physical remains may be scant. Including spruce variables in the model would help to account for these areas, despite the lack of statistical significance.

6.8 Draft Final Model

Owing to the accuracy of the preliminary model, and considering the limited sample of 42 map sheets, the draft final model reflects the inclusion of variables which provide direct evidence of human occupation (documented sites and trails and ethnographic observations). In addition, both moose and spruce were included as variables in the model due to the recommendations given in Table 22. Unfortunately, at the time of this study, appropriate GIS data was not available to address all of the recommendations in Table 22. This problem is addressed more fully in Section 8.

Spruce was included because of its importance in the ethnographic record, despite the fact that it is not statistically significant. Inadequate recording of CMTs in the past and identified survey biases may have contributed to the under-representation of sites within spruce forest cover. The potential for spruce was added for areas that were near water sources.

Moose was included because high moose suitability was statistically significant. Rather than creating a separate additive layer for moose, high moose suitability was combined with high caribou suitability. This was done because moose suitability and caribou suitability were correlated.

The timberline was buffered on both sides of the timberline in the draft final model to account for palaeo-environmental shifts.

In addition to the buffers in the preliminary model, the following features were buffered:

250 m around the following:

- Ethnolines;
- Known archaeological sites; and
- Documented trails.

The areas within these buffers were automatically given high potential (a value of 4).

6.8.1 Application of the Draft Final Model

In FoxPro, the model was tested using the following set of commands:

Repl all potential with 1

Repl potential with potential + 1 for ((timberline < 200) or streamsalm < 1200 or streamfish < 500 or ((zone = 'ESSF' or zone = 'SWB' or zone = 'AT') and streamothr < 150) or ((zone = 'ESSF' or zone = 'SWB' or zone = 'AT') and lakevs < 150) or lakesmall < 150 or lakemed < 200 or lakelarge < 200) and zone <> 'ICH'

Repl potential with potential + 1 for streamsalm < 200

Repl potential with potential + 1 for streamfish < 200

Repl potential with potential + 1 for zone = 'AT' and streamothr < 150

Repl potential with potential + 1 for lakemed < 100
 Repl potential with potential + 1 for lakelarge < 100
 Repl potential with potential +1 for (sprce_id= 'SPRUCE' and potential > 1)
 Repl potential with potential +1 for caribou < 3 or moose < 3
 Repl potential with potential +1 for lpine_id = 'LPINE'
 Repl potential with potential – 1 for slope = 5 or slope = 6
 repl potential with 4 for trails < 250
 repl potential with 4 for sites < 250
 repl potential with 4 for ethnoline < 250

6.9 Assessment of the Draft Final Model

Table 23 and 24 present the assessment of accuracy of the model using the FoxPro commands given above. The model is assessed overall, by zone and by site type. The potential, the number of sites, and the proportion of sites are presented.

Table 23. Assessment of the Draft Final Model

Overall	Sitelist		Kmgdlist	
potential	n	%	n	%
1	1	0.68%	1898	33.72%
2	5	3.40%	1721	30.58%
3	17	11.56%	1144	20.33%
4+	124	84.35%	865	15.37%
total	147		5628	
AT	Sitelist		Kmgdlist	
potential	n	%	n	%
1	1	4.76%	699	43.58%
2	3	14.29%	372	23.19%
3	10	47.62%	440	27.43%
4+	7	33.33%	93	5.80%
total	21		1604	
BWBS	Sitelist		Kmgdlist	
potential	n	%	n	%
1	0	0.00%	87	9.72%
2	1	0.95%	265	29.61%
3	5	4.76%	198	22.12%
4+	99	94.29%	345	38.55%
total	105		895	
ESSF	Sitelist		Kmgdlist	
potential	n	%	n	%
1	0	0.00%	596	38.70%
2	1	16.67%	525	34.09%
3	2	33.33%	256	16.62%
4+	3	50.00%	163	10.58%

Overall	Sitelist		Kmgdlist	
total	6		1540	
ICH	Sitelist		Kmgdlist	
potential	n	%	n	%
1	0	0.00%	268	53.28%
2	0	0.00%	150	29.82%
3	0	0.00%	39	7.75%
4+	1	100.00%	46	9.15%
total	1		503	
SBS	Sitelist		Kmgdlist	
potential	n	%	n	%
1	0	0.00%	41	10.51%
2	0	0.00%	110	28.21%
3	0	0.00%	101	25.90%
4+	14	100.00%	138	35.38%
total	14		390	
SWB	Sitelist		Kmgdlist	
potential	n	%	n	%
1	0	n/a	180	31.03%
2	0	n/a	232	40.00%
3	0	n/a	100	17.24%
4+	0	n/a	68	11.72%
total	0		580	

6.9.1 Discussion of the Draft Final Model

The inclusion of direct evidence for human occupation creates significant improvements in the accuracy of the model. The proximity of sites to other sites, to documented trails and to trails identified in ethnographic research all show strong statistical significance. The improvements in the model are related to the fact that trails likely pass through marginal zones which would not otherwise be utilized. By placing a buffer around these features, more archaeological material will be included by the model.

The model represents a generalised model for all documented site types with the possible exception of some lithic sites and the single food_other site recorded. The number of lithic sites in low and moderate potential suggests inherent inaccuracies in the modelling process.

6.10 Potential Maps

The results of this model are presented in the five 1:50,000 scale potential maps that are included in Volume II. These maps are colour coded. Refer to the legend of these maps for a description of the mapped features. Summaries of the recommendations

regarding each level of potential are given in the legend as well. For more information regarding these recommendations, see Section 8.

Table 24. Assessment of the Draft Final Model by Site Type

potential	n	%	n	%	n	%
	Lithic		Habit_depr		Cachepit	
potential	n	%	n	%	n	%
1	1*	0.84%	0	0.00	0	0.00
2	5	4.20%	0	0.00	0	0.00
3	16	13.45%	0	0.00	0	0.00
4+	97	81.51%	2	100.00	22	100.00
total	119		2		22	
	Cairn		Trail		Burial	
potential	n	%	n	%	n	%
1	0	0.00	0	0.00	0	0.00
2	0	0.00	0	0.00	0	0.00
3	0	0.00	0	0.00	0	0.00
4+	2	100.00	4	100.00	7	100.00
total	2		4		7	
	Rockart		Fish		Historic	
potential	n	%	n	%	n	%
1	0	0.00	0	0.00	0	0.00
2	0	0.00	1	10.00	0	0.00
3	0	0.00	0	0.00	0	0.00
4+	2	100.00	9	90.00	12	100.00
total	2		10		12	
	Food_othr					
potential	n	%				
1	0	0.00				
2	0	0.00				
3	0	0.00				
4+	1	100.00				
total	1					

* In this table a nearness to sites measure was used to assess the accuracy of the model. To evaluate the accuracy of the model, it was presumed that each site was an unrecorded site. In the draft final model, all recorded sites will be in areas of high potential.

6.11 Theoretical Considerations and Limitations in Determining Potential

6.11.1 Considerations in Predictive Modelling

Models cannot predict the location of all sites, nor can they reflect all possible uses of the landscape by past human populations. A place may have significance to living peoples or to peoples in the past that is not recorded in the archaeological record. For these reasons, the Tahltan First Nations should be consulted during the course of making management decisions.

All locations in the study area are considered to have potential. A rating of low potential does not necessarily imply that there is an absence of sites, but that there are factors that are not conducive to *either* site formation, *or* past human occupation. As such, the model should not supersede the expressed interests or wishes of the Tahltan First Nations. A possible complication for modeling 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 (Altschul 1990). 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 such secluded locations (e.g., ritual isolation).

Other problems include site preservation quality and post-depositional factors. The poor preservation of faunal and floral materials in some areas will affect the archaeologist's ability to locate areas of past human occupation. Post depositional factors such as soil erosion or geophysical activity can also destroy or significantly alter sites. Some of these factors were taken into consideration in determining buffer sizes and analysing the model's accuracy. Since the modeling methodology used is a product of previous archaeological studies, some biases will also be carried forward into the present and future predictive models.

6.11.2 Data Gaps

The application of specific data to the model also has its limitations. For example, Tahltan place names often make reference to caribou where none are presently found (Norman Day, personal communication 1997). This is important in demonstrating the limitations of using current environmental data to predict past behaviours. Future models might consider place name information in the construction of predictive models.

Another variable which was not included in the model is vantage or lookout points as it was not available in GIS format. In the future, this information should be included in the modeling procedure.

Because of financial and time restrictions, geographic data was only available for the 42 map sheets which make up the Stikine and Iskut areas selected for archaeological potential. The Stikine River maps were selected as the majority of archaeological

research in the CIS LRMP region has been conducted along the Stikine. The Iskut River maps were chosen based on operational planning priorities. Certain site types and certain geographical variables were not available for modelling because of this.

The ethnographic interviews conducted by the ethnographic interview team were used to determine the locations of the ethnographic points and ethnographic trails. Data on the aboriginal use of these sites was recorded and stored in database tables. The bulk of ethnographic points that were identified did not fall within the 42 map sheets that were chosen for us. This important information could not be utilized effectively for modeling because too few ethnographic points fell within these 42 map sheets. Ethnographic trails were utilized for this model, however.

An important aspect of the present modeling is that separate models were not made for different site types. A rating of high or low potential does not indicate that a specific site type will be present. As mentioned above, important sites such as isolated sites or very old sites may be present, or perhaps even more likely, in areas of low potential.

Owing to the small number of known archaeological sites and biases inherent in archaeological survey, ethnographic documentation provides a more reliable guide for the prediction of site types than the archaeological record itself. Table 22 discusses the probable location of sites by site type and general comments.

