GIS MODELLING OF ARCHAEOLOGICAL POTENTIAL for the NORTHERN NUU-CHAH-NULTH HAHOULTHEES, 1998

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SUMMARY

Introduction

In 1997-1998, Arcas Consulting Archeologists Ltd (Arcas), in partnership with the six Northern Nuu-chah-nulth First Nations, undertook an Archaeological Overview Assessment (AOA) of the Northern Nuu-chah-nulth hahoulthees (territories). The purpose of this AOA was to assess and map the archaeological potential within the study area which covers about 670,000 hectares including some parks, private lands, leased lands and 'Indian Reserves'. The study area encompasses the hahoulthees of the Che:K'tles7et'h', Ehattesaht, Ka;'yu:'K't'h', Mowachaht, Muchalaht, and Nuchatlaht First Nations. The overview was funded by FRBC.

This overview is concerned with archaeological sites and resources. An archaeological site is a geographical place which contains physical evidence of past human activities which can be best studied using archaeological methods of investigation. Different kinds of physical evidence (also known as archaeological resources) can be present in various combinations at archaeological sites. Examples of archaeological resources are house depression, artifact scatters, trails, human burials, fish traps, rock art, and culturally modified trees. Although an archaeological site is restricted to the location containing physical evidence, it is related to the traditional use of the area around a site which often is important for understanding why a site is present and the purpose of the site.

A traditional use site is a geographical place where First Nations people undertook one or more traditional activities. Some traditional use sites contain physical evidence of those activities, (and are considered to be archaeological sites as well as traditional use sites), but some traditional activities (such as berry picking, medicine collecting, and spiritual practices) leave little or no physical evidence. Traditional use studies, which rely on interviews and archival research, are best suited to address the nature and location of those traditional use sites which do not contain archaeological evidence.

The overview is based on current knowledge and assumptions, and should be subject to ongoing updates and revisions as our knowledge about the location of archaeological sites in the study area increases. The overview is concerned only with the archaeological (physical) evidence for past human activity, and does not address traditional use activities or other concerns. It was not the intent of this overview to document First Nations interests in the land, and the study was conducted without prejudice to aboriginal rights or title. The participation of First Nations in this overview does not necessarily mean that these First Nations endorse or agree with the process or results of this overview. The overview is not meant to be a substitute for direct consultation with First Nations who have interests in the lands covered by this overview.

Objectives and Methods

The objectives of the overview were to:

- classify the lands of the six Northern Nuu-chah-nulth hahoulthees into classes of different archeological potential;

- provide recommendations for each class of potential for the archaeological management of proposed forestry developments; and
- provide accurate digital GIS data (see below) showing the location of recorded archaeological sites, aboriginal trail routes, and known ethnographic villages.

A computer model created in a geographic information system (GIS) was used to assess the potential for archaeological resources throughout the study area. Broadly defined, a GIS is a computer-based system used to store and manipulate digital geographic information. A model can be defined as a simplified description of a more complex system, which can be used to make predictions about that system. In this case, the system under examination is past First Nation landscape use which resulted in the formation of archaeological sites.

The modelling approach used here is based on the relationship between the various kinds of traditional activities reported for the study area and the characteristics of the natural environment (biophysical variables). This type of modelling relies heavily on ethnographic, historic, and community sources of information Past changes to the natural environment were also considered. Modelling involved identifying:

- The traditional activities which resulted in physical evidence;
- The types of archaeological sites resulting from these activities;
- The associated archaeological evidence associated with the site types; and
- The locations for each of these site types, along with the mappable biophysical variables associated with these locations.

Given this approach, the overview did not attempt to create a model that predicts the specific locations of archaeological sites. Rather, the overview model predicts the capability of the landscape to support the types of traditional First Nations activities which resulted in physical evidence, thereby forming archaeological sites, with each type of activity resulting in one or more specific kinds of archaeological sites.

The analysis of the interaction between environmental variables in the model is based on the idea of biophysical constraints. From this perspective, variation in archaeological potential can be seen as a result of the number and degree of biophysical constraints which inhibit traditional use of an area, and conversely, the number of favourable biophysical variables which enhance traditional use. The challenge in developing such a model is identifying these constraints and variables, and identifying how their presence or absence affects overall archaeological potential.

GIS modelling requires mapped data in digital (electronic) format. Relevant biophysical data such as stream locations, forest cover, topography, landforms, and wildlife habitat areas were obtained in digital format (or subsequently digitized), as were relevant cultural data such as trail routes, ethnographic village locations, and known archaeological site locations. Most of these data were obtained at a scale of 1:20,000. This digital information was entered into the computer and stored as layers of data (coverages). Before applying the model, each coverage was divided into

a 30 rn grid, creating millions of map "cells" across the study area. The GIS then examined the content of each cell for each coverage, created a database record for each cell, applied the model to each database record, and lastly, predicted the potential for different kinds of traditional activities (and the various kinds of archaeological sites associated 'with them) for each cell. The highest score for each cell was then placed in a new database, which was used to create digital maps on computer disks. As the database record for each cell is linked directly to a point on the digital maps, any point on the maps can be queried to obtain the biophysical and cultural data and the archaeological potential scores for that location.

Access to Information

The results of the overview are available in two formats:

- Digital maps showing archaeological potential, known archaeological site locations, known ethnographic village locations, and trail locations, with attached database; and
- Paper maps at a scale of 150,000 showing archaeological site potential.

The digital data is held by the Ministry of Forests, Campbell River District (MoF), and Nootka Forest Products. Requests for access to digital data or paper printouts of digital plot files should be directed to the Ministry of Forests.

Results

Two different models were used to classify the archaeological potential of the study area. One model focussed on archaeological sites that do not include culturally modified trees (CMTs). Three classes of potential were defined: Class 3 (High potential, Low constraint), Class 2 (Moderate potential, Moderate constraint), and Class 1 (Low potential, High constraint) with each level of potential represented on paper maps by a different colour. The second model focussed specifically on the potential for CMTs, and classified the study area into either Low or Moderate-to-High potential classes. On the paper maps, CMT potential is indicated by hachure lines which overlie the coloured non-CMT potential classes. The classes are mapped digitally across the study area.

The classes of archaeological potential do not predict the specific locations of archaeological sites. Rather, these classes predict the potential of the landscape to be favourable to the traditional land use activities that would result in the formation of archaeological sites. High potential areas are the most favourable for activities, and therefore, the highest probability of finding an archaeological site will occur in these areas. Although the highest overall density of archaeological sites will be found in Class 3 areas, it is important to keep in mind that sites are not necessarily present at all points within all high potential areas. Conversely, Class 1 (Low potential, High constraint) areas have the lowest probability of containing archaeological sites and the lowest overall site density. It is important to remember that low potential areas do not have "zero" potential, and archaeological sites may therefore be present on Class 1 lands.

Model Application and Archaeological Management Recommendations

For the application of the overview results in forestry planning, we recommend the following:

Step	Required Action
1	Identify the mapsheets for areas where proposed forestry developments (including roads, gravel pits, cutblocks, silviculture areas, etc) are located.
2	Obtain the appropriate digital files and/or paper maps from the MoF.
3	Using the digital or paper archaeological potential maps as an overlay on the development plan, determine the archaeological potential of the area affected by the proposed developments.
4	Determine the appropriate archaeological management action(s) for each development area or portion thereof (see Archaeological Management Recommendations).
5	Obtain additional information necessary for determining the appropriate archaeological work in consultation with the MoF and relevant First Nations.
6	Where required, engage an archaeologist to conduct a field assessment or further research.
7	Report results of all archaeological fieldwork or research to the MoF, the Archaeology Branch, and the relevant First Nations so that they can be incorporated into future model revisions.
8	Determine the appropriate management actions for identified archaeological resources in consultation with the MoF, the Archaeology Branch, and the First Nations.

All proposed developments should be reviewed to determine if any archaeological studies are required. The following is a list of recommended management actions to be carried out in response to a proposed development in the study area:

Non-CMT Resource Potential:

- If a proposed development is planned in an area with **Class 1 Potential,** the recommended management action is consultation with First Nations in order to gather local knowledge and identify possible conflicts known to the First Nations. If no conflicts or concerns are demonstrated, then it is recommended that no further archaeological management actions take place. If conflicts or concerns are demonstrated, then it is recommended that the proponent consider the need for an archaeological field reconnaissance (AFR) or an archaeological impact assessment (AIA) in consultation with the First Nations, Ministry of Forests, and the Archaeology Branch.

- If a proposed development is planned in an area with **Class 2 Potential,** the recommended management actions are: (1) consultation with First Nations in order to gather local knowledge and identify possible conflicts or concerns known to the First Nations, and (2) an archaeological field reconnaissance (AFR) of the development area to identify the presence or absence of micro-features and assess their effect on the Moderate archaeological potential assigned to the area by the overview. If micro-features can be identified on air photos or maps then an in-office review is recommended. If these features are not present on air photos or maps than an AFR is recommended. We also recommend that the AFR be conducted under a heritage inspection permit.

- If a proposed development is planned in an area with only **Class 3 Potential** present, the recommended management actions are: (1) consultation with First Nations in order to gather local knowledge and identify possible conflicts or concerns known to the First Nations, and (2) an archaeological impact assessment (AIA) of the development area under a heritage inspection permit.

- If a proposed development is planned in an area with a combination of **Class 1 and 2 Potential or Class 2 and 3 Potential,** the recommended management action is for that of the highest class present, to be applied to the entire proposed development area, with the possibility for adjustments to the management action based on a field review.

CMT Resource Potential

- If a proposed development is planned in an area with **Low CMT Potential,** the recommended management action is consultation with First Nations in order to gather local knowledge and identify possible conflicts known to the First Nations. If no conflicts or concerns are demonstrated, then it is recommended that no further archaeological management actions take place. If conflicts or concerns are demonstrated, then it is recommended that the proponent decide on the need for an AFR or an AIA in consultation with the First Nations, Ministry of Forests, and the Archaeology Branch.

- If a proposed development is planned in an area with **Moderate-to-High CMT Potential,** the recommended management actions are: (1) consultation with First Nations in order to gather local knowledge and identify possible conflicts known to the First Nations, and (2) a CMT inventory in order to identify the presence or absence of CMTs. The CMT inventory does not have to be done under permit, but the results should be reported to the Archaeology Branch. Where the inventory identifies CMTs, a subsequent AIA may be required. The need for an AIA should be determined in consultation with the Ministry of Forests and the Archaeology Branch.

- If a proposed development contains areas with potential for both CMT and non-CMT resources, the recommended management action is that an AFR or AIA be conducted under a heritage inspection permit, depending on the level of non-CMT potential.

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The container presented on the cover is used with the permission of the Museum of Anthropology, Vancouver. The photograph was taken by Bill McLennan. The basketry weaving depicts a whale, whaling canoe, waves, and possibly a thunderbird.

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Although the expertise of many individuals has contributed to make this project what it is, the professional opinions expressed in this report are those of the authors, and not necessarily those of any individuals, groups, or institutions involved with the study. Arcas is solely responsible for the contents of this report, including any errors, omissions, or shortcomings.

TABLE OF CONTENTS

TABLES

APPENDIX TABLES

FIGURES

1 .O INTRODUCTION

This report presents the methods and results of **an Archaeological Overview Assessment (AOA)** of lands located within the traditional hahoulthees of the six Northern Nuu-chah-nulth First Nations on the west coast of Vancouver Island (Che:K'tles7et'h', Ehattesaht, Ka;'yu:'K't'h', Mowachaht, Muchalaht, and Nuchatlaht). **Hahoulthees** is the Nuu-chah-nulth term for a chiefs territorial rights and privileges based on the ownership of real property (Drucker 195 1:247-257).

An AOA is conducted in order to assess the archaeological potential of a defined study area. There are several ways in which archaeological potential can be assessed, but the most common method is usually through the creation of a model which is then applied to the study area and used to predict the relative archaeological potential of the study area landscape. This results in the production of a map showing the levels of archaeological potential present. The findings of an AOA can be used as an important planning tool for managing archaeological resources and future proposed developments.

The terms of reference for this project required that the AOA fulfill its goal of predicting archaeological potential for the six Northern Nuu-chah-nulth hahoulthees through digital means, more specifically, through a **Geographic Information System** (GIS)-based predictive modelling scheme. GIS is a digital system used to store and manipulate information about the physical landscape (see Chapter Two for more information about GIS). The model developed by the study team uses GIS-based digital data to analyse the physical landscape for certain attributes such as forest cover or slope. Depending on the presence or absence of these attributes, the model predicts archaeological potential over the landscape of the study area. The results of this AOA consist of a series of paper and digital maps and digital files which reside with the First Nation partners, and the MoF.

The primary objective of this overview was to map the relative archaeological potential of the study area. There were benefits for all groups with an interest in the protection and appropriate management of archaeological resources of the study area. Some of the benefits from the outcome of this project are:

- Precise mapping of known archaeological site locations;
- Identification of areas in need of future inventory studies;
- Identification of areas with the highest archaeological concern;
- Assisting all interested parties in making appropriate land use decisions; and
- Recommending appropriate archaeological assessments in forestry developments.

The overview was conducted by Arcas Consulting Archeologists Ltd. (Arcas) with the assistance of John Dewhirst of Archaeo Research Limited (ethnographic village and archival trails research), Sheila Savey (community trails research), and Doug Campbell of Range & Bearing Environmental Resource Mapping Corporation (digitization and GIS services). This overview was funded by Forest Renewal British Columbia. Nootka First Nations Forest Products Ltd., on behalf of the six Northern Nuu-chah-nulth Nations, was the lead partner on the project. In addition to the six First Nations, other partners were: the Ministry of Forests, Campbell River Forest District (MoF); Western Forest Products; International Forest Products Ltd.; Canadian Forest Products Ltd.; and Hecate/Coulson.

1 .1 Definitions

The Nuu-chah-nulth have lived on the west coast of Vancouver Island for thousands of years. In that time they have engaged in a variety of activities, some of which still make up a part of their lives, Today, the locations where these activities took (take) place are called **traditional use sites.** Those traditional use sites with physical evidence are called **archaeological sites.** Examples of archaeological sites are village sites, fishing places, or travel routes. The physical materials found at archaeological sites include **cultural features** such as house depressions at village sites, rock or wooden fish traps at fishing places, trails and blazed trees along travel routes. An archaeological site results from all of the activities that took place at one site over many years and can vary in size. Some sites are the result of a single activity such as stripping cedar trees for bark, some are the result of many activities such as a village site. Some sites are old, some are young. Some sites are occupied only once, while others were returned to on a regular basis for thousands of years.

Because an archaeological site can be many different combinations of cultural features, this overview is concerned with predicting the potential for the specific activities and resulting archaeological resources that make up a site, rather than for the site itself.

In order to predict archaeological potential, the overview relied on ethnographic, archaeological and historical information. **Ethnography** is the description of the culture of particular social groups, based on First Nation testimony, participant observation, and written records. **Archaeology** is the study of past cultures through the examination of material remains, that is physical evidence. **History** is the study of the human past through the examination of written records.

1.2 Study Area

The study area consists of all lands including non-forested lands, in the traditional hahoulthees of the Che:K'tles7et'h', Ehattesaht, Ka;'yu:'K't'h', Mowachaht, Muchalaht, and Nuchatlaht First Nations on the west coast of Vancouver Island (Figure 1). The study area extends from Escalante Point north to the Brooks Peninsula and is approximately 670,000 thousand hectares. There is

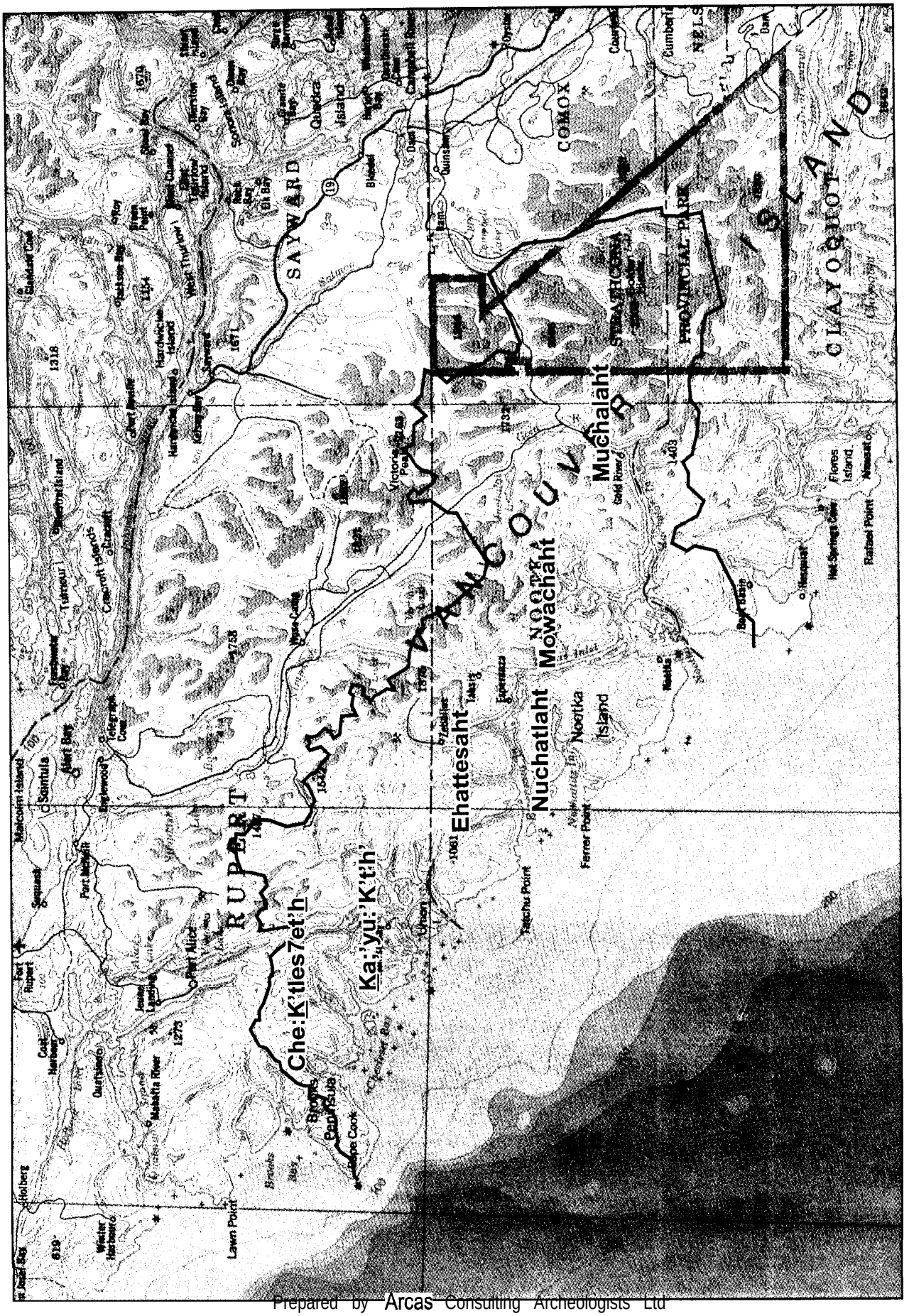


Figure 1. The Northern Nuu-chah-nulth Hahoulthees.

considerable environmental diversity in the study area, with the following environmental settings: outside coast, inside coast, coastal mountains, inlets, estuaries, Muchalat Lake, inland mountains, and river valleys (Figure 2 and 3). Much of the study area is located in the Campbell River Forest District (with some minor portions in the Port Albemi and Port McNeil1 Forest Districts).

1.3 Study Team

The individual members of the study team are listed on the Credit Sheet. Overall project management, documentary research, direct consultation, model development and review, and reporting were the responsibility of Arcas staff. Sheila Savey, who acted on behalf of Nootka Forest Products and the Mowachaht/Muchalaht First Nations, was the project coordinator and ensured that information was communicated between the various involved parties. Archaeo Research Limited (Archaeo) were employed for the ethnographic village and archival trails research components; Sheila Savey of Nootka Forest Products was employed to coordinate the community trails research component; and Range and Bearing Environmental Resource Mapping Corporation (R&B) was subcontracted to provide digitized coverages for the model developed by Arcas.

Figure 2. Muchalaht Inlet.

Figure 3. Port Eliza.

2.0 ARCHAEOLOGICAL POTENTIAL MODELLING APPROACH

A **model** represents a simplified set of relationships or information about a more complex system such as the real world. In this case, the system we are attempting to understand is the Nuu-chah-nulth use of the landscape. This overview does not try to create a model that predicts the location of archaeological sites. Modelling for archaeological sites is dependent on the distribution of known sites and the archaeological site inventory for the study area is inadequate for this type of modelling. Instead, this study uses a model that predicts **archaeological potential,** which is the capability of a landscape to support the types of traditional First Nations land use activities which would have resulted in the formation of archaeological sites comprised of physical cultural features.

A GIS was used in this study to describe and analyse the terrain of the Northern Nuu-chah-nulth hahoulthees, focussing specifically on landscape attributes associated with traditional activities. Information on these landscape attributes, initially derived from the GIS, was used to develop a model of archaeological potential for the overview area.

A GIS-based model brings a great deal of analytical power to the archaeological potential modelling process, but it restricts the user because of its ability to only utilize spatial information in digital form. GIS models can be negatively affected by limitations within map datasets, such as missing features or a lack of digital data for physical features that would be useful in the model.

Four sources of local knowledge data were incorporated into the model used in this overview, including: the ethnographic record, in-house field experience, community knowledge, and known archaeological site distribution.

The ethnographic record provided information concerning traditional activities and their resulting archaeological evidence. In some cases the ethnographic record was silent about certain traditional activities. We were able to address these data gaps and model for undocumented traditional activities because of in-house experience. There is little written information about the location of forest utilization sites, but because of the extensive field experience that Arcas personnel have had in the study area, we were able to create a model that predicts the potential for CMTs over the landscape.

Another source of data for model building comes from the known archaeological sites recorded within the study area. Although neither the ethnographic record, oral history, nor the archaeological record provide information on the locations of the earliest sites within the study area, the presence of older sites on ancient raised marine terraces has been documented elsewhere in B.C. and these sites were modelled for based on the presence of these terraces in the study area.

Any community-based knowledge about past traditional activities, was incorporated into the model. In particular, the community-based trails research project depended upon knowledge from the individual First Nation communities.

Of special significance to this overview was the creation of two models that are used together in order to predict the potential for archaeological resources over the landscape. One model focussed on the potential for **culturally modified trees (CMTs)** on the landscape. A CMT can be defined as a tree that has been altered by First Nations people as part of their traditional use of the forest. The CMT model does not differentiate between prehistoric (pre-1846) and historic CMTs; the model predicts the archaeological potential for CMTs on the physical landscape and includes cedar trees greater than 80 years of age.

A second model was created to predict the potential for archaeological resources other than CMTs (non-CMT resources such as shell middens, fishing stations, bear hunting traps, and shellfish harvesting areas) and the potential for their presence on the landscape. Traditionally, this type of model has been the major focus of overview projects, but it does not adequately capture areas with CMT potential. Both the CMT and non-CMT model are integral parts of the overall archaeological potential model

2.1 Assumptions and Constraints

The underlying assumption of the archaeological potential model is that all of the study area has potential for supporting traditional Nuu-chah-nulth land use activities that would leave some physical evidence, but some areas have a lower probability for archaeological resources due to the number and degree of certain biophysical constraints that inhibited past use of an area. For the model to work, these constraints must be identified, and the effects of their presence or absence on archaeological potential must be considered.

Using a GIS modelling perspective constraints are identified on the basis of physical landscape variables which can be classified into macro-features and micro-features.

- **Macro-features** are large-scale features easily identifiable on maps (digital or paper). Macro-features include: distance to water, major landforms, slope, aspect, climate, elevation, broad vegetation zones, and wildlife habitat.

- **Micro-features are** small-scale features identifiable from field inspections or examination of aerial photos; most mapping does not have the resolution to detect the presence or absence of these features. The presence or absence of micro-features modifies the level of constraints posed by macro-features. Micro-features include: specific aquatic characteristics, minor topographic features, ground terrain, specific vegetation, and specific habitat.