6.11.3 Other Considerations in Predictive Modelling

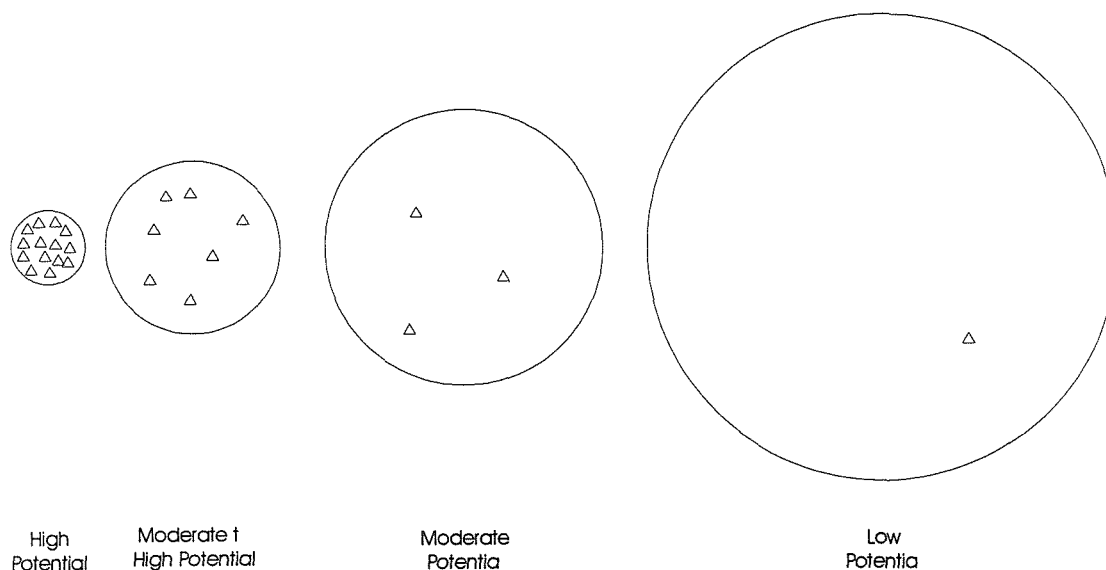
Other factors necessary to consider in relation to the use of predictive modelling in overview assessments include:

- 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.
- Both the written and archaeological record of First Nations cultures represents only a fraction of the cultural systems they seek to describe and explain.
- The time allotted for this type of study is insufficient to permit an exhaustive review of the literature or thorough First Nations consultation. The Tahltan Tribal Council in Dease Lake, that controls access to the most complete record of ethnographic notes and traditional site use information for the area within the CIS LRMP, did not release this information for review.
- Many of the data that are critical for predicting archaeological site potential (e.g., detailed palaeoenvironmental syntheses, fish habitat data, and terrain maps) do not exist for large areas of the province.
- Archaeological overview assessments are open-ended studies that are subject to review and revisions as new information becomes available.

6.11.4 The Ideal Potential Model

The ideal model is one in which most of the sites fall within the categories of highest or moderate to high potential and the majority of the points in the one kilometre grid fall within the categories of low potential. The ideal model would maximise the total area in the category of low potential without sacrificing the accuracy of the model. There should thus be an inverse relationship between the sites and surveyed areas without sites in terms of their archaeological potential. This ideal model is expressed in the diagram below.

In Figure 10, the circle represents the area covered by each category of potential. The smallest area (high potential) contains the greatest number of sites (triangles), while the largest (low potential) contains the fewest number of sites. This model is considered ideal because it is most efficient in terms of allocating time and funding to heritage management interests. The size of the areas of potential may differ from the ideal model, however the distribution of archaeological sites across those areas should always be weighted to those areas with the highest potential. The possibility (although unlikely) exists that in the best possible model for an area, the area with highest potential is the largest area.



The circle indicates the proportional area of each zone of potential and the number of triangles indicates the number of sites.

Figure 10. Diagram of the Ideal Model.

7. Discussion of Research

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 or management of archaeological resources.

The accuracy of the final model presented was tested in a database. When tested in the database, only one known archaeological sites was located in an area of low potential and 95 percent of the sites were located either in moderate high or high potential. This suggests considerable accuracy from a modelling perspective. Because of the nature of low potential areas, and the stated concerns of the Tahltan whose territory is affected, it is strongly recommended that future Archaeological Inventory Surveys (AIS) be conducted in areas of low potential in order to verify the model's accuracy.

Predictive modelling must remain an ongoing process. The more surveys that are conducted, the more data become available for modelling purposes. The data gaps discussed in this report need to be addressed in the future. Specific areas of concern include the lack of fisheries data, biases inherent in the surveying process, and issues concerning culturally modified tree (CMT) recording (a CMT is a tree that has been modified as a result of the traditional aboriginal use of forest resources).

Because the model was generated using only 42 mapsheets from the entire study areas and that these mapsheets were not representative of the CIS LRMP as a whole, it is strongly recommended that the model generated be considered a draft final model. Coverages for the entire study area should be assembled and data generated to allow modelling, and the accuracy of the present model should be assessed in light of that data. In the interim, the model should only be used for resource management purposes within the 42 mapsheet area modelled for.

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.

8. Recommendations

The modelling component of this overview was based on analysis of only 42 of the 458 TRIM map sheets for the LRMP study area. The mapsheets are not representative of the LRMP area as a whole, and are proportionally under-represent both the existing archaeological inventory and the available ethnographic/traditional use locational data for the study area. No CMTs of any type were recorded in the 42 map sheets, and this represents a significant data gap that can be at least partly addressed by including all the study area. Expanding the modelling to the entire study area would allow for considerable refinement in the model.

Funds are being pursued from Forest Renewal B.C. to complete potential mapping for the entire CIS LRMP study area. This next phase should attempt to include a wider range of variables in the potential model. Additional variables to be considered include more wildlife data (bear and beaver in particular), alpine ridges and lookouts, Tahltan place names, fishery data, and areas prone to burning or lightning strike.

As a result of this study, we also recommend that funding be pursued for archaeological inventory studies in areas where operational planning is being considered. We recommend that these inventories be done prior to impact assessments. Ground truthing should be undertaken as soon as funding becomes available. Archaeological Inventory Studies (AIS) can be funded under the Forest Renewal B.C. mandate. Inventory work is recommended as existing inventory for the study area as a whole is skewed to a few areas of special interest, such as the Mt. Edziza obsidian quarry complex, ethnoarchaeology of the Telegraph Creek locality, and the Hyland Post Trail. Representative sampling of a wide range of ecozones and ecosections will allow testing for accuracy and further refinement of the model. This testing can involve particular variables as well as more global ones. To take one example, the presence of spruce near major waterways was used to increase potential, since there was reliable, detailed ethnographic information that spruce bark was used as house roofing at the major villages and fishing camps. Only 13 of the 147 previously recorded sites have spruce in their forest cover, and only one has spruce as the leading species. This would lead us to rank spruce dominant stands as having reduced potential, if it were not for the contrary ethnographic information. An additional problem is the absence of previously recorded CMTs, which draws into question the reliability of the existing inventory for this site type. However, it is possible that stripped or girdled spruce trees do not survive. AIS can resolve such specific questions.

AIS should include intensive survey within a sample of low potential lands. AIA work will gradually build up a sample of intensively surveyed higher potential lands, but it is not anticipated that developers will be asked to pay for AIAs where there is low archaeological potential and no ethnographic information suggesting otherwise. Therefore, survey in such areas is necessary to ensure that low potential is indeed low, and that important site location patterns are not being missed.

The model should be periodically reviewed: after any AIS project; or after two to five years of accumulated AIA surveys. Any AIA survey should collect clear data on survey coverage (traverse routes, etc) so that both site and non-site data can be included in future reviews.

Management strategies should be developed in consultation with the Tahltan First Nation. The assessment of archaeological potential is limited to the material remains of past human activity. For this reason, issues concerning the extent of traditional use activities and aboriginal rights and title should not be inferred from this report or the potential maps associated with it. We would recommend that any developments in high or moderate-high potential lands be subject to AIA survey. AIAs in high potential lands are expected to encounter a higher density of archaeological remains compared to those in moderate-high, and can therefore be expected to require a somewhat higher budget. The risk of encountering archaeological remains in both zones is relatively high, especially for large areas (20 ha or more) typical of forestry and mining developments.

Moderate potential lands should be subjected to further review, including air photo examination, and possibly including field reconnaissance survey for large area projects. In some cases, the need for a full AIA might be identified by such a review.

Finally, a sample of low potential areas should be assessed through AIS in order to test the validity of our model. The Tahltan First Nation should help determine the appropriate level of effort for further archaeological work or impact assessment.