In order for the potential model to work, we must identify the specific biophysical variables associated with traditional activities and the types of archaeological resources resulting from such activities. This exercise is presented in a table format in Chapter 3 and in the Appendix. The effect that each variable has on either increasing or decreasing constraints on activities must then be

identified, The more constraints that are imposed by biophysical variables at a particular place on the landscape, the less potential there is for the activities to occur there. Conversely, the fewer the constraints that are imposed, the greater potential there is for the activities to occur.

2.2 Potential Classes

Various combinations of different macro and micro-features can create different levels of potential. Each level of potential may require different archaeological resource management actions. Each of the two models created for this overview has a slightly different approach to potential, both of which are discussed below.

Non-CMT Resource Potential

Three levels of potential are proposed for non-CMT archaeological resources:

- **Class 3 (High potential, Low constraint):** This is the highest level of archaeological resource potential. The highest density of archaeological sites, and the greatest range in archaeological site types, is expected for this class. Few or no constraints on use of the landscape are presented by the macro-features. The-micro-features are not expected to increase the level of constraints (decrease potential).

- **Class 2 (Moderate potential, Low constraint):** A moderate-to-high site density and range of site types is expected. This level has some constraints presented by macro-features, but is expected to have areas where micro-features either increase or decrease the level of constraint.

- **Class 1 (Low potential, High constraint):** A low density of sites and only a few site types is expected. This level has a high degree of constraints resulting from macro-features, and is not expected to have micro-features which decrease the level of constraint (which would increase the level of potential).

CMT Resource Potential

In terms of CMT potential the landscape was regarded as either having Low or Moderate-to-High potential. It was determined that if the most important macro-features (forest cover, slope, and distance to water) were within predefined parameters, there was Moderate-to-High potential for CMTs. An archaeological field reconnaissance would help clarify whether or not the micro-features present would increase or decrease the level of constraint and the resulting level of potential.

2.3 GIS Mapping and Digital Data

This overview is spatially based, using elements of the landscape that can be described with geographical shapes such as points, lines, or area1 shapes (polygons). These elements are predominantly biophysical in character, which is typical of most overview studies dedicated to modelling prehistoric land use. The geographic information used by a GIS must be in digital form, being derived from either existing sources or manually digitized. Once the information is entered into the computer, it is stored as discrete layers of data, sometimes referred to as ***themes,*** or, in the case of the software employed by this study (Arc/Info), as *coverages*. By recording the geographic locations of objects that can be summarised as points (x- and y- coordinates), lines (points linked in sequence), or enclosed area1 shapes (polygons), and by allowing for complex manipulation of this data, a series of analysis functions becomes possible. Coverages can be displayed separately or brought together in new combinations. Questions can be asked about the relations between coverages. These functions progress from basic descriptive activities such as new map displays, to more interpretive actions where the data is presented in new combinations, and finally on to the prescriptive activities like spatial modelling, which produce new spatial information (Berry 1997).

The storage and manipulation of spatial information typically employs one or both of two GIS data management methods (see Figure 4):

- **Vector:** the surface of the earth is segmented into a set of discrete unique area1 shapes. Points, lines, and polygons are the units used to describe the landscape. An example of one of these discrete units would be a 100 m buffer around the lake feature that would form a discrete unit. Both the lake shape and the buffer shape subsequently make their own contribution to the model.

- **Raster (also known as Grid):** the coverages used to describe the landscape are systematically divided into square cells of a size deemed small enough to accurately represent the terrain. Each cell carries information from each coverage for that section of the landscape. Each resulting grid can be compared or merged with all other coverage grids used in the model. This overview employed the raster method and an example of how this process took place is shown in Figure 13.

2.4 Analysis and Modelling Capabilities of a GIS

With map-based input forming the foundation of a GIS, mapped output is a basic initial part of the analysis. Displays of individual variables at various scales and in combination with other elements within the system provide useful views of how well the data capture process has worked. A further step in display is when data in its raw form is *reclassified*. Slope, for example, can be grouped according to specified ranges. The relationship between variables can be explored, using overlay operations, where two separate coverages are allowed to intersect to provide new information. For example, a water coverage showing streams can be matched to a slope coverage

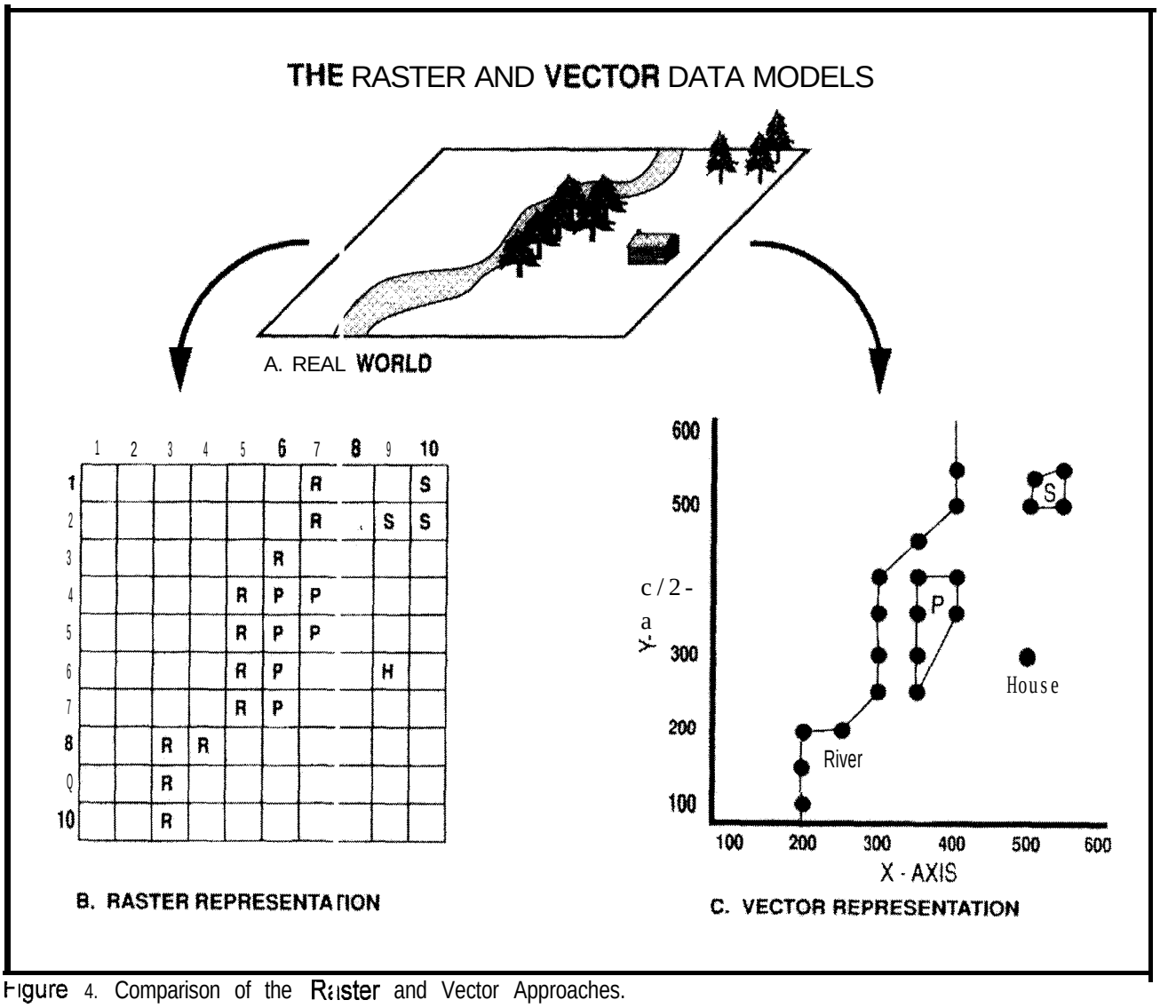


Figure 4. Comparison of the Raster and Vector Approaches.

to determine stream sections too steep to be included in the model. Various *distance* and *connectivity* measurements can also be made. In this overview, numerous distance measurements were made from the site locations to other landscape features. Finally, *adjacency* or *neighbourhood* analyses can be important in describing various features relationships to each other (Berry 1997).

Often these four operations represent the entire function of a GIS and are certainly at the core of its analytic capabilities, However, once the data has been updated and re-examined more complex spatial modelling operations are still possible. New areas can be described around various features using *buffering* operations, and once a series of area1 or polygon shapes have been defined, score values can be attached to them. These scores can then be accumulated to provide a final modelled landscape that becomes an effective decision-making tool.

2.5 Review of Previous Modelling Attempts

Arcas, in the past, has been involved in a number of large-scale GIS-based archaeological overviews. Through time, these overviews have evolved from simple, coarse-scaled mapping projects to sophisticated, complex, and fine-scaled modelling studies. With this evolution, the overviews have increased greatly in accuracy and resolution.

The earliest GIS-based overviews were produced for the Land and Resource Management Plan (LRMP) process (Arcas 1994a) and the Commission on Resources and Environment (CORE) process (I.R. Wilson Consultants Ltd 1992). For the most part, these overviews simply mapped out archaeological potential by creating hand-drawn buffers around major aquatic features, modified by a few additional variables, which were subsequently digitized. They were largely mapping exercises that did not utilize the full capabilities of a GIS. Although useful from a general, regional-scale planning perspective, these LRMP overviews are inadequate for operational level planning. The mapping scale of 1:250,000 is inadequate for identifying many of the micro-features which influence archaeological potential.

The archaeological overview assessment for the Okanagan Timber Supply Area (Arcas 1997a) was a more sophisticated application of GIS mapping. It was completely digital and each variable considered in the model existed as a separate digital coverage layer. These digital coverages were not hand-digitized versions of the vaguely defined variables used in the LRMPs, but rather were based on real world digital mapping, which improved accuracy and resolution. For instance, environmental units were based on biogeoclimatic zones, which are more representative of actual conditions. Also, rivers and lakes were classified and buffered consistently using digital mapping, and slope was calculated from digital data.

Each coverage was assigned a numeric score or, in the case of buffers, a series of decreasing scores as distance from the feature increased. When the coverages were combined, new polygon shapes resulted and these were given the cumulative score from the contributing coverages. This is similar to the process used for the Nuu-chah-nulth overview. In the Okanagan case, however, the

cumulative score was sufficient for assigning potential; it was not analysed for the presence or absence of particular coverages. The final potential class resulted from assigning ranges of values to the cumulative result (i.e., O-3 = Low, 4-6 = Medium and so on). This approach resulted in a much more consistent assessment across the region as well as providing more flexibility in the choice and application of biophysical variables.

Despite the substantial improvement of the Okanagan overview relative to the LRMP overviews, a number of limitations have been identified. For example, the model was based largely on the distribution of known archaeological sites, and did not necessarily account for all site types. Well-surveyed lower elevation valley and lake areas were emphasized, and less consideration was given to mid and high elevation areas, Streams were classified on the basis of size alone, and did not account for fish values or environmental zones. Not all digital coverages were complete (i.e. forest cover, ungulate range) and not all biogeoclimatic zones were used.

The simple cumulative approach used in the Okanagan overview can misrepresent the relative potential of polygons. For example, an area with only a few variables present will receive a low score. These variables, however, may be sufficient to indicate fairly high potential for a certain type of activity that does not require a rich suite of biophysical elements to be present. A bark-gathering place, for example, would not require the more optimal, low constraint setting required by a major village site.

The current GIS-based overviews (Arcas 1998a and 1998b), including the Northern Nuu-chah-nulth overview are designed to overcome many of the problems associated with the Okanagan overview. In the Nuu-chah-nulth overview, archaeological potential is determined **not from** a simple addition of scores from each of the variables (the cumulative method), but rather on the basis of a specific combination of variables (see Model Building, Review, and Application, Section 3.8). The result provides a more sophisticated assignment of potential and, in addition, it shows the variables which contributed to the potential assessment and the types of traditional activities that could have been carried out at that location.

Previous models have been **inductive** in nature, in other words, the variables used to predict site locations have been largely determined on the basis of known site distributions. This approach is problematic in that it assumes that known site distributions and survey coverages are representative. Predictions based on these models are generally difficult to test. A **deductive** approach, on the other hand, is based on ethnographically-supported patterns of human behaviour. This means that not even a single site location needs to be known for a model to be built, although known site distribution is required to test the effectiveness of the model.

The current overviews also use **constraint** modelling. This type of modelling considers the variables which mitigate against (i.e. decrease) potential. For example, an unfavourable slope value can quickly assign large areas of land to the lowest potential. **Sensitivity analysis** is used to determine which variables are the most sensitive to altering the modelling outcome. Slope is a highly sensitive value, because changing the slope value by a small increment can lead to massive

changes in the polygons, whereas changing the weight of the ungulate winter range will in most cases result in relatively minor changes to potential.

In summary, the modelling approach used in this study relied on the following assumptions:

- The existing level of archaeological survey in the study area is limited and unrepresentative; therefore, known archaeological site distribution alone is inadequate and unreliable for predicting archaeological potential;
- Ethnographic, historic, and contemporary sources documenting traditional use activities are relatively comprehensive;
- Traditional activities resulting in archaeological evidence may have taken place across the entire landscape; therefore, the entire landscape has archaeological potential;
- Various biophysical constraints decrease the diversity, intensity, and frequency of traditional activities, thereby reducing archaeological potential, while other favourable variables enhanced traditional use, thereby increasing archaeological potential;
- Major biophysical constraints and favourable variables can be identified using a GIS, while minor constraints and variables can only be identified through fieldwork; and
- Certain combinations of constraints and favourable variables are associated with specific traditional activities and archaeological site types.

3.0 AOA METHODOLOGY

3.1 First Nations Consultation

First Nations involvement in this project commenced with the Call For Proposals issued by the Ehattesaht First Nation on behalf of its partners (the other Northern Nuu-chah-nulth Tribes, MoF, and the licensees). Arcas submitted a proposal in December 1996 which was accepted. The AOA unofficially began in January 1997 with a preliminary start-up meeting in Campbell River attended by the six Northern Nuu-chah-nulth Tribes, Arcas, MoF, R&B, and several of the licensees. Initially, the Ehattesaht First Nation was the lead proponent on the overview, with Victoria Wells acting as the project coordinator. The contract delineating the Mowachaht/Muchalaht as the lead partner for the overview was signed on June 1, 1997. Sheila Savey was appointed by the Mowachaht/Muchalaht to act as the project coordinator.

The initial Steering Committee meeting was held in Gold River on October 1, 1997 at Tsaxana, near the village of Gold River. It was attended by representatives of the Northern Nuu-chah-nulth First Nations and it was agreed that the remote locations of the First Nation communities would make it difficult for meetings to be held in each of the communities. It was proposed that the various First Nation communities would be represented by those people from the communities who had agreed to participate on the steering committee. Subsequent Steering Committee meetings were held and attended by various members of the six Northern Nuu-chah-nulth communities on November 12, 1997, January 20, 1998, and February 26, 1998. The meetings took place at Tsaxana, Campbell River, and Port Albemi.

Mary Pat Mathers (MoF) and Sheila Savey travelled to Ehatis, Oclucje, and Kyuquot to hold community information sessions in order to discuss the project goals and objectives with interested people who were unable to attend the Steering Committee meetings. They also requested feedback from those who were present at the community presentations, particularly concerning the traditional activities table created for the first stage of the archaeological modelling process.

Besides the steering committee meetings, there was frequent phone and fax correspondence between Arcas and Sheila Savey. Part of Sheila's job as project coordinator was to act as a liaison between the First Nation communities and Arcas in order to alert Arcas to any concerns that were brought to her attention. This was thought to be the most appropriate means of communication and was agreed to by the First Nations during the early stages of the project.

3.2 Other Consultation

Three sections of the Northern Nuu-chah-nulth overview were subcontracted to other consultants. R&B was subcontracted to assist Arcas with the GIS-based modelling, digitize datasets, create map-database linkages, create and implement data set formatting, and produce digital and paper end map products. Doug Campbell (R&B president) provided his input and expertise

concerning matters relating to GIS and GIS modelling. Archaeo Research was subcontracted to serve as the professional ethnographer for this project and provided specific information concerning the location of known ethnographic villages within the study area and archival information concerning known historical trails. John Dewhirst (Archaeo Research president) also provided his advice and expertise concerning traditional Northern Nuu-chah-nulth culture that was incorporated into the traditional activities table. Sheila Savey was subcontracted to coordinate the community trails research. She travelled to the communities and interviewed people about known trails that had been used by the Nuu-chah-nulth in the past. The resulting trail information was placed onto 1:50,000-scale maps for digitization by R&B. The activities completed by the aforementioned subconsultants is described in the appropriate subsections of this report.

3.3 Background Research

Before developing a model of archaeological potential, it is essential to have an understanding of the natural and cultural context of the study area and its archaeological resources. The background component of this AOA involved a review of pertinent ethnographic, archaeological, and biophysical sources. This information was used to develop the model of archaeological potential that forms the basis of this study. Introductory statements about the ethnographic, archaeological, biophysical, and GIS-modelling information are presented in the remaining sections of this chapter. The Appendix provides more detail concerning the background research conducted for the AOA.

3.4 Ethnography

The ethnographic section is not an all encompassing discourse on the Nuu-chah-nulth people. Early in the project, the partners discussed the relevance of spending time and money on a detailed ethnographic literature review. Much has already been written about the Nuu-chah-nulth people and it was not the intent of this study to be an exhaustive review of previous work. It was proposed that Archaeo Research focus on providing information about archival trails, which was thought to be an important data gap. A second objective was to compile information about ethnographic villages which could be summarized in a table format and plotted onto maps for digitization.

The ethnographic research was conducted in order to determine the types and locations of traditional activities that would have left a physical record on the landscape of the study area. The sources used to obtain this information include: written documents recording observations of early Euro-Canadian visitors to the region, descriptions of aboriginal culture by anthropologists and other researchers, and the oral histories and traditions of Nuu-chah-nulth people. These sources are important for understanding the traditional Nuu-chah-nulth way of life and they help to place the archaeological resources into a cultural and historical context.

3.4.1 Ethnographic Villages

John Dewhirst of Archaeo Research agreed to compile information about documented ethnographic villages present within the overview area. This research was done because one important component of the model building process focussed on determining how far people went from villages to gather wood, bark, or other resources. Knowing where the villages were located assisted in predicting CMT locations in relationship to villages, with the assumption that appropriate cedar stands close to villages would have a higher chance of containing CMTs. The Appendix includes a table of all known ethnographic villages, including a brief description of each village and its Nuu-chah-nulth name. Figure 7 shows the locations of the recorded ethnographic villages in the study area.

3.4.2 Traditional Activities/Material Culture

The purpose of this overview is to predict archaeological resource potential within the traditional hahoulthees of the Northern Nuu-chah-nulth using a model developed specifically for the study area. Past models made predictions about archaeological site locations dependent upon known site distribution and survey coverage. This method of prediction is somewhat flawed because it is dependent on the assumption that where people have surveyed is representative of the entire physical landscape, which is often not the case.

The Northern Nuu-chah-nulth model attempts to 'deduce' (also known as deductive modelling) the potential for archaeological sites based on ethnographically-supported patterns of human behaviour and how that behaviour was constrained by the landscape. In order for the model to work, it is necessary to know about the cultural landscape inhabited by Nuu-chah-nulth people. This was done by gathering data about past activities known to have taken place within the study area. Once the data had been gathered, a table was created which included known traditional activities, the specific kinds of archaeological evidence that might be found, the types of archaeological sites expected from such activities, the physical location of the activities, the biophysical variables present at the location, and the digital coverages required for modelling the variables. The following table is a summary of the more detailed table included in the Appendix.

Although the model relied heavily on documented information about past traditional activities, opportunities were provided throughout the study for Nuu-chah-nulth people to comment on and critique the traditional activities table and to provide information about activities not well documented. As previously mentioned, there is very little written information about the use of inland areas of the study area, but because of the presence of CMTs throughout the overview area, we were able to create a CMT model for predicting the potential for the presence of forest utilization sites that is not dependent on the written sources.

Table 1: Traditional Activity Table Summarized.

Traditional Activity	Resulting Archaeological Activity	Archaeological Site Feature Type in Overview		Activity Location
		General Type	Specific Type	
Collecting inner cedar bark	Bark-stripped yellow cedar (tapering scar)	Forest Utilization	Yellow Cedar Bark-Stripped CMT	Straight old yellow cedar stands accessible from the shore, and water courses
	Bark-stripped red cedar (tapering scar)	Forest Utilization	Red Cedar Bark-Stripped CMT	Straight old red cedar stands accessible from the shore, water courses, lakes, and trails
Obtaining timber for blanks, canoe blanks, posts, and other objects	Aboriginally- logged trees	Forest Utilization	Aboriginally-Logged CMT	Straight old red cedar stands on level terrain accessible from the shore and water courses
Collecting bark for medicines	Bark-stripped trees (cascara, wild cherry, hemlock, spruce, red alder, and yew) with smaller scars	Not modelled because locations cannot be predicted with present knowledge		
Collecting roots and other plant materials	No evidence	Not modelled because there is no archaeological evidence		
Burying the deceased	Remains in Sitka spruce trees, and remains at or near base of tree	Habitation/ Subsistence/ Ceremonial	Tree Burial	In spruce trees near the ocean, near villages; in spruce trees on islets near villages
	Remains in middens	Habitation/ Subsistence/ Ceremonial	Midden	At villages or camps
	Remains on ground	Not modelled due to low probability of remains still being present		
	Remains in rockshelter/ cave/crevice	Habitation/ Subsistence/ Ceremonial	Burial Caves/ Burial Crevice	In rock shelters, caves, and crevices close to shore and villages

Traditional Activity	Resulting Archaeological Activity	Archaeological Site Feature Type in Overview		Activity Location
		General Type	Specific Type	
Ritual Bathing	None	Not modelled because there is no archaeological evidence		
Ceremonies and Rituals	Pictographs	Habitation/ Subsistence/ Ceremonial	Rock Art	Near the ocean on steep cliffs near burial caves
	Shrines (including whaling)	Not modelled because the information needed is not available		
Salmon Fishing	Wooden fish weir	Habitation/ Subsistence/ Ceremonial	Intertidal	On mud, silt, or gravel tidal flats at the mouth of salmon streams; or lower reaches of salmon streams
	Fishing camp consisting of artifacts, bones, fire-altered rocks and charcoal	Habitation/ Subsistence/ Ceremonial	Midden, Inter-tidal	On flat land near the lower reaches or mouth of salmon streams
				On stream exiting from lake and connected to coastline
				On or near shores of lakes containing salmon
Fishing or non-salmon	Stone fish trap	Habitation/ Subsistence/ Ceremonial	Intertidal	On flat beaches
Hunting bears	Large dead fall trap consisting of logs and rocks	Not modelled because locations cannot be predicted with present knowledge		
	Hunting camp consisting of artifacts, fire-altered rock, bones and charcoal	Habitation/ Subsistence/ Ceremonial	Artifact Scatter	On flat land near salmon streams
Hunting marmots	Hunting camp in a subalpine rock shelter with bones and artifacts	Habitation/ Subsistence/ Ceremonial	Subalpine Rockshelter	Granitic bedrock exposures in alpine parkland

Traditional Activity	Resulting Archaeological Activity	Archaeological Site Feature Type in Overview		Activity Location
		General Type	Specific Type	
iunting ungulates elk and deer)	Medium-sized deadfall trap consisting of logs and rocks	Not modelled because locations cannot be predicted with present knowledge		
	Hunting camp consisting of artifacts, bones, fire-altered rock, and charcoal	Habitation/ Subsistence/ Ceremonial	Artifact Scatter	On flat land near streams and lakes: or flat land along migratory corridors: on flat land in ungulate (deer elk) habitat
lunting (trapping) ur-bearing animals	Small-sized deadfall trap consisting of logs and rocks	Not modelled because locations cannot be predicted with present knowledge		
Travel	Trail			As mapped
	Canoe run	Not modelled because these locations cannot be identified by GIS		
	Canoe portage consisting of rows of logs	Not modelled because these locations cannot be identified by GIS		
fabitation	Village	Habitation/ Subsistence/ Ceremonial	Midden, Intertidal	On level sheltered land adjacent to tidal flats (beaches) in upper reaches of inlets and coves
	Known ethnographic village	Habitation/ Subsistence/ Ceremonial	Midden, Intertidal	On level sheltered land adjacent to tidal flats (beaches) in upper reaches of inlets and coves
topover camp	Small camps consisting of artifacts, bones, fire-altered rock, and charcoal	Habitation/ Subsistence/ Ceremonial	Artifact Scatter	On flat land adjacent to navigable water close to fresh water; if located on salt water close to a tidal flat (beaches)
				close to fresh water along trails, flat land