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10. Appendices

Appendix 1. Trails within the CIS LRMP Identified Through Documentary Research.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T1	104 J/2	-	From T16 along the E side of Tahltan R. NE to IR #2 at Hiusta Lake.	NTS Map 104 J/2, 1st Edit., 1958; Dease Lake Area Map, Mines, 1925 (Ball 1983)	-
T2	104 J/15	"Dease Lake to Teslin Lake Winter Trail"	From Dease Lake W along Thibert Cr., N along the E side of Tuya R.	Dease Lake Area Map, Mines, 1925 (Ball 1983)	-
T3	94 E/5, 94 E/12, 104 H/9	-	From the confluence of the Spatsizi and Ross rivers N to the confluence of the Spatsizi and Stikine rivers, E along the S side of the Stikine R. to the confluence of the Stikine R. and Sanabar Cr., S along the W side of the Stikine R to T4 at the confluence of the Stikine R. and Moyez Cr.	Friesen 1983	The trail was reportedly used by the Tahltan as an occasional winter trail from Caribou Hide to Hyland Post via the Stikine River Valley.
T4	94E/5, 94E/6, 104G/14, 104G/15, 104G/16, 104H/8, 104H/9, 104H/10, 104H/13,	"Hyland Post Trail" "Indian Trail" "Police Trail" "Government Trail"	From T15 just NW of Telegraph Creek, back SE along the S side of the Stikine R., S to Three Mile Lake, E to Buckley Lake, E along Klastline R., along the N side of Kluachon Lake, E across the Stikine R. near	Friesen 1983; NTS Map 104G/14E, 1st Edit., 1951; NTS Map 104G/15W, 1st Edit., 1951; NTS Map 104G/15E, 1st Edit., 1951; NTS Map 104G/16W, 1st	Trail continues further east long Toodoggone R. to Ware and Fort Grahame on Finlay R. The trail name may refer to T36 from Buckley Lake to Tahltan I.R. #1 or possibly T4 From Buckley Lake to Telegraph Creek.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
	104H/14, 104H/15		the confluence of the Stikine R. and McEwan Creek, E along the N side of McEwan Cr., SE along NE side of Cullivan Cr., along the N sides of Bug, Black Fox, and Cold Fish Lakes, E along Mink Cr., E along the N side of Spatsizi R., S along W side of Ross R., E along N side of Tomias Mountain, across the Stikine R. at the its confluence with Moyez Cr., E along N side of Metsantan Cr., along the N side of Metsantan Lake, E along N side of Toodoggone R.	Edit., 1951; NTS Map 104G/16E, 1st Edit., 1951; NTS Map 104H/13, 2nd Edit., 1978; 1:600 000 Map NW BC, 4th Edit., 1993; Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps); Aresco 1982	
T5	104H/9, 104H/10, 104H14, 104H/15	"Hyland Post Summer Trail"	From T4 at Cullivan Cr. E along the S side of Kliweguh Cr. to T4 at the confluence of Kliweguh Cr. and Spatsizi R.	Friesen 1983; 1:600 000 Map NW BC, 4th Edit., 1993;	-
T6	104H/10	-	From the S end of Bug Lake SE along the S side of Black Fox Lake to the NW tip of Cold Fish Lake.	NTS Map 104H/10, 1st Edit., 1967	T4 clearly runs N of both Bug and Black Fox lakes.
T7	104H/2,	"Trail to	From where T4 and	1:600 000 Map NW	Trail continues S to Hazelton.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
	104H/6, 104H/7, 104H/11, 104H/12, 104H/13	Hazelton"	T39/T42 connect at the confluence of Klappan R. and McEwan Cr. S along E side of Klappan R., along the E side of Little Klappan R., E along N side of Didene Cr., S across Didene Cr. just before its confluence with the Spatsizi R., E across Spatsizi R., back again, S along W side of Spatsizi R.	BC, 4th Edit., 1993; Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	T4 is probably a continuation of T39/T42
T8	104H/1, 104H/2	-	From T7 at the confluence of the Spatsizi R. and Kluayetz Cr. E along the N side of Kluayetz Cr., across McCumber, Thule, Merry, and Wash Cr.	1:600 000 Map NW BC, 4th Edit., 1993	The trail continues on to Lonesome Mt.
T9	104H/1	-	From T8 at the confluence of Kluayetz and Skelhorne creeks N along the W side of Kluayetz Cr. to Happy Lake, along the E side of Happy Cr., to an unnamed Lake.	1:600 000 Map NW BC, 4th Edit., 1993	-
T10	104H/13	-	From T4 at the village of Iskut S to the N end of Eddontenajon Lake.	NTS Map 104H/13, 2nd Edit. 1978	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T11	104G/16	"Indian Trail"		NTS Map 104G/16E, 1st Edit., 1951; Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T12	104G/16	-	From T4 along Klastline R. NE to a small cluster of buildings.	NTS Map 104G/16E, 1st Edit 1958	-
T13	104G/16, 104J/1	"Ethnographic Trail"	From T4 at Kluachon L. N across Tsaybahe Cr. to connect with T67 on the N side of the Stikine R.	NTS Map 104G/16E, 1st Edit., 1958; Aresco 1982	-
T14	104G/16	-	Trail runs N to S at the end of T12, halfway between Klastline R. and Morchuea Lake.	NTS Map 104G/16E, 1st Edit., 1958	-
T15	104A/13, 104B/16, 104J/3, 104J/4, 104G/7, 104G/8, 104G/9, 104G/10, 104G/14, 104G/15	"Telegraph Creek Trail" "Stikine Trail"	N up from Stewart, along Snowbank and Beaverpond Creeks, across the Ningunsaw R., along the N side of Echo Lake, N to Pup Lake, across Thomas, Durham, Burrage, and Eastman Creeks, W across Iskut R., N across Little Iskut R., N along the E side of Mess Cr., across Elwyn	Map, Dawson 1888 (Ball 1983); Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps); MacDonald and Cove 1987	Trail continues both further north and south. Only that part of the trail N of Telegraph Creek is on Dawson's map. According to MacDonald and Cove (1987:XIII), "The Stikine Trail begins at Cranberry Junction where it meets the Kispiox Trail from the Upper Skeena River at which point a

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
			Cr., N along Telegraph Cr., along the NE side of Tutesheta Cr., across Tahltan R., along E side of Saloon Lake, W along N side of Kennicott Lake.		number of trails intersect. Obsidian from the Stikine source found along the Skeena River indicates that this trail has been in use for several thousand years. Although more research is required, it appears that this was a major trail bringing Russian trade goods (from Fort Dionysius along T73) into the Upper Skeena and Nass River areas."
T16	104J/2, 104J/3	"Route Travelled by Callbreath's Train in 1896" "Tahltan Trail"	From T26 NW along the N side of Tahltan R., connects with T15 at the confluence of Tahltan R. and Saloon Cr.	NTS Map 104J/2W, 1st Edit., 1958; NTS Map 104J/3E, 1st Edit., 1958; NTS Map 104J/3W, 1st Edit., 1958; Map, Dawson 1888 (Ball 1983); Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps); No Name (30T3 Roads and Trails); Ham 1988a	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T17	104J/2, 104J/7, 104J/10	-	From T16 at the confluence of Tahltan R. and Hartz Cr. N across Classy and Mansfield Creeks, along the W side of Tuya R.	Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The trail just ends on both maps at a point on the W side of Tuya R. just N of the confluence of Tuya R. and Cody Cr.
T18	104I/5, 104J/8	"Trail to Turnagain River"	From Dease Lake E along the N side of Tanzilla Butte, across Little Eagle R., connects with T19 at Cariboo Cr.	NTS Map 104I/5, 3rd Edit. 1984; 1:600 000 Map NW BC, 4th Edit., 1993; Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The Lands 1929 Map shows 'Trail to Trail to Turnagain Creek' as T18 and T19 from Cariboo Cr.
T19	104I/5	"Trail to Turnagain River"	From the S end of Allan B. Lake E along the S side of Tanzilla Butte, along the N side of Zuback Cr., along the N side of Turnagain R., E past Boulder City Lake.	NTS Map 104I/5, 3rd Edit., 1984; 1:600 000 Map NW BC, 4th Edit., 1993; Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The trail continues on past Boulder City Lake and further NE to a trail network on the Liard Plain.
T20	104I/5	-	From T18 N up Little Eagle R., E along Goldpan Cr., S along Caribou Cr., connects again with T18.	1:600 000 Map NW BC, 4th Edit., 1993	-
T21	104I/5	-	From T20 N towards Eagle R.	1:600 000 Map NW BC, 4th Edit., 1993	Connects with trail network further N.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T22	104I/5	-	From the confluence of the Tanzilla R. and Tsenaglode Cr. E.	NTS Map 104I/5, 3rd Edit., 1984	Runs parallel with and S of T19. Unknown ending. Possibly an alternate route for T19 to Turnagain R.
T23	104I/5	-	Located W of Tanzilla R. and S of Tsenaglode Cr. the trail runs S and W of Highway #37.	NTS Map 104I/5, 3rd Edit., 1984	Probable cat trail.
T24	104I/4, 104I/5, 104I/6	-	From a point just S of the confluence of the Tanzilla R. and Tsenaglode Cr. S along the Tanzilla R., NE along the N side of the 3 Sisters Range, turns S, E, and then N along McBride R., along E side of Turnagain Lake to the N tip of lake.	NTS Map 104I/4, 3rd Edit., 1984; NTS Map 104I/5, 3rd Edit., 1984; 1:600 000 Map NW BC, 4th Edit., 1993	-
T25	104I/4, 104I/5	-	From T39 just W of Lower Gnat Lake W.	NTS Map 104I/4, 3rd Edit., 1984; NTS Map 104I/5, 3rd Edit., 1984	The trail splits to the N and S.
T26	104G/14, 104J/2, 104J/3, 104J/7, 104J/8,	"Valley Trail" (From Caribou Meadows to Dease Lake) "To Telegraph Creek"	From Glenora along the N side of the Stikine R., past Telegraph Creek, confluence of the Stikine and Tahltan Rivers, to the S end of Dease Lake.	Sketch Map, Moore 1873 (5T1 Misc); Sketch Map, Dawson 1888 (Ball 1983); Dease Lake Area Map, Mines	The trail follows the road route unless the source maps clearly indicate otherwise. The no name map (30T3) shows a bridge over the Tuya R. Campbell noted in 1837 a