Traditional Activity	Resulting Archaeological Activity	Archaeological Site Feature Type in Overview		Activity Location
		General Type	Specific Type	
Habitation associated with ancient sea levels	Village or camp on raised beach	Habitation/ Subsistence/ Ceremonial	Midden, Intertidal	In ancient raised leach terraces
Harvesting shellfish	Camp consisting of shellfish remains, artifacts, fire-altered rocks, and charcoal	Habitation/ Subsistence/ Ceremonial	Midden, Intertidal	On flat land adjacent o tidal flats
Hunting sea mammals	None	Not modelled because there is no archaeological evidence		
Hunting birds (including water fowl)	None	Not modelled because there is no archaeological evidence		
Defence	Archaeological remains on steep bluffs or offshore islands	Habitation/ Subsistence/ Ceremonial	Defensive/ Refuge	On small islands with steep cliffs or on narrow headlands with steep sides; close to villages
Woodworking on beach	Stone tools on beach	Habitation/ Subsistence/ Ceremonial	Intertidal	On beaches near villages or camps
Quarrying for cooking stones	None	Not modelled because locations cannot be predicted with present knowledge		
Quarrying for iron ore	None	Not modelled because locations cannot be predicted with present knowledge		

3.4.3 Trails Research

Aboriginal trails were/are used by First Nation peoples as trade and communication routes, or to provide access to resource locations for hunting, fishing, plant collecting, procurement of lithic materials, and so on. They are an important variable in the development of an archaeological potential model, since many activities that could potentially leave material remains are expected to occur along trail corridors. It is suspected that most trail routes should be distinguished by linear concentrations of sites along their routes; by extension, such linear concentrations of sites might represent ancient travel corridors for which no physical or documentary evidence now exists.

Aboriginal trails can be identified through historic maps and archival sources, and through community-based research involving discussions with elders and other community members, In the project proposal it was acknowledged that one of the existing data gaps to be addressed was the lack of information available about aboriginal trail locations. Arcas proposed that the overview include a component of ethnographic research that would focus on gathering historical data about aboriginal trails from archival sources. John Dewhirst of Archaeo Research conducted this research. He found archival information on six documented trails. This absence of archival information for trails is not unexpected as historical documents do not tend to concern themselves with the accurate discussion of native trails. See the Appendix for a table displaying the archival trail information.

A portion of the money directed towards the Mowachaht/Muchalaht First Nation was used to conduct a trails research programme within the First Nations communities. Sheila Savey agreed to conduct the research programme. She travelled and consulted with people from each of the Northern Nuu-chah-nulth communities during the early phases of the project. The results were mapped onto 1:50,000-scale maps and digitized for use in model building. No report was compiled, as it was agreed that the mapped trail locations would be the most useful information. See the Appendix for a table compiling the information gathered as a result of the community-based trails research. Unlike the archival trails research, a great deal of information was gathered by talking to people in the communities who used the trails both in past and present times.

3.5 Archaeology

Documented archaeological sites contribute predictive power to the archaeological potential model because the presence of a site signifies that the surrounding landscape had the ability to support the types of traditional land use that resulted in the formation of archaeological resources. Thus, the existence of one site in a particular setting would tend to support an assertion that additional, as-yet undiscovered sites may also exist nearby, or in other settings with similar biophysical features and constraints.

The archaeology of the study area is not well known when compared to other parts of the province. In general, the best studied portion is Nootka Sound, and the study area becomes less known archaeologically as one travels south to north. Only one major excavation has taken place

within the study area, and only portions of the study area have been systematically surveyed. The Appendix provides pertinent details regarding references.

3.51 Review Of Archaeological Sources

In recent years, there has been a greater emphasis on the identification of inland archaeological sites and on the recording of forest utilization sites comprised of CMTs (Figures 5 and 6). This is in part a direct result of the implementation of Section 5 1 of the ***Forest Practices Code*** (1995) requiring archaeological assessments of proposed forestry developments. Forestry related surveys in the vicinity of Kyuquot/Nootka Sounds have been conducted for a variety of proposed forestry developments (see Appendix), The vast amount of this work has been completed as a component of archaeological impact assessments (AIAs) and, while the number of AIAs has increased substantially within the study area since 1994, it is insignificant in comparison to other areas of the province. However, the context within which the AIAs is being done (the coastal rain forest) is significant because in the past most survey work on the coast took place within 200 m of the shoreline. Moving inland has greatly added to our knowledge of Nuu-chah-nulth activities away from the water or the shoreline.

The question of changing sea levels and their effect on ancient settlement patterns was taken into account during creation of the non-CMT model. Ancient raised beach terraces noted on the ***Terrain Inventory and Geological Hazards: North Vancouver Island*** map (Ministry of Environment 198 1) were hand drawn onto the Terrain Resource Information Management (TRIM) maps for digitization and incorporated into the model as landscapes with high or moderate potential for ancient sites. As with the lack of ethnographic information for forest utilization sites, the lack of information about archaeological sites on ancient beach terraces was not of great concern because we were aware of the potential for such sites as a result of previous studies in other areas, and we incorporated that knowledge into the creation of the non-CMT model.

3.5.2 Site Typology

The Archaeology Branch has created a site typology that must be used to describe sites when first recorded and submitted to the Branch for documentation and inclusion in the Archaeological Sites Registry. The Branch's site typology is the starting point for this overview study, but a revised site typology was created in order to customize the data for the modelling purposes exclusive to this project (Table 2). This overview focuses on prehistoric archaeological sites, but **historic sites** have also been documented in the study area. Historic sites, regardless of cultural affiliation, post-date contact with Europeans. Historic sites are included in the overview site database but they are not included in the model.

The site typology used by the Archaeology Branch is based on a hierarchical system of terms that describe different types of features. The terms are modified by various other terms which can

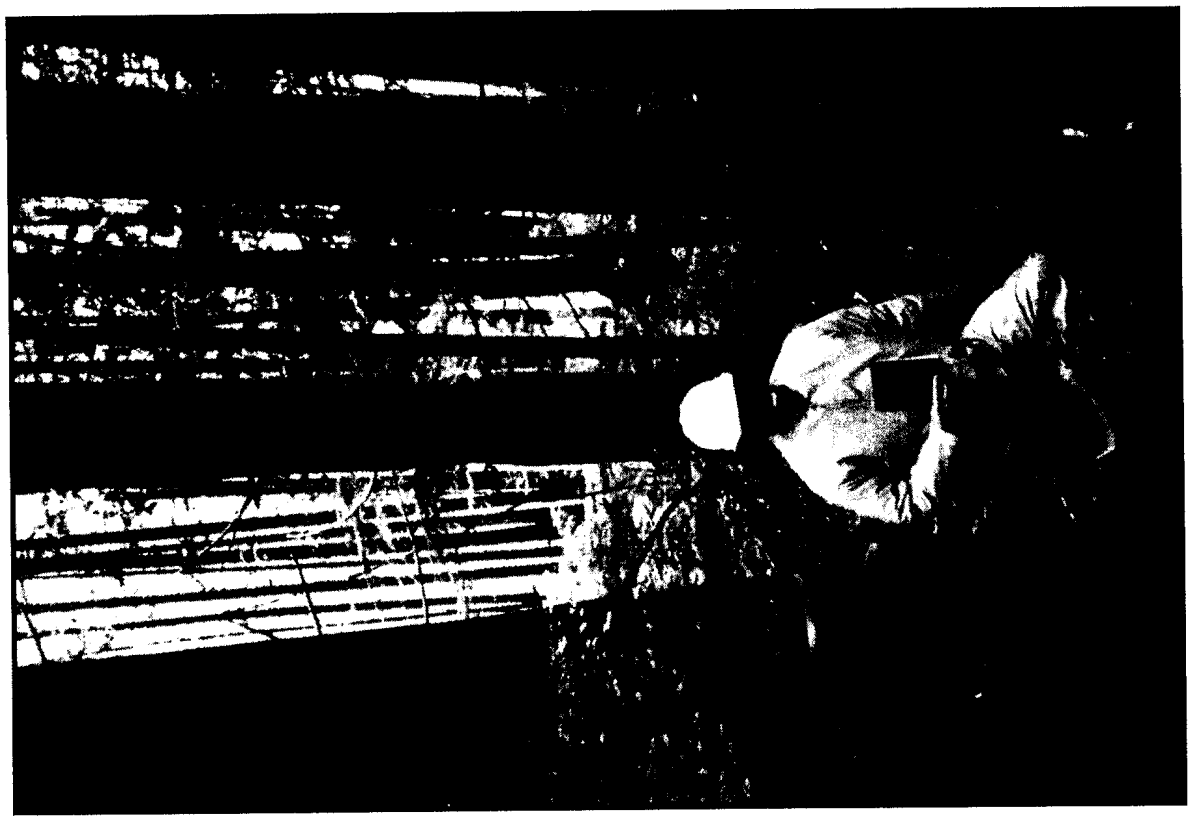


Figure 6. Bark-stripped Trees.

Figure 5. Planked Log.

be combined in a number of ways. For example the type "Habitation" can be modified by: rock shelter, cave, refuge, platform, or depression. The subtype "depression" can be modified by: rectangular or circular, which can be further modified by: plank house, housepit, mat lodge, sweat lodge, menstrual lodge, or other. To describe a rectangular house depression for the Archaeology Branch one would write: Habitation, depression, rectangular, plank house.

The overview site typology is based on describing the physical **features** that comprise an archaeological site. An archeological site can be comprised of one or several features. Features can be defined as the different types of archaeological resources comprising a site. The following table provides the site feature types defined for the overview along with the corresponding Archaeology Branch typology name. The general and specific site types are also included as a column in the traditional activities table (see Table 1 and Appendix).

Table 2: Archaeological Site Feature Types.

General Site Type	Specific Site Type (Feature)		Corresponding Archaeology Branch Site Type
Forest Utilization Site (FUS)	Yellow Cedar Bark-Stripped CMT		Cultural Material, surface, CMT
	Red Cedar Bark-Stripped CMT		Cultural Material, surface, CMT
	Aboriginally-Logged CMT		Cultural Material, surface, CMT
Habitation, Subsistence, and Ceremonial	Shrine (including Whaling)		Cultural Material, surface, whaling shrine
	Above Ground Burial		Human Remains, burial box/platform/grave house
	Tree Burial		Human Remains, tree
	Midden Burial		Human Remains, other
	Burial Cave/Burial Crevice		Human Remains, rockshelter/cave
	Rock Art		Pictograph
	Intertidal	Fish Trap	Subsistence Features, fish, trap
		Fish Weir	Subsistence Features, fish, weir
		Canoe Run	Petroform, canoe skid
		Intertidal Artifact Scatter	Cultural Material, surface/subsurface, lithics
		Wet site	Cultural Material, surface/subsurface, wetsite
	Midden		Habitation, rockshelter/cave; Cultural Material, subsurface/surface, shell midden
	Artifact Scatter		Cultural Material, subsurface/surface, lithics
	Defensive/Refuge		Earthwork, mound/trench embankment; Habitation, refuge
	Subalpine Rockshelter		Subsistence Features, land mammal

3.5.3 Site Frequency and Distribution

A total of 368 archaeological sites were recorded within the study area when this project was initiated. These include 308 sites classified as prehistoric and 60 sites classified as historic (Figure 7). The nature, frequency, and distribution of all prehistoric archaeological resources are discussed below and presented in Table 3.

The total number of sites do not match the numbers of site records in the Archaeological Site Registry, because several archaeological features can occur at a single site (for example, a midden site where CMTs and burials are also present). In the site Registry, each different feature is treated as if it were a single site. In this way, the total number of archaeological features is greater than the number of recorded sites.