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
		To Dease Lake" "Cassiar Trail" "Indian Trail" (Through Glenora) "Dease Lake Trail" "Yukon Trail" (To T33) "Moore Trail"		1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps); Plan of Tahltan I.R.#1, 1905 (CR14); Gov. Res. Telegraph Creek, 1875 (29T1 Land Reserves); No Name (30T3 Roads and Trails); Wilson 1970	bridge across the Tuya R. by Thomas' Falls. As T26 is the main trail route across the Tuya, the reference is probably to the bridge on the map.
T27	104I/5	-	From Highway #37 E to T24.	NTS Map 104I/5, 3rd Edit., 1984	-
T28	104J/2	-	From T26 W to Tuya R.	NTS Map 104J/2E, 2nd Edit., 1967; Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	
T29	104G/13, 104G/14	-	From T49 at the confluence of the Stikine R. and Shakes Cr. W along the W side of Shakes Cr.	Sketch Map, Dep. of Mines, 1926 (Ball 1983)	Trail leads to claims up Shakes Cr.
T30	104G/12	-	From the confluence of the Stikine and Chutine rivers W along the N side of the Chutine R, N along the E	Sketch Map, Dep. of Mines, 1926 (Ball 1983)	Trail leads to claims up Barrington R.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
			side of Barrington R.		
T31	104I/6	-	From T24 E.	1:600 000 Map NW BC, 4th Edit., 1993	-
T32	94E/11	-	From the W end of Chukachida Lake S along the E side of Midas Cr., across Midas Cr., along the W side of Midas and Upper Belle lakes, continues on to connect with T4 at the confluence of Toodoggone R. and Belle Cr.	1:600 000 Map NE BC, 4th Edit., 1992	-
T33	104J/1, 104J/2, 104J/8	"Mountain Trail" "Yukon Trail" "Major Pope 1866"	From T26 on the w side of the confluence of the Stikine and Tanzilla Rivers across the Tanzilla R., NE along the W side of the Hotailuh Range, between Hluey Lakes, N across the Tanzilla R., connects back up with T26 just S of Dease Lake.	Sketch Map, Moore 1873 (5T1 Misc) Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps); Aresco 1982; Wilson 1970	Dawson's 1888 sketch map (Ball 1983) shows an "Indian Bridge" across the Tanzilla R. in the location where Moore's 1873 sketch map (5T1 Misc) shows the trail crossing the river. In 1837, Campbell noted a narrow Indian bridge across the Tanzilla Gorge consisting of 5 tree trunks and measuring 6.7 m long and 4.6 m above the river (Wilson 1970).
T34	104J/2, 104J/7, 104J/8, 104J/9	"Mountain Trail"	From Caribou Meadows N along the W side of Thirty Mile Lake, to the head of Auguschilde Cr., along the	Sketch Map, Moore 1873 (5T1 Misc)	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
			N side of Snow Peak Mountain, E along the S side of Mount McLeod to W side of Dease Lake.		
T35	104G/15	-	From T4 at the N tip of Buckley Lake E to connect again with T4 along the E side of Klastline R.	Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T36	104G/15, 104J/2	"Indian Trail"?	From the S side of Stikine R. at the confluence of the Stikine and Tahltan Rivers SE to the N tip of Buckley Lake, connects with T4.	Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The trail name may refer to T36 from Buckley Lake to Tahltan I.R. #1 or possibly T4 From Buckley Lake to Telegraph Creek.
T37	104J/2	-	From Hiusta Meadow E, connects with T26 just N of Days Ranch.	Dease Lake Area Map, Mines, 1925 (Ball 1983)	-
T38	104J/2	-	From T37 N along the W side of Tuya R., across Classy Cr., through I.R. #8 to the S end of Mincho Lake.	Dease Lake Area Map, Mines, 1925 (Ball 1983); Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T39	104H/13, 104I/4,	-	From T26 at Allan Lake S along the W side of the	Dease Lake Area Map, Mines, 1925	The map incorrectly shows the confluence of the Stikine and

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
	104I/5, 104J/8		Tanzilla R. and the W side of Gnat Cr., along the E side of Lower and Upper Gnat Lakes, along the E side of Beggerlay Cr., across Moose Cr., across the Stikine R. at its confluence with Beggerlay Cr., S along the E side of Klappan R. to connect with T7 at the confluence of Klappan R. and McEwan Cr.	(Ball 1983); Aresco 1982	Klappan Rivers SE of the confluence of Beggerlay Cr. and the Stikine R.
T40	104H/6, 104H/11	-	From T7 at the confluence of Tsetia Cr. and Little Klappan R. SE along the N side of Tsetia Cr., S across Tsetia Cr., connects with T7 on the N side of Little Klappan R.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T41	104H/3, 104H/6, 104H/11	"Old Ashcroft Trail"	From T7 at the confluence of the Klappan and Little Klappan Rivers S along the E side of Klappan R., along the E side of Nass Lake, W across the Nass R., and S to Muskaboo Cr.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The trail continues S to connect with the Telegraph Trail to Hazelton.
T42	104H/13, 104I/4, 104I/5	"Trail to Hazelton"	From Dease Lake S along the E side of the Tanzilla R.,	Prelim. Map Stikine River, Dep. of	The map shows the proper relationship between the

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
			along the E side of Gnat Cr., E along the N. side of Beggerlay Cr., across Moose Cr., W across Beggerlay Cr., to the confluence of the Stikine R. and Klappan R., S along E side of the Klappan R. to T7.	Lands, 1929 (41T2: Old Maps); Aresco 1982	confluence of the Stikine and Klappan Rivers and the confluence of the Stikine R. and Beggerlay Cr. From the confluence of the Stikine and Klappan Rivers T42 is the same as T39.
T43	104H/13, 104H14	"Indian Trail"	From where T4 and T39/T42 connect at the confluence of Klappan R. and McEwan Cr. E along the S side of McEwan Cr.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	Trail runs parallel with T4.
T44	104G/16, 104J/1	-	From T4 at the confluence of the Klastline R. and Morchuea Cr. N across Morchuea Cr., along the W side of Morchuea Lake, across the Stikine R., along the W side of Tsenaglode Lake to the N tip of the lake.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T45	104G/8, 104G/9	-	From T46 along the S side of Klastline R. S along W side of Kakiddi Cr., E across Kakiddi Cr., S along the E side of Nuttlude,	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
			Kakiddi, Mowchilla, and Natadeleen Lakes, to T15 where it crosses Eastman Cr.		
T46	104G/15, 104G/16	"Indian Trail"	From T4 along the N side of Klastline R. S across the river and then W along the S side to T35.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T47	104H/14	-	From T43 N across McEwan Cr. and connects with T4.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The map shows T47 continuing as T4.
T48	104G/1, 104G/8	-	From T15 at the confluence of Iskut R. and Eastman Cr. S along the W side of Iskut R. to the confluence of Iskut R. and Ball Cr.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The map shows "old placer digging" at the confluence of Iskut R. and Ball Cr.
T49	104G/14	"Indian Trail to Shakes Hills" (From Glenora S along Stikine)	From T4 at I.R.#7 SW across Mess Cr., along the N side of Callbreath Cr., across the Stikine R. to Glenora, S along the W side of the Stikine R. to connect with T29 at the confluence of the Stikine R. and Shakes Cr.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps); Gov. Res. Telegraph Creek, 1875 (29T1 Land Reserves)	-
T50	104G/14	-	From T49 at Buck Riffle S along the E side of Susie	Prelim. Map Stikine River, Dep. of	Trail just ends.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
			Cr., W across Susie Cr., S to a small unnamed cr. N off Tsikhini Cr.	Lands, 1929 (41T2: Old Maps)	
T51	104G/14	-	From T49 at Callbreath Cr. E across Tsikhini Cr., NW across Nightout Cr.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	Trail just ends.
T52	104G/14	-	From T50 W across Callbreath Cr., connects with T51.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	-
T53	104J/2, 104J/7	-	From T27 N connects with T34 just S of Thirty Mile Lake.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	Map shows trails T27, T53, and T34 as one trail from T26.
T54	104J/8	-	From T26 at the confluence of Auguschidle Cr. and Tanzilla R. N towards Tatshow Cr.	Prelim. Map Stikine River, Dep. of Lands, 1929 (41T2: Old Maps)	The trail just ends.
T55	104I/5	"Summer"	From T19 N along the W side of Little Eagle R. to its confluence with Goldpan Cr.	Dease Lake Area Map, Mines, 1925 (Ball 1983)	-
T56	104I/5	"Winter"	From T19 NW around a peak and back SE to connect with T55 at the confluence of an unnamed cr. and Little Eagle R.	Dease Lake Area Map, Mines, 1925 (Ball 1983)	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T57	104J/2	-	From T26 at the confluence of the Stikine and Tahltan Rivers NE along the W side of the Tahltan R.	Plan of Tahltan I.R.#1, 1905 (CR14)	-
T58	104J/2, 104J/3	-	From T26 along the N side of the Stikine R. NE to the church on I.R.#1 NW through the village, along a spring, and continuing N.	Plan of Tahltan I.R.#1, 1905 (CR14)	-
T59	104G/14	-	From T26 at the confluence of the Stikine R. and 9Mile Cr. SW through L5688.	Survey Plan of L5688 (3T1 Cassiar)	Trail/road passes a pair of houses and smoke houses and splits into two parts.
T60	104G/14	-	From houses along T59 SW along the Stikine R.	Survey Plan of L5688 (3T1 Cassiar)	Smaller trail loops off T60.
T61	104G/14	-	From a point on the Stikine R. S of its confluence with Mess Cr. SE along Kunishma Cr	Survey Plan of Lot L473 (3T1 Cassiar)	Site HITt-13 is at the N terminus of the trail.
T62	104G/14	"Trail From Glenora" "Trail to Dease Lake"	From the W along the N side of Sawmill Lake, across Telegraph Cr. To E.	Gov. Res. Telegraph Creek, 1875 (29T1 Land Reserves)	-
T63	104G/14	"Trail"	From street and houses at Telegraph Creek winding N, connects with T62.	Gov. Res. Telegraph Creek, 1875 (29T1 Land Reserves)	-
T64	104G/14	"Trail to Dease Lake"	From street and houses at Telegraph Creek N across T63 and T62.	Gov. Res. Telegraph Creek, 1875 (29T1 Land Reserves)	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T65	104B/10	-	From the confluence of Iskut R. and Snippaker Cr. N along the "left" side of Snippaker Cr.	Arcas 1990	The trail is marked with blazes on trees, presumably the trail leads to a recent campsite and is possibly associated with the trapping activities of Francis Gleeson.
T66	104B/7, 104B/8	-	From the confluence of Unuk R. and South Unuk R. N along the S side of Unuk R. to a historical cabin (HcTp-1) and from the cabin E.	Arcas 1990	-
T67	104H/13, 104I/4, 104J/1	"Alternate Klondike Trail" "Ethnographic Trail"	W along the N side of the Stikine R. across Beggerlay Cr. and Tess Cr. to the confluence of Latham Cr. and the Stikine R., N along the E side of Latham Cr.	Aresco 1982 NTS Map 104I/4, 2nd Edit., 1984	Trail probably continues further E and probably connects with T44 to continue further N. The "Ethnographic Trail" component refers to that section from the confluence of Latham Cr. and the Stikine R. N along Latham Cr.
T68	104G/16	"Ethnographic Trail"	From T4 at Kluachon L N to connect with T13.	Aresco 1982	-
T69	104H/13	"Ethnographic Trail"	From T4 S along the E side of Ealue Lake.	Aresco 1982	Trail probably continues further S.
T70	104G/16, 104H/13	"Ethnographic Trail"	From T13 E along the N side of Tsaybahe Cr. and Tsetogamus Cr. to Klappan R.	Aresco 1982	-

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T71	104J/1, 104J/2	"Route of Major Pope 1866"	From T67 at the confluence of Latham Cr. And the Stikine R. W along the N side of the Stikine R. to T72 at the confluence of the Stikine and Tanzilla rivers.	Aresco 1982	-
T72	104J/2	"Mines Report 1911"	From T26 at Day's Ranch N along the W side of the Stikine R. to the confluence of the Stikine and Tanzilla rivers, N along the W side of the Tanzilla R.	Aresco 1982 (Mines 1911)	-
T73	104A/13, 104B/15, 104B/16	"Branch of the Stikine Trail"	From T15 at Snowbank Cr. W along the N side of an unnamed creek to its confluence with Iskut R.	MacDonald and Cove 1987	In the E, the trail connects with T15 (see remarks for T15). According to MacDonald and Cove (1987:XVI), the trail follows Iskut R to its confluence with the Stikine R and along the Stikine R to the Pacific Ocean. The trail was the shortest route from the Russian fur trading post (Fort Dionysius) at Wrangell to the Skeena R. The trail is very low accuracy and its exact route from the unnamed creek to its connection with T15 is speculative.

Trail #	NTS Map	Name/Reference	Geographical Description	Source Maps	Remarks
T74	94E/6	"Aboriginal Trail"	From T4 at the N side of Metsantan Lake N to HiSu-20 and HiSu-19.	Ham 1987b	-
T75	104O/1, 104O/2	"Trail to Cassiar"	From the N end of Tuya Lake E along the N side of Ed Asp Lake and W along the N side of Mt. Josephine.	Friesen 1986	-
T76	104H/10, 104H/15	-	From T4 at the NW tip of Coldfish Lake NE along the E side of Black Fox Cr. to T5 at the headwaters of Black Fox Cr. and Kliweguh Cr.	Friesen 1983	-
T77	104I/6	-	From T19 along Cariboo Cr. S along W side of Turnagain R to T78.	1:600 000 Map NW BC, 4th Edit., 1993	-
T78	104I/6	-	From T19 along Cariboo Cr. SE along Snowdrift Cr. To the N tip of Turnagain Lake.	1:600 000 Map NW BC, 4th Edit., 1993	-
T79	104I/6	-	From T78 along Snowdrift Cr. S and W to T24 along McBride R.	1:600 000 Map NW BC, 4th Edit., 1993	-

Appendix 2. Tahltan Mammal Resources Occurring in the CWH, MH, ICH, SBS, ESSF, BWBS, SWB, and AT Biogeoclimatic Zones within the CIS LRMP. 1=present, 0=not present.

Game Species	Latin	C W H	M H	I C H	S B S	E S S F	B W B S	S W B	A T
Caribou	<i>Rangifer tarandus</i>	0	0	1	1	1	1	1	1
Moose	<i>Alces alces</i>	0	0	1	1	1	1	1	0
Mule Deer	<i>Dama hemionus</i>	0	0	1	1	1	1	0	1
Rocky Mountain Elk		0	0	1	1	1	1	1	1
Roosevelt Elk		1	1	0	0	0	0	0	0
Bison	<i>Bison bison</i>	0	0	0	0	0	1	1	0
Mountain Goat	<i>Oreamnos americanus</i>	1	1	1	0	1	1	1	1
Rocky Mountain Bighorn Sheep	<i>Ovis canadensis</i>	0	0	0	0	1	0	0	1
Dall's Sheep	<i>Ovis Dalli</i>	0	0	0	0	0	1	1	1
Stone Sheep		0	0	0	0	0	1	1	1
California Bighorn Sheep		0	0	0	0	1	0	0	1
Black Bear	<i>Ursus americanus</i>	1	1	1	1	1	1	1	1
Grizzly Bear	<i>Ursus horribilis</i>	1	1	1	1	1	1	1	1
Beaver	<i>Castor canadensis</i>	0	0	1	1	1	1	1	0
Marmot	<i>Marmota caligata</i>	0	0	0	0	1	0	0	1
Woodchuck	<i>Marmota monax</i>	0	0	0	1	0	0	0	0
Douglas Squirrel	<i>Tamiasciurus douglasii</i>	1	1	0	0	0	0	0	0
Arctic Ground Squirrel	<i>Spermophilus undulatus</i>	0	0	0	0	0	0	1	1
Columbian Ground Squirrel	<i>Spermophilus columbianus</i>	0	0	1	0	1	0	0	1
Golden-mantled Ground Squirrel	<i>Spermophilus lateralis</i>	0	0	1	0	1	0	0	1
Snowshoe Hare	<i>Lepus americanus</i>	0	1	0	1	1	1	1	1
Porcupine	<i>Erethizon dorsatum</i>	0	0	0	1	1	1	1	0
Lynx	<i>Lynx canadensis</i>	0	0	1	1	1	1	1	0
Red Fox	<i>Vulpes vulpes</i>	0	0	0	1	0	0	0	1
River Otter	<i>Lutra canadensis</i>	1	0	0	0	0	0	0	0
Marten	<i>Martes americana</i>	1	0	1	1	1	1	0	1
Fisher	<i>Martes pennanti</i>	0	0	0	1	1	0	0	0
Long-tailed Weasel	<i>Mustela nivalis</i>	0	0	0	0	1	0	0	0
Mink	<i>Mustela vison</i>	1	0	0	0	0	1	1	0

Game Species	Latin	C W H	M H	I C H	S B S	E SS F	B W BS	S W B	A T
Wolverine	<i>Gulo luscus</i>	0	0	1	0	1	1	1	1
Ermine	<i>Mustela erminea</i>	0	0	0	1	0	1	0	0
Total		8	6	13	15	20	18	16	18

Appendix 3. Tahltan Avian Resources Occurring in the CWH, MH, ICH, SBS, ESSF, BWBS, SWB, and AT Biogeoclimatic Zones within the CIS LRMP. 1=present, 0=not present.

Common Name	Latin	C W H	M H	I C H	S B S	E SS F	B W BS	S W B	A T
Blue Grouse	<i>Dendragapus obscurus</i>	1	1	1	0	1	0	1	1
Ruffed Grouse	<i>Bonasa umbellus</i>	1	0	1	1	1	1	1	0
Sharp-tailed Grouse	<i>Pedioecetes phasianellus</i>	0	0	0	0	0	1	0	0
Spruce Grouse	<i>Canachites canadensis</i>	0	0	0	1	1	1	1	0
Rock ptarmigan	<i>Lagopus mutus</i>	0	0	0	0	0	0	0	1
White-tailed ptarmigan	<i>Lagopus leucurus</i>	0	1	0	0	0	0	0	1
Willow ptarmigan	<i>Lagopus lagopus</i>	0	1	0	0	0	0	1	1
Arctic loon	<i>Gavia arctica</i>	0	0	0	0	0	1	1	0
Common Loon	<i>Gavia immer</i>	0	0	1	1	0	0	0	0
Red-throated Loon	<i>Gavia stellata</i>	1	0	0	0	0	0	1	0
Barrow's Goldeneye	<i>Bucephala islandica</i>	0	0	0	1	0	0	0	0
Bufflehead	<i>Bucephala albeola</i>	0	0	0	0	0	0	1	0
Redhead	<i>Aythya americana</i>	1	0	0	0	0	0	0	0
Ring-necked Duck	<i>Aythya collaris</i>	1	0	0	0	0	0	0	0
Harlequin Duck	<i>Histrionicus histrionicus</i>	1	0	0	1	1	0	0	0
Mallard	<i>Anas platyrhynchos</i>	0	0	0	0	0	0	1	0
Pintail	<i>Anas acuta</i>	0	0	0	0	0	0	1	0
Wood Duck	<i>Aix sponsa</i>	1	0	0	0	0	0	0	0
Canada Goose	<i>Branta canadensis</i>	0	0	1	1	0	1	0	0
Common Merganser	<i>Mergus merganser</i>	1	0	0	0	0	0	0	0
Tundra Swan		0	0	1	0	0	0	0	0

Common Name	Latin	C W H	M H	I C H	S B S	E SS F	B W BS	S W B	A T
Trumpeter Swan	<i>Olor buccinator</i>	1	0	0	1	0	0	0	0
Total		9	3	5	7	4	5	9	4

Appendix 4. Fish Resources Occurring within the Stikine Plateau Area (after Albright 1984).