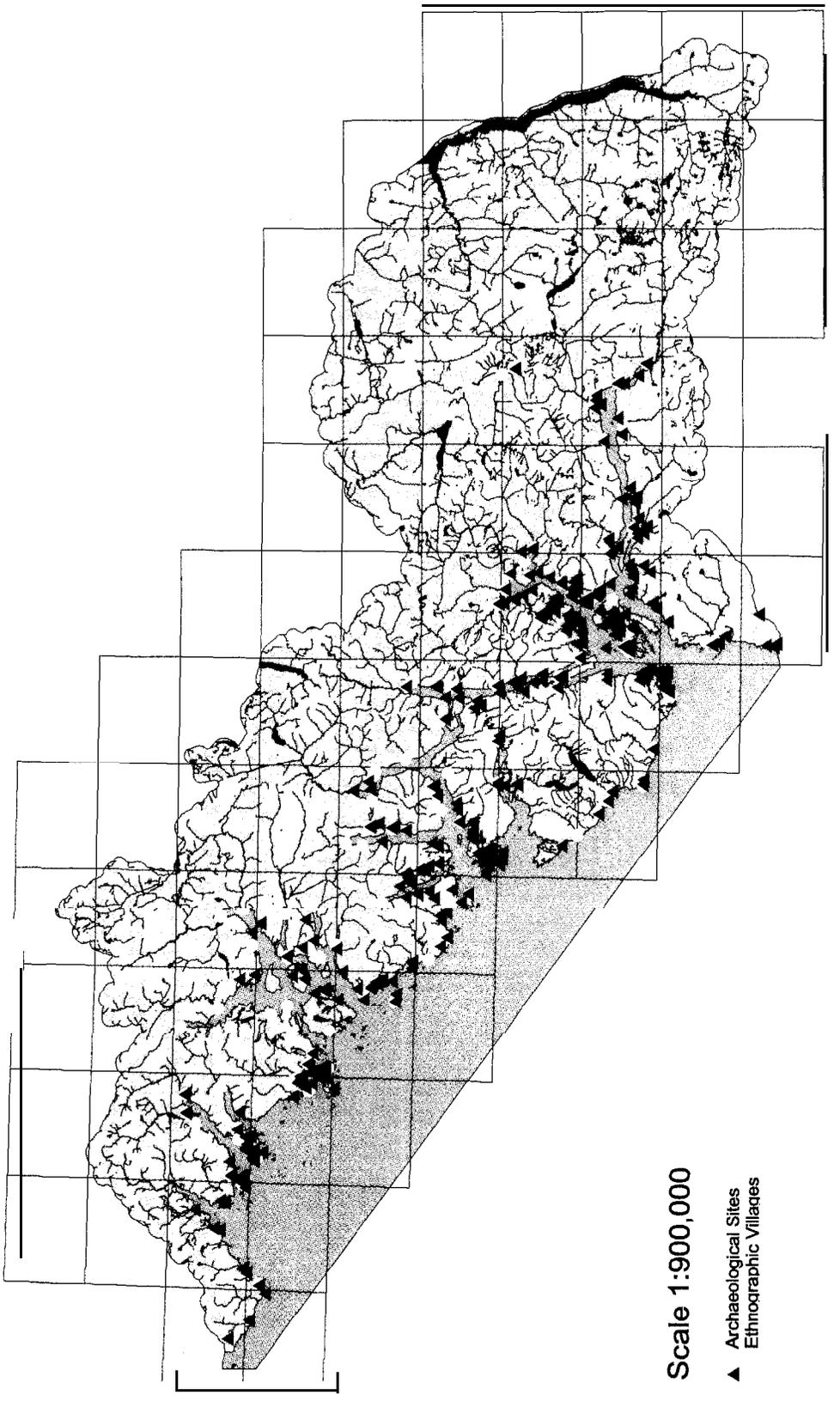


Figure 7: Recorded Archaeological Sites and Ethnographic Villages Within the Study Area

Table 3: Archaeological Sites in Study Area by Revised Site Feature Type.

Site Type (Feature)		Number of Features Present
Yellow Cedar Bark-Stripped CMT		5 (Total Number of Yellow Cedar CMTs=52)
Red Cedar Bark-Stripped CMT*		67 (Total Number of Red Cedar CMTs=1607)
Aboriginally-Logged CMT		53 (Total Number of Aboriginally Logged CMTs=57)
Shrine (including Whaling)		2
Above Ground Burial		0
Tree Burial		0
Midden Burial		43
Burial Cave/Burial Crevice		47
Rock Art		12
Intertidal	Fish Trap	29
	Fish Weir	5
	Canoe Run	11
	Intertidal Artifact Scatter	0
	Wet site	0
Midden		266
Artifact Scatter		6
Defensive/Refuge		18
Subalpine Rockshelter		0
Historic		69
TOTAL		633

'This count includes 16 unspecified CMT sites for which CMT types are not recorded

When site types are grouped into either of the general categories (Forest Utilization, or Habitation, Subsistence, and Ceremonial), 125 sites are categorized as Forest Utilization Sites and 508 are categorized as Habitation, Subsistence, and Ceremonial sites. It must again be stressed that many of these archaeological sites may have several different kinds of associated features.

3.6 Biophysical

A review of the biological and physical context of the study area was conducted in order to understand the general biophysical constraints that may have affected past human use of the landscape, and to highlight the specific relationship of resources to settlement and subsistence patterns. This research was essential for identifying the biophysical variables that are related to archaeological potential and could be incorporated in the GIS digital coverages of the study area. The research included a review of the (1) general biophysical classification of the study area, (2) the systems used for classifying landforms and aquatic features, and (3) the distribution and abundance of specific floral and fauna that were important subsistence resources.

3.6.1 Biogeoclimatic Zone

In order to classify the environments found in B.C., the Ministry of Forest has developed the biogeoclimatic ecosystem classification system [BEC (Meidinger and Pojar 1991)]. The BEC system provides a framework for the presentation of information concerning the physical landscape, climatic processes and their classification. The BEC system has three levels of integration: regional, local, and chronological (Meidinger and Pojar 1991 :Figure 3). The BEC also combines three levels of classification: zonal, vegetation, and site (Meidinger and Pojar 1991: 17). At the regional level, a regional zonal climate is defined and it reflects the plant and animal. communities present. Biogeoclimatic units represent classes of ecosystems under the influence of the same regional zonal climate. Biogeoclimatic zones can also be divided into subzones and variants depending on the degree of diversity present within the regional zonal-climate.

Most of the study area is located within the Coastal Western Hemlock (CWH) zone which occurs at low to middle elevations west of the coastal mountains along the entire B.C. coast, and covers most of Vancouver Island (Ministry of Forests Research Branch 1994, Pojar et al. 199 1:96). The CWH zone occupies elevations from sea level to 900 m. The Mountain Hemlock zone (MI-I) is usually the subalpine zone above the CWH.

Within the study area, the two most common CWH subzones are the Very Wet Hypermaritime Maritime (CWHvh1) and the Very Wet Maritime (CWHvm1) (Pojar et al. 1991:95-112). As is evident from the descriptors used for the subzones, the CWH zone is, on average, the rainiest biogeoclimatic zone in the province.

Western hemlock *(Tsuga heterophylla)* is usually the dominant tree species present in the CWH zone forest cover. Other tree species present include: western red cedar *(Thuja plicata) (south* of 56" N latitude), Douglas-fir *(Pseudotsuga menziesii),* amabilis fir *(Abies amabilis),* some Sitka spruce *(Picea sitchensis),* and some yellow cedar *(Chamaecyparis nootkatensis).* Within the MH zone, along with most of the tree species present in the CWH zone, mountain hemlock *(Tsuga mertensiana)* is also present.

Associated with the aforementioned trees species is an associated shrub layer consisting of: false azalea (*Menziesia ferruginea*); varying kinds of blueberry including alaskan and oval-leafed blueberry *(Vaccinium alaskaense, ovalifolium*); red and evergreen huckleberry *(Vaccinium parvifolium, ovatum);* and salal (*Gaultheria shallon*). The associated herb layer is considered to be somewhat sparse and consists *of:* deer fern (*Blechnum spicant),* swordfern (*Polystictum munitem),* false lily of the valley *(Maianthemum dilatatum*), bunchberry (*cornus canadensis),* and twinflower (*Linnaea borealis).* The moss layer consists of mainly step and flat moss (*Hylocomium splendens*, and *Plagiothecium undulatum*).

3.6.2 Ecosection

Ecosections are the smallest units of a provincial ecoregion classification system developed to provide a systematic method for showing the small scale ecological relationships in the province. The ecoregion classification system is based on macroclimatic and large scale physiography. Each ecosection represents an area with minor physiographic and macroclimatic variation, creating an area of broad ecological uniformity. The study area is located in the Windward Island Mountains Ecosection of the Western Vancouver Island Ecoregion, as defined by the Ministry of Forests Research Branch (1994). The Windward Island Mountains Ecosection is an area of lowlands, islands and mountains on the western margin of Vancouver Island (Demarchi et al. 1990; Figure 2). This area is also located within the Vancouver Island Mountains of the Insular Mountains physiographic subdivision (Holland 1976:3 1).

3.6.3 Landforms

The landforms that are of interest to archaeological potential modelling include those formed by geomorphic processes that deposited sedimentary materials onto the landscape, such as glacial, fluvial (rivers), lacustrine (lake), colluvial (gravitational), and aeolian (wind) processes. Some of these deposits (such as well-drained terraces) are favourable for human use and archaeological site preservation, and others (such as active flood channels) are not. Other landforms result from organic processes, such as bog and wetland deposits, or from volcanic activity, such as deposits of vitreous (glassy) basalt and obsidian from which raw materials for stone tools were obtained. The information on the classification and distribution of landforms was obtained through review of Geological Survey of Canada maps and surficial geology maps. The following discusses specific aspects of certain landforms pertinent to this study.

- **Glacial landforms** in this study focussed on the presence of ancient raised marine terraces as mapped and described by the North Vancouver Island Generalized Terrain Map (Ministry of Environment 198 1); and

- **Fluvial and lacustrine landforms** data was acquired for this project but was not used in the model because it was determined that these landforms were less significant than other landform types in predicting archaeological potential.

3.6.4 Slope

In this AOA slope is expressed in percent, where a 100% slope (i.e., 100 m rise over 100 m run) is equivalent to 45 degrees. Two systems for classifying slope were reviewed: (1) a geomorphological system based on slope stability, and (2) a new Ministry of Forests initiative designed to streamline mapping in the province: the Integrated Corporate and Spatial Attribute Database (INCOSADA). Slope was expressed in the same manner for both the CMT and non-CMT models.

3.6.5 Aquatic Features

Included in this category are all waterbodies, streams, and wetlands. Although a number of systems for classifying these aquatic features exist, the major systems which were reviewed for this project were developed as part of the B.C. Forest Practises Code operating guidelines (BC Environment 1995a, 1995b). The Forest Practices Code classifies streams according to the presence or absence of fish (or fish potential), and average stream width. Lakes and wetlands are classified on the basis of size.

3.6.6 Fauna and Flora

In terms of the wildlife, Pojar et al. (199 1: 105) state that the CWH zone probably has the most diversity and abundance in habitat elements, which leads to a corresponding diversity in the types of fauna present. The land, sea, and sky are inhabited by numerous species of animals in varying degrees of abundance which were and are readily available food sources. Nuu-chah-nulth people developed a land and sea use system that enabled them to successfully harvest these abundant resources. The following list provides the most important foodstuffs available to the Nuu-chah-nulth but should not be considered exhaustive.

Black-tailed deer, Roosevelt elk, black bear, gray wolf, cougar, marten, mink, land otter, raccoon, and weasel are the most common mammals. Bird species represent the varying environments available including the forest, foreshore, and ocean. Almost all of the colony-nesting bird habitats are found in the CWH zone. Vegetation resources included many species of berries including salmon berry, thimble berries, red huckleberry, edible seaweeds, labrador tea, bog cranberries. Fish species include: herring, salmon, cod, halibut, flatfish, flounder, and rockfish. Shellfish and marine invertebrates are readily available on the foreshore and include: California mussels, clams, chitons, sea urchins, barnacles, octopus, sea cucumbers, cockles, and sea anemones.