Common Name	Latin
Sockeye Salmon	<i>Oncorhynchus nerka</i>
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
Coho Salmon	<i>Oncorhynchus kisutch</i>
Pink Salmon	<i>Oncorhynchus gorbuscha</i>
Chum Salmon	<i>Oncorhynchus keta</i>
Steelhead Trout	<i>Salmo gairdneri</i>
Rainbow Trout	<i>Salmo gairdneri</i>
Cutthroat Trout	<i>Salmo clarki clarki</i>
Dolly Varden	<i>Salvelinus malma</i>
Lake Trout	<i>Salvelinus namaycush</i>
Arctic grayling	<i>Thymallus arcticus</i>
Longnose Sucker	<i>Catostomus catostomus</i>
Burbot	<i>Lota lota</i>
Mountain Whitefish	<i>Prosopium williamsoni</i>

Appendix 5. Plants used by the Tahltan in Technology (after Albright 1984:Appendix 2).

Common Name	Latin
Wolf moss	<i>Letharia vulpina</i>
Paint fungus	<i>Echinodontium tinctorium</i>
Bracket fungus	<i>Fomes sp.</i>
Sphagnum	<i>Sphagnum sp.</i>
Lodgepole pine	<i>Pinus contorta var. latifolia</i>
White spruce	<i>Picea glauca</i>
Black spruce	<i>Picea mariana</i>
Subalpine fir	<i>Abies lasiocarpa</i>
Saskatoon berry	<i>Amelanchier alnifolia</i>
Juniper	<i>Juniperus scopularum</i> <i>J. communis</i> <i>J. horizontalis</i>

Common Name	Latin
Trembling aspen	<i>Populus tremuloides</i>
Cottonwood	<i>Populus trichocarpa</i> P. <i>balsamifera</i>
White birch	<i>Betula papyrifera</i>
Water birch	<i>Betula occidentalis</i>
Scrub birch	<i>Betula glandulosa</i>
Sitka alder	<i>Alnus sinuata</i>
Mountain alder	<i>Alnus tenuifolia</i>
Willow	<i>Salix</i> sp.
Red osier	<i>Cornus stolonifera</i>
Dogbane	<i>Apocynum androsaemifolium</i>
Wormwood	<i>Artemesia frigida</i>
Horsetails	<i>Equisetum</i> sp.

Appendix 6. Edible Plants in the Stikine River Area.

Common Name	Latin
Black tree lichen	<i>Alectoria fremontii</i>
Honey mushroom	<i>Armillaria mellea</i>
Chanterelle	<i>Cantharellus cibarius</i>
Shaggy manes	<i>Coprinus comatus</i>
Polypor fungus	<i>Polyporus sulphureus</i>
Horsetails	<i>Equisetum arvense</i>
Lady fern	<i>Athyrium filix-femina</i>
Wood fern	<i>Dryopteris austriaca</i> <i>D. dilatata</i>
Licorice fern	<i>Polypodium glycyrrhiza</i> <i>P. vulgare</i>
Bracken fern	<i>Pteridium aquilinum</i>
Onion	<i>Allium schoenoposum</i>
Rice root	<i>Fritillaria camschatcensis</i>
Solomon's seal	<i>Smilacina stellata</i>

Common Name	Latin
Twisted stalk	<i>Streptopus amplexifolius</i>
Fairy slippers	<i>Calypso bulbosa</i>
Poplars	<i>Populus tremuloides</i> <i>P. trichocarpa</i> <i>P. balsamifera</i>
Nettles	<i>Urtica gracilis</i>
Toadflax	<i>Geocaulon lividum</i>
Junipers	<i>Juniperus communis</i> <i>J. scopularum</i>
Pine	<i>Pinus contorta</i>
Cattail	<i>Typha latifolia</i>
Burreed	<i>Sparganium angustifolium</i>
Arrow grass	<i>Triglochim maritimum</i>
Black Current	<i>Ribes hudsonianum</i>
Mt. Ash	<i>Sorbus scopulina</i>
Saskatoon berry	<i>Amelanchier alnifolia</i>
Raspberry	<i>Rubus pedatus</i> <i>R. chamaemorus</i> <i>R. arcticus</i> <i>R. idaeus</i>
Thimbleberry	<i>Rubus parviflorus</i>
Strawberry	<i>Fragaria virginiana</i>
Chokecherry	<i>Prunus virginiana</i>
Silverweed	<i>Potentilla anserina</i>
Wild rose	<i>Rosa acicularia</i> <i>R. nutkana</i> <i>R. woodsii</i>
Lupine	<i>Lupinus arcticus</i>
Milk Vetch	<i>Astragalus alpinus</i>
Arrowhead	<i>Sagittaria cuneata</i>
Skunk cabbage	<i>Lysichitum americanum</i>
Bullrush	<i>Scirpus microcarpus</i> <i>S. validus</i>
Dock	<i>Rumex arcticus</i> <i>R. occidentalis</i>
Mt. Sorrel	<i>Oxria digyna</i>

Common Name	Latin
Bistort	<i>Polygonum viviparum</i>
Strawberry blite	<i>Chenopodium capitatum</i>
Spring beauty	<i>Claytonia sp.</i>
Pond lily	<i>Nuphar polysepalum</i>
Rockcress	<i>Arabis lyrata</i>
Saxifrage	<i>Saxifraga punctata</i>
Gooseberries	<i>Ribes lacustre</i> <i>R. triste</i>
Crazyweed	<i>Oxytropis maydelliana</i> <i>O. campestris</i>
Sweet vetch	<i>Hedysarum alpinum</i>
Giant vetch	<i>Vicia gigantea</i> <i>V. americana</i>
Soapberry	<i>Shepherdia canadensis</i>
Silverberry	<i>Elaeagnus commutata</i>
Fireweed	<i>Epilobium angustifolium</i> <i>E. latifolium</i>
Sweet cicily	<i>Osmorhiza depauperata</i>
Water parsnip	<i>Sium suave</i>
Wild rhubarb	<i>Heracleum lanatum</i>
Dogwood	<i>Cornus stolonifera</i>
Bunchberry	<i>Cornus canadensis</i>
Crowberry	<i>Empetrum nigrum</i>
Labrador tea	<i>Ledum palustre</i> <i>L. groenlandicum</i>
Bearberry	<i>Arcostaphylos uva-ursi</i>
Blueberries	<i>Vaccinium caespitosum</i> <i>V. membranaceum</i> <i>V. alaskensis</i> <i>V. uliginosum</i>
Bog cranberry	<i>Vaccinium vitis-idaea</i> <i>V. oycoccus</i>

Common Name	Latin
Red huckleberry	<i>Vaccinium parvifolium</i>
Wild mint	<i>Mentha arvensis</i>
Monkey flower	<i>Mimulus guttatus</i>
Elephanthead	<i>Pedicularis sudetica</i> <i>P. langsдорffii</i>
Elderberry	<i>Sambucus racemosa</i>
High bush cranberry	<i>Viburnum edule</i>
Yarrow	<i>Achillea millefolium</i> <i>A. borealis</i>
Mugwort	<i>Artemisia telesii</i>
Sweet coltsfoot	<i>Petasites frigidus</i> <i>P. hyperboreus</i> <i>P. sagittatus</i> <i>P. palmatus</i>
Wild thistle	<i>Cirsium folisum</i>

Appendix 7. Tahltan Local Knowledge: Interviews with Tahltan Elders for the CIS LRMP AOA.

Tahltan Local Knowledge: Interviews with Tahltan Elders for the Cassiar-Iskut-Stikine L.R.M.P. Archaeological Overview Assessment

prepared for

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by

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December 31, 1997

Introduction:

Diaz-McIlwraith Cultural Services (DMCS) was retained by Millennia Research Ltd. to meet with representatives of the Tahltan Nation in Telegraph Creek, Dease Lake and Iskut. The goals of this work were to: compile currently existing cultural heritage data; interview up to 15 elders about archaeological sites and other traditional use information directly relevant to archaeological site locations; and train Tahltan representatives in documenting local knowledge. The information collected during this work will be processed by Millennia Research Ltd., and applied to the Cassiar-Iskut-Stikine LRMP Archaeological Overview Assessment predictive model.

DMCS would like to thank the three Tahltan communities for their co-operation, hospitality, and input on this project. Particular thanks is extended to Norman Day and Rodney Day from Telegraph Creek, and Sally Havard and Eric Havard of Iskut. Additional thanks is extended to Kathy Bisset (Ministry of Forests-Dease Lake) for taking the time to set up elder meetings and act as a liaison with the various Tahltan communities; this project would not have been a success without the interest of all of these individuals.

To complete this project, Robert Diaz of DMCS visited the above mentioned communities between December 3-14, 1997. During the visits similar concerns were expressed by the First Nations participants and should therefore be mentioned here. They are:

- That archaeological, traditional and contemporary use sites all embody the same level of cultural significance and use. All of these site classifications are interconnected and therefore each should be viewed and interpreted as having the same level of importance in any study.
- That the entire Tahltan traditional territory be represented as an aboriginal use site where many activities took place and continue to take place. Therefore, the entire

Tahltan Traditional Territory should be assigned a site number (for full description please contact Tahltan Nation).

- That a different set of interview maps is used in each community and that a copy of these interview maps is set back to each community along with the original interview tapes.
- That the results of the Archaeological Overview Assessment be presented to the Tahltan communities, upon its completion.

A full copy of this report has been sent to Millennia Research Ltd., along with the original 1:250,000 maps, original interview tapes, and an electronic version of this report and database. Two copies of this report have been sent to the Tahltan Nation (Telegraph Creek, Iskut) accompanied by two copies of the interview maps. One copy of this report and database is in the possession of Diaz-McIlwraith Cultural Services.

Methodology

Prior to the start of this Tahltan Local Knowledge Project, Kathy Bisset distributed a letter concerning elder interviews and Band support. Ms. Bisset continued by attempting to determine the extent of existing information held by the Tahltan Nation. She was informed that the Dease Lake Band Office was the main information repository. Unfortunately, for reasons beyond the scope of this project the information held at the Dease Lake Band Office was inaccessible.

Utilizing Dease Lake as a base office, Robert Diaz spent 10 days compiling data of existing information, interviewing elders and training Tahltan assistants. Accordingly, to accomplish the above tasks, up to 3 days were spent in each of the three communities (Telegraph Creek, Iskut, and Dease Lake). When permitted, all material held by the Tahltan communities was accessed and reviewed for relevant information. Likewise,

where possible, a bibliography of relevant material was generated. However, the main focus of this project involved community liaison regarding the Archaeological Overview Assessment, and documenting local oral knowledge.

The process of documenting local knowledge occurred as follows:

- The interviewee was informed of the purpose of the project, how the data will be used, and where the original data will be held;
- The interviewee was asked to sign a consent form prior to starting the interview;
- All concerns were addressed and answered prior to commencing and interview;
- Interviews were conducted with 1:250,000 NTS maps;
- All information was tape recorded;
- Notes about each site mentioned were taken;
- Questions asked focused on habitation sites, trails, hunting/fishing areas, burials, and processing areas;
- Interviews were conducted in groups to enhance memory, familiarity, and comfort;
- Interviews were conducted in the Band Office or home of interviewee;
- A different set of interview maps was used in each community;
- Each site identified was given a unique interviewee number on the interview maps, site form and tape recorder.

The identification of elders for interviews could only be accomplished via a group effort. Kathy Bisset (Ministry of Forests), with the assistance of the Norman Day, Sally Harvard, and Eric Havard developed a list of Tahltan Elders who resided in different communities. Some of these elders lived in Dease Lake, while others lived in Telegraph Creek and Iskut. One of the goals in interviewing elders was to learn about “activity” sites and types throughout the LRMP study area.

The interview setup process began with a member of the Tahltan research team contacting all of the cultural advisors interviewed. This conversation typically consisted of a project description and purpose, followed by an interview request. In attempts to create a familiar environment during the interview, each interview occurred either in the

home or work place of the person being interviewed. Interviews began with an introduction and explanation of the project and its goals. Discussions also included how the data would be used in the Archaeological Overview Assessment, who had permission to view the data, and how the data may be used in the future. Only after the interviewee was comfortable with the people present in the room and the project goals, did the interview start. Each interviewee was taken through the project goals again and given various options such as having the interview tape-recorded. All of the interviews were in English and tape-recorded, lasting from 2-6 hours. In instances where Tahltan words were recorded, they were spelled phonetically. Any errors in the spelling of Tahltan words or documentation of sites are the responsibility of Diaz-McIlwraith Cultural Services.

During the interview process, a question was asked and the interviewee response was simultaneously mapped on the 1:250:000 NTS maps and recorded on site recording forms developed by Diaz-McIlwraith Cultural Services. The interviews were both rigidly structured and open-ended. These interviews involved a formal set of questions aimed at retrieving site specific information. However, throughout the interviews, the methodology often became open ended, as this encouraged the interviewees to take advantage of the looseness of the situation to talk freely, often mentioning sites that may not have otherwise been discussed. The interview process utilized a different set of interview maps for different communities, as this helped ensure privacy and confidentiality.

Another key component of this project was to assist in building infrastructure within the Tahltan communities. Consequently, training occurred throughout this entire project. The trainees were briefed on the purpose and importance of local knowledge and how to retrieve this knowledge. Further discussion involved how local knowledge is used in archaeological studies. Various techniques of information retrieval and documentation were discussed, and then the chosen methodology was reviewed and practiced. Training elements included, but were not limited to:

- Setting up the interview, discussing the project goals and the purpose of the interview;
- Determining interview questions;
- Asking interview questions;
- The purpose of the interview questions;
- Interview protocol;
- Filling out site forms;
- Documenting the oral information;
- Mapping the oral information;
- Follow-up questions;
- The importance of consent and confidentiality issues.

The first two days of this project was spent meeting with representatives from Iskut and Telegraph Creek. The meeting in Iskut involved Robert Diaz, Kathy Bisset, Chief Councilor Louis Louie, Sally Havard (trainee), Eric Havard (trainee), Robert Quock (elder) and Loveman Noel (elder). It was agreed that interviews could proceed the following week. However, representatives from the Iskut Band Office stated that all existing information was held in the Dease Lake Band Office, and was therefore inaccessible. A subsequent trip was made to Telegraph Creek. There, it was determined that Norman Day and Rodney Day, the Tahltan trainees, were unavailable to work on this Tahltan Local Knowledge Project. Consequently, an alternate trainee (Gordon Frank) was identified. Time was then spent discussing the project with Gordon Frank and councilors at the Telegraph Creek Band Office. Again, it was agreed that interviews could commence as soon as possible. Similarly, representatives from the Telegraph Creek Band Office stated that the Dease Lake Band Office held all existing information.

The Telegraph Creek interview component was unsuccessful. The alternate Tahltan trainee/liaison had great difficulty contacting the previously identified elders to interview. It was further determined that because it was a weekend, close to Christmas, many elders were away. An additional comment made by Gordon Frank was that more than three days were needed to complete interviews in his community.

The Iskut interviews proceeded as scheduled. Three days were spent in Iskut, and five elders were interviewed. These interviews all took place in the Iskut Band Office and were conducted by Robert Diaz, with Eric and/or Sally Havard assisting. Three days were also spent in Dease Lake and six interviews were conducted in the homes of interviewees. Robert Diaz and Eric Harvard took turns conducting the interviews.

In total 11 Tahltan elders were interviewed, producing 223 unique sites. Due to the dearth of existing information held at the Iskut and Telegraph Creek Band Offices, the bibliography of existing sources was minimal. Likewise, a review of existing sources held by the Tahltan Nation did not occur because all of this data was stored in the Dease Lake Band Office.

The database of Tahltan Local Knowledge was created by Diaz-McIlwraith Cultural Services, in Microsoft Access 7.0 and it contains all data retrieved about site types and locations.

The database fields are:

- **Site Number** referring to the unique site number (site location) on the original 1:250,000 maps,
- **Predictive Model Rating** refers to the archaeological potential of the site, 1 = very high, 2 =high, 3 =moderate and 4 =low. Millennia Research Ltd., determined the predictive model rating,
- **Map Number** refers to the 1:250,000 NTS map
- **Site Type and Comments** refers to the activity and type of site identified and additional data associated with that site,
- **Site Location** is a geographical description of a sites location on the 1:250,000 maps,
- **Tape Identification** refers to who was interviewed and the label on the interview tape,
- **Tape Side** is the interview tape 1, 2 or 3 and sides A or B,

- **Counter Number** is the interview tape counter number where the specific information is located,
 - **Interview Site Number** is the unique site number used during the interviews and on the interview maps,
 - **Tahltan Name** is the Tahltan translation and or placename of a site.
-

Tahltan Nation Contributors:

<u>Tape Identification</u>	<u>Community</u>	<u>Number of Tapes</u>
Loveman Nole, Robert Quock	Iskut	2
Charles Quock, Peggy Quock	Iskut	2
James Dennis	Iskut	3
Susie Tashoots, Myra Blackburn, Jack Clem	Dease Lake	2
Opal Ball	Dease Lake	1
Rosie Dennis, Freddie Vance	Dease Lake	2

The Tahltan Nation has requested:

- that all original tapes and interview maps be returned to their respective communities,
- due to confidentiality issues, that the Tahltan Local Knowledge database, only be used to develop the predictive model, but not included in the Cassiar-Iskut-Stikine LRMP AOA final report to be completed by Millennia Research Ltd.

Results:

The Tahltan Local Knowledge Project interview process yielded 223 unique activity sites within the LRMP study area. All 11 interviewees stated that numerous activities occurred at these sites, and that all sites were used in the past and continue to be used in the present. During the interview process it was observed that many of the elders did not provide exact site locations. Rather, large areas were identified as site locations, with multiple site types existing within these large areas. Consequently, in some instances, geographical site locations are general in description. For example, a Tahltan elder may have identified both sides of a river as a hunting and a habitation site type. Specifically, when asked for exact camp locations along the river, an elder's response may have been "everywhere along the river".

Among the site types identified in the study area, were 96 habitation sites and 42 trails. The habitation sites identified served as villages, stopovers, and resource procurement camps. Moreover, many of the trails identified are connected to other trails and often lead to, or are a characteristic of habitation and/or resource harvesting areas. Of equal importance was the identification of sites that the Tahltan consider historically and culturally traditional. These latter sites include traditional history sites, placenames, three fish traps, three native bridges (sticks piled on top of each other), obsidian collecting sites, stone tool collecting sites, and raft building sites.