Sea mammals present include: California and steller's sea lion, harbour seal, harbor porpoise, sea otter, northern fur seal, grey whale, humpback whale, and killer whale.

The review of flora and fauna focussed on those species which were important subsistence resources. The focus of this review, and the major sources consulted, are:

- The distribution of **anadromous salmon** and other fish species using federal and provincial inventory data;
- The distribution of **elk** and **deer** using provincial inventory and capability studies;
- The distribution of **marmot** habitat using biogeoclimatic zones and surficial geology maps for the study area; and
- The distribution of **red and yellow cedar** using provincial inventory data and species accounts.

3.7 Digital Data

Because a GIS-based model of archaeological potential must rely exclusively on mapped biophysical and landscape features, an important step in the AOA methodology was obtaining relevant biophysical data mapped in a digital format. Using this digital data, map layers or coverages can be built for each set of biophysical features which are applied to the GIS.

As illustrated in Figure 8 the following steps were involved in building the digital coverages for the study area:

- **Step 1:** Acquisition of existing digital data;
- **Step** 2: Digitization of additional coverages;
- **Step** 3: Translation and review of coverages;
- **Step** 4: Classification of features;
- **Step** 5: Analysis and review of association between sites and features; and
- **Step** 6: Definition of feature buffers.

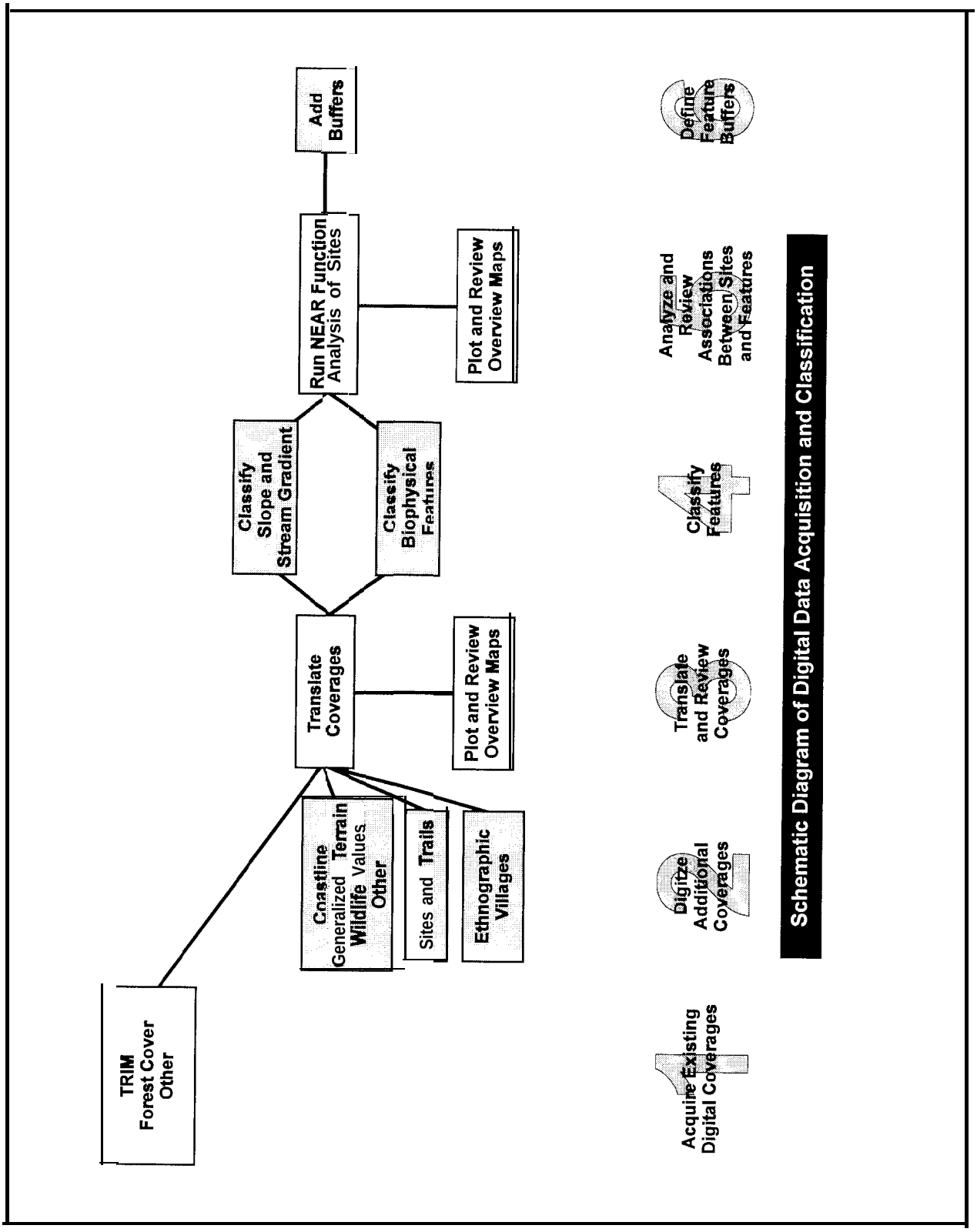


Figure 8. Schematic Diagram of Digital Data Acquisition and Classification.

3.7.1 Data Acquisition and Translation (Steps 1 through 3)

In order to develop an understanding of the suitability of various landscapes for past human use in the Northern Nuu-chah-nulth study area, several cultural and biophysical variables were chosen as the foundation for building the model and analysis. These variables are described below in terms of their data sources, how they were entered into the GIS, and how they were modified for use in the model. Details on these variables, including the rationale for their selection and effectiveness in the modelling are presented in the Appendix. The base maps used were B.C. Ministry of Crown Lands TRIM maps in both paper hardcopy and digital form (scale=1:20,000). These represented base mapping data for the model as well as a medium for plotting and entering data to be digitized.

The types of biophysical features identified as having significance for archaeological potential included: slope, aquatic features, glacial and other landforms, wildlife values, and specific vegetation stands. Most of the biophysical data required for the model were available from existing digital sources (Figure 8, Step 1). However, in a number of cases it was necessary to manually digitize specific features or data from existing paper maps or from information plotted onto maps. In addition to biophysical data, archaeological sites, ethnographic village locations, CMT concentrations, and trails were manually plotted and digitized as separate coverages (Figure 8, Step 2).The resulting coverages are detailed in Table 4.

- **Landforms:** Information on specific geomorphological landforms was derived from generalized terrain and surficial geology map sets prepared by the Provincial Ministry of Environment, Lands, and Parks and by the Federal Department of Energy, Mines, and Resources. Coastlines were derived from TRIM. Originally, an attempt was made to differentiate between varying types of beaches present along the shoreline, but there was limited success in pulling this information from marine charts.

- **Slope:** A slope coverage was derived fi-om the Digital Elevation Model in TRIM. The two models in this overview had different needs for slope. Therefore, different ranges of slope percent were developed for the two models.

- **Wildlife Values:** Specific areas on Canada Land Inventory maps showing high and moderate capability for wildlife habitat including deer and elk winter range coverages were digitized. Marmot habitat was described using a combination of alpine and montane areas from biogeoclimatic zone mapping and granitic outcrops from surficial geology mapping for the study area.

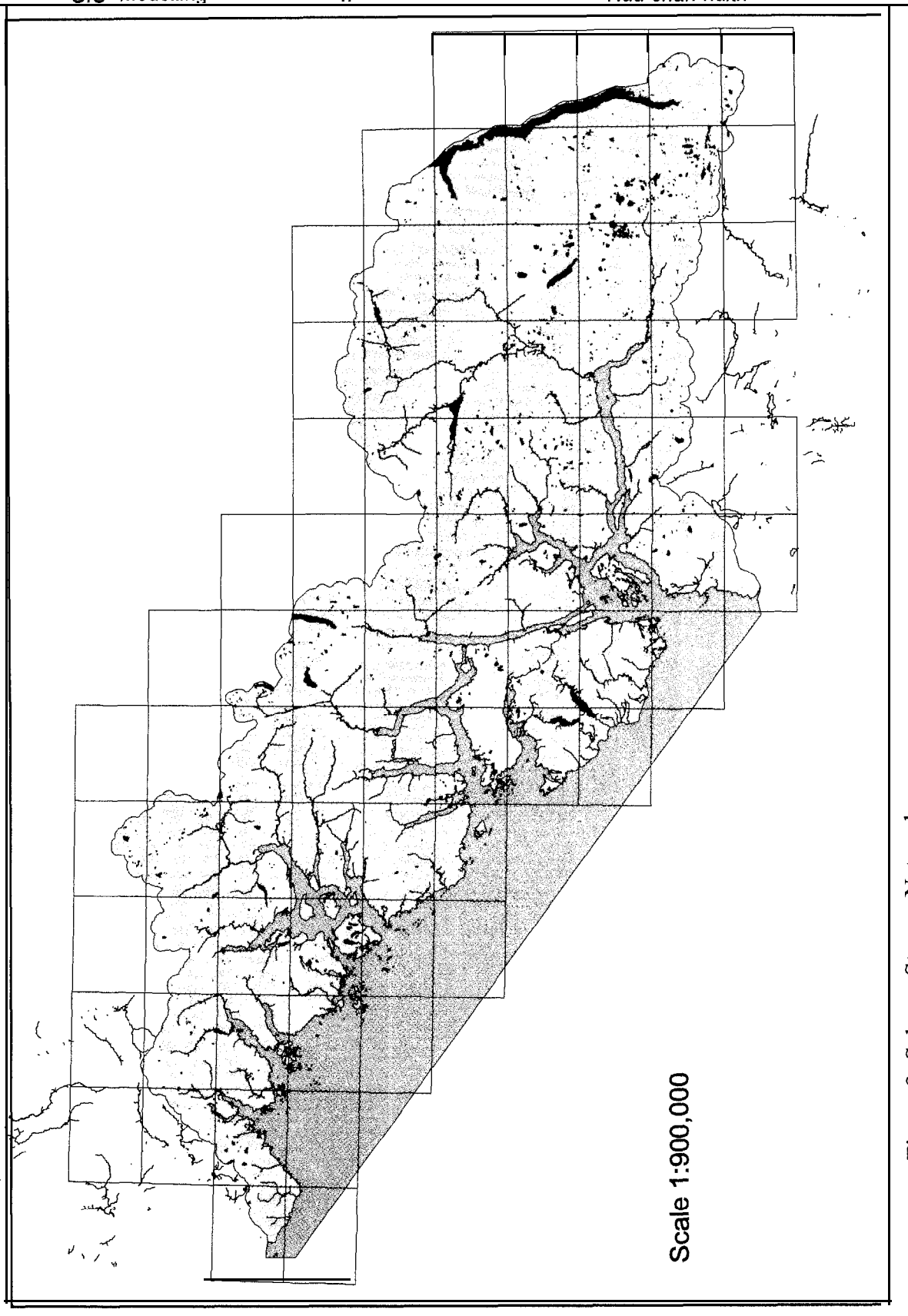


Figure 9: Salmon Stream Network.

- **Aquatic Features:** These features were available from TRIM sources. In the case of streams, single and double-lined streams were used. Indefinite and intermittent streams were excluded from the non-CMT model because they were considered to have low potential for fish values. In order for a stream to be considered to have salmon or other fish potential, its gradient had to range from 0% to 20% and be directly linked to the ocean. This fairly coarse designation was used because of the generally steep terrain present throughout the study area. From this a salmon stream network was created (Figure 9). All water bodies classified as lakes in TRIM were used.

- **Vegetation:** In order to model for CMTs, forest cover data was acquired. Of most importance was the classification of old growth red and yellow cedar stands. Certain areas were not covered including provincial parkland and private land.

- **Archaeological Sites Including CMT Clusters:** In order to ensure the maximum locational accuracy possible, the 368 archaeological sites in the study area were plotted onto 1:20,000 paper TRIM mapsheets prior to entry into the GIS. Individual site maps, locational descriptions from the Canadian Heritage Information Network (CHIN) site records, and Archaeology Branch 1:50,000 scale NTS maps were all used in this exercise. All sites extending more than 100 m in any direction were drawn as polygon shapes, with an approximate centrepoint. All other sites were plotted as points. CMT clusters were also plotted in the same manner. In the case of CMT sites with multiple CMT features the area of the site tended to be large. Concentrations of these features were plotted as cluster points in these larger areas.