As stated, a limitation of this study was the absence of Telegraph Creek representatives during the interview process. Consequently, the Tahltan Nation stated that this Local Knowledge Project does not represent all areas of cultural significance to the Tahltan Nation. Additional remarks made by the Tahltan include the need to complete a larger scale study of Tahltan land use, oral knowledge and documentation. If possible this larger study would include interviews with all Tahltan elders from each Tahltan community, and a complete archival search. Moreover, because many site locations were vague in location, future interviews should forecast the time required to utilize maps at a larger scale, and/or bringing the elders into the "field" to complete the interview process.

Sources Identified in Tahltan Communities:

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1928 *Big Game Shooting in British Columbia and Norway*. London: M. Hoptinson.

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1957 Telegraph Creek in *The Alaskan Sportsman*. Ketchikan: Alaska Magazine Publishing Company.

Appendix 8. Archaeological Investigations within the CIS LRMP

ADR=Archaeological Data Recovery, AIS=Archaeological Inventory Study, AOA=Archaeological Overview Assessment, AIA=Archaeological Impact Assessment

Permit	Investigator and Report Year	Investigation Type	Project/ Development	Location	Results
1969-8	Smith 1969	ADR	Research	Grand Canyon of the Stikine River	Six archaeological sites were tested and four others excavated.
1970-10	Smith 1971	ADR	Research	Telegraph Creek	Two archaeological sites were excavated.
1972-non	Helmer and Mitchell 1972	AIS	B.C. Railway Dease Lake Extension	(Within the CIS LRMP) The extent is unclear	A total of six heritage sites were identified.
1973-28	Robinson and St. Pierre 1973	AIS	Survey for the B.C. Department of Highways	(Within the CIS LRMP) The extent is unclear	Numerous archaeological and heritage sites were identified during the project including during that portion conducted in the CIS LRMP. Total number is unclear.
1975-4	Bernick 1975	AIS	Survey for the B.C. Archaeology Branch	(Within the CIS LRMP) Dease Lake to Telegraph Creek	Five heritage sites were identified within that portion of the survey that was within the CIS LRMP.
1977-17	Bernick and Clark 1977	AIS	Survey for the B.C. Archaeology Branch	(Within the CIS LRMP) West of Dease Lake, south end of Dease Lake	Two heritage sites were identified.
1978-7	French 1980	AIS	Survey for the B.C. Archaeology Branch	Stikine River, Tahltan River and Klastline River	A total of 132 new archaeological and heritage sites were identified.

Permit	Investigator and Report Year	Investigation Type	Project/ Development	Location	Results
1979-26	Albright 1980	ADR	Research	Along the Stikine River	A total of 23 known smokehouses were investigated.
1979-29	Aresco Ltd. 1980	AOA	Proposed hydroelectric development	Stikine and Iskut River basins	Areas of high and low potential were identified and a program of judgemental sampling recommended. Four heritage sites were identified.
1981-6	Aresco Ltd. 1982b	AIA	Proposed Stikine-Iskut hydroelectric project	Upper Stikine, Iskut, and Klappan Rivers, and More Creek	A total of 20 heritage sites and 7 historic buildings were identified. As well, 44 traditional use areas were identified.
1981-10	Fladmark 1982	AIS	Research	Mt. Edziza	A total of 112 heritage sites were identified.
1982-non	Aresco Ltd. 1982a	AOA	Proposed Stikine-Iskut hydroelectric project	Upper Stikine, Iskut, and Klappan Rivers, and More Creek	Areas of high, moderate, and low potential were identified.
1982-10	Friesen 1983	AIS	Research	Upper Stikine River Basin and Spatsizi Plateau Region	A total of 34 new heritage sites were identified.
1982-16	Aresco Ltd. 1983	AIS	Proposed Stikine-Iskut hydroelectric project	Upper Stikine, Iskut, and Klappan Rivers, and More Creek	A total of 12 new archaeological sites and six heritage sites were identified.

Permit	Investigator and Report Year	Investigation Type	Project/ Development	Location	Results
1983- non	Albright 1983	AIS	Review of heritage resources for the Kitimat- Stikine Regional District and the Smithers regional office of the Ministry of Lands	Telegraph Creek management area	-
1983-15	Friesen 1985	AIS	Research	Upper Stikine River Basin and Spatsizi Plateau Region	A total of 67 new heritage sites were identified.
1983-35	I.R. Wilson Consultants Ltd. 1984	AIA	Proposed Stikine-Iskut hydroelectric project	Upper Stikine, Iskut, and Klappan Rivers, and More Creek	Summary of previous project work.
1984- non	Albright 1984	Research	Research	Tahltan traditional territory	Proposed that ethnological subsistence patterns are similar to prehistoric patterns as seen through the archaeological record.
1985-8	Aresco Ltd. 1986	AIA	Proposed developments for the Mount Klappan Coal Property	Mt. Klappan	A total of 14 archaeological sites and three heritage sites were identified.

Permit	Investigator and Report Year	Investigation Type	Project/ Development	Location	Results
1986-non	Friesen 1986	AIS	Research	Tuya Lake	The survey resulted in the location of two prehistoric lithic scatter sites and three historic camp sites.
1986-24	Simonsen 1986	AIA	Proposed access road for the Mount Klappan Coal Project	Mt. Klappan	One archaeological site and one heritage site were identified.
1987-18	Ham 1987b	AIA	Proposed developments for Energex Minerals Ltd.	Al Property, Toodoggone Region	Six archaeological sites and one contemporary use site were identified.
1987-27	Ham 1987a	AIA	Proposed access road for the Golden Bear Operating Company	From the Stikine River north of Tahltan, to Bearskin Creek	One archaeological site and one traditional use site were identified.
1987-39	Points West Heritage Consulting Ltd. 1987	AOA	Proposed access road for the Sulphurets Property	From Highway 37 to Sulphurets Creek.	The results of the assessments were that while there was some potential for heritage resources, the proposed route was not expected to impact any significant sites.
1988-24	Ham 1988a	AIA	Proposed access road for the Golden Bear Operating Company	Revised route for 1987-27, from the Stikine River north of Tahltan, to Bearskin Creek	No new archaeological resources were identified.

Permit	Investigator and Report Year	Investigation Type	Project/ Development	Location	Results
1988-49	Ham 1988b	AOA, AIA	Proposed SNIP Project	Confluence of the Iskut and Craig Rivers	No new archaeological resources were identified.
1989-52	Albright 1989	AIA	Proposed access roads	Southeast corner of Dease Lake.	Numerous components of the historic Tahltan village at Dease Lake were identified. No new archaeological resources were identified.
1990-81	Rousseau 1990	AIA	Proposed Eskay Mine development	Tom Mackay Lake	A single projectile point was recovered that resembles Paleo-Indian bifaces dated from 9000 - 7000 B.P.
1990-102	Arcas Consulting Archaeologists Ltd. 1990	AOA	Proposed Iskut Mine access road	From Bob Quinn Lake to Snippaker Mountain and Tom Mackay Lake.	No new archaeological resources were identified.
1993-76	Walde 1993	AIS, AIA	Proposed realignment of the Telegraph Creek to Dease Lake Road	Along the Telegraph Creek to Dease Lake Road	No new archaeological resources were identified.
1993-114	Broderick and Ham 1994	AOA, AIS	Proposed hydro project	Hluey Lakes	No new archaeological resources were identified.
1993-115	Broderick and Ham 1993a	AOA, AIS	Proposed subdivision	Dease Lake	No new archaeological resources were identified.

Permit	Investigator and Report Year	Investigation Type	Project/ Development	Location	Results
1993-116	Broderick and Ham 1993b	AOA, AIS	Proposed extension of I.R. No. 9	Dease Lake	No new archaeological resources were identified. It was determination that as many as 18 individual interments may be present at IcTm-4.
1994-77	I.R. Wilson Consultants Ltd. 1994	AIA	Proposed highways yardsite	Along the Stikine River, just northeast of Telegraph Creek	While a known archaeological site was observed on the north side of the study area, no archaeological resources were observed.
1996-non	I.R. Wilson Consultants Ltd. 1996	AOA	Ministry of Forests Cassiar Forest District	Atlin, Dease-Liard and Iskut Forest Dev. Plan Areas	No new archaeological sites were identified.
1996-136	McLaren 1996	AIA	Proposed realignment of the Telegraph Creek to Dease Lake Road	Telegraph Creek to Dease Lake Road	The study identified new sites consisting of culturally modified trees (CMT) at Telegraph Creek, Tatcho Creek, and Eight Mile Creek. It was also determined that archaeological sites would be impacted by the proposed developments at both the Nine Mile Creek and the Eight Mile Creek areas.
1998-non	I.R. Wilson Consultants Ltd. 1998	AOA	Review of heritage resources for the B.C. Archaeology Branch	CIS LRMP	No new archaeological sites were identified.

LEGEND:

- Cassiar/Iskut/Stikine AOA Area
- LRMP Boundary
- NTS 1:250000 Neatline
- NTS 1:50000 Neatline
- BCGS 1:20000 Neatline
- Road
- Trail
- Water Feature
- Archeological Site

104k

104i

94l

104f

104g

104h

94e

104b

104a

Metres
0 5000 10000 15000 20000 25000 30000 35000

Scale 1:500000 - 1 cm = 5000 metres

Plot file generated on April 22, 1998 at 23:12:24 (Timberline Starter Kit, ARC/INFO Rev. 7.1.1)
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