- **Ethnographic Village Locations and Trails:** One hundred and twenty six ethnographic village locations as well as both archival and community-based researched trails were hand-drawn onto 1:50,000 scale NTS maps and digitized.

3.7.2 Feature Classification (Step 4)

Once the digital coverages were assembled, they were checked to see if further classification was necessary (Steps 4 through 6, Figure 8). Classification of these features focussed on criteria which were assumed to be meaningful to past human activities, with an emphasis on their subsistence resource potential. However, pre-existing systems for the classification of features were used wherever possible. In particular, classification criteria were kept consistent with the Forest Practises Code.

3.7.3 NEAR Analysis and Definition of Feature Buffers (Steps 5 and 6)

For some feature categories, the area enclosed by their polygons was used in the modelling (for example, slope and wildlife habitat). For others such as coastal, river, and lakes shorelines, it is the area around or adjacent to the feature where associated traditional activities took place, and therefore, where archaeological potential exists. For these latter features, decisions must be made as to how far away from the feature's margin the archaeological potential extends. This involves setting buffers of varying widths, a common task carried out in most GISs. A feature could be assigned one or more buffer, with each successive buffer reflecting greater constraints (lower potential) for traditional activities. By creating a series of buffers, they can be used in the model to predict differing levels of archaeological potential at varying distances to different features.

Buffer width decisions were initially based on a combination of information collected during the background research, and from previous field experience in the study area. Determining the number and width of buffers for each feature was a difficult task. In most cases, the first buffer on a feature is intended to capture those activities which occur immediately adjacent to that feature. For example, salmon fishing stations occur immediately adjacent to specific aquatic features. However, ethnographic and historic records do not provide explicit information describing the distances at which most traditional activities, and associated sites, occur in relation to specific features. Two factors were initially considered when setting buffer widths:

- Certain features in themselves would rate higher than others (i.e., single or double lined streams with salmon potential versus intermittent streams with no fish potential).
- Certain features were known to have a strong association with archaeological remains (i.e. certain aquatic features and particular landforms).

These preliminary buffers were tested against the distribution of known archaeological sites. A function available in ArcInfo (the GIS employed in this overview), called NEAR, allows for multiple measurements from points to various landscape features. This analysis helps to determine the effectiveness of various buffer widths and highlighted situations where a widening or a narrowing of a buffer was necessary. This information was then fed back into the model development process.

Several features were assigned multiple buffers to indicate varying degrees of archaeological potential within certain distances of the feature (see Table 4). For example, a salmon bearing stream has two buffers. The first buffer (between O-100 m from the stream) has the highest potential to support activities that would leave archaeological evidence, while the second buffer (100-200 m from the stream) has more moderate potential.

For features characterized as polygons (i.e., landforms, ungulate ranges, and forest cover), it is often the area within the polygon that contributes to the potential and a buffer is not required. In other cases, such as granitic outcrops, it is the feature periphery that is of interest and that requires

a buffer. For features characterized as points and/or lines (i.e., trails) the point and/or line was assigned a single buffer. Archaeological sites were characterized either as points or polygons, depending on their size. They were buffered to protect the surrounding terrain, which might contain as-yet undiscovered archaeological resources. It also helped in some instances to compensate for sites whose exact location could not be determined with reasonable confidence.

Table 4. Features and Buffer Definitions Summarized (Non-CMT Model).

Feature Category	Feature Class/Code		Type	Buffer/ Polygon Criteria	Buffer/ Polygon Value
Landforms	Surficial Geology	Granitic outcrops (RO on label)	polygon	buffer 0-100 m	1
	Coastline	COA 1	line	buffer 0-150 m	1
				buffer 150-300 m	2
		COA 2		buffer 0-500 m	3
		COA 3		buffer 3000 m	4
	Generalized Terrain	Ancient Raised Beaches (ANC)	polygon	label=M	1
Biogeoclimatic Zones	Alpine Tundra (AT*), Parkland and Montane Hemlock (MH*)		polygon	all polygons	1
Slope	Slope (SLO)		grid (generated from TIN)	0-20%	1
				20-50%	2
				> 50%	3
Wildlife	CLI Land Capability for Wildlife	Ungulate Winter Range (WIL) - moderate-high (2, 2w) -moderate (3, 3w)	polygon	label=2	1
				label=2W	2
				label=3	3
				label=3	4
Water	Streams	Salmon bearing streams -- includes single and double-lined (SAL)	line	<20% buffered 100 m	1
				<20% buffered 200 m	2
	Lakes	LAK 1	polygon	buffered 0-100 m	1
		LAK 2		buffered 0-500 m	2
Cultural	Archaeological Sites	ARC 1	point	buffered 250 m	1
		ARC 2	polygon	buffered 250 m	1
	Ethnographic Village (ETH)	ETH 1	point	buffered 250 m	1
		ETH 2	polygon	buffered 1200 m	2
	Trails	Archival and Community (TR)	line	buffered 100 m	1

Table 5. Features and Buffer Definitions Summarized (CMT Model).

Feature Category	Feature Class/Code		Type	Buffer/ Polygon Criteria	Buffer/ Polygon Value
Vegetation	Forest Cover	Western Red Cedar Bark Strip (FC1)	olygon	Species=CW and>=20% of forest stand, Age Class>=5, Heiaht Class >=3	1
		Yellow Cedar Bark Strip (FC2)		Species=Yc and>=20% of forest stand, Age Class>=5, Height Class >=3	1
		Aboriginally Logged Tree (FC3)		Species=CW and>=20% of forest stand, Age Class>=8, Height Class >=3	1
Landform	Coastline	CMTCOA	ne	buffer 0-300 m	1
				buffer 0-1400 m	2
				buffer O-2000 m	3
				buffer 0-3000 m	4
	Elevation	E L	)EM oints	0-200 m asl	1
				0-550 m asl	2
				1 50-880 m asl	3
Slope	Slope	SLO	rid generated om TIN)	0-15 %	1
				15-50 %	2
				50-100 %	3
Water	Streams	Single-lined and intermittent (STR)	n e	buffered 500 m	1
		Double-line (STR)		buffered 500 m	1

3.8 Model Building, Review, and Application

3.8.1 Model Building

Several components already described elsewhere in this document were developed and reviewed in a sequence that would ultimately produce a final model of mapped potential for archaeological resources. Figure 10 illustrates in schematic form the six sequential steps of the model building. The traditional activities table (Table 1 and Appendix) illustrates all of the steps except for Step Six, the resulting logical statements. The six steps to the modelling sequence are:

- **Step One:** Identify traditional activities;

- **Step Two:** Identify archaeological site types that result from these activities;
- **Step Three:** Identify associated archaeological evidence;
- **Step Four:** Identify typical locations where these activities/sites should be found;
- **Step Five:** Identify biophysical feature types typically present at those localities; and
- **Step** Six: Define model statements by combining these individual features into a set of aggregates ranging from loosely constrained (High potential) to highly constrained (Low potential).

The final step in the model building process involved the definition, for each site type, of a series of model statements, or "logical statements", which form the instructions to the GIS for modelling the landscape. These statements (an example is shown in Figure 1 1), which are basically "if-then" statements, identify the specific combinations of biophysical features associated with each site type, and they assign the overall potential value to each cell. The first statement shown in Figure 11 can be translated as:

IF . . . . a setting is located on a slope [SLO] of 0-20% **and** within 500 m of the coastline (COA 2) **and** within the first or second buffer of a salmon stream [SAL],

THEN . . . . that setting has high potential [=2] for a coastal midden [ACT6].

A similar set of model statements was defined for each of the 16 site types used in the CMT and non-CMT model (see Appendix). Each statement represents a unique combination of features which result in a specific level of potential for a particular site type or set of site types. A site type can receive a range of values or scores depending on the strength of the combination of the biophysical variables. The most favourable setting or combination of features received the highest potential rating for that site type, and for each setting with greater constraints or fewer favourable features, the potential rating was reduced. If, after processing the entire set of logical statements at a particular location the very best score possible for that location is a "2" (for a Coastal Midden - ACT6 - for example), then "3" becomes the overall potential value for that location. Only the highest score is retained.

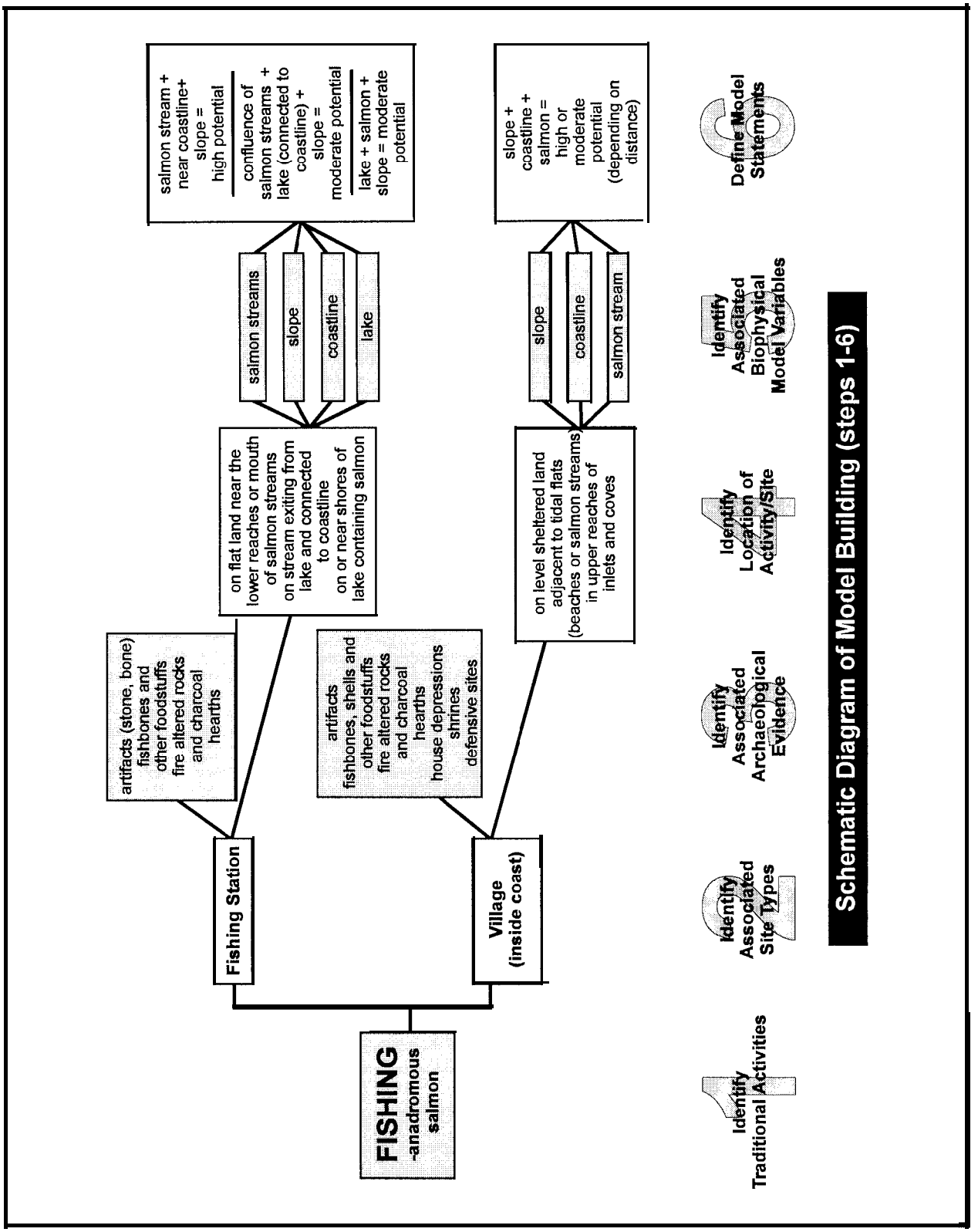


Figure 10. Schematic Diagram of Model Building.

```
/***
/*** ACT 6:Coastal Midden
/***


If (SLO = 1)
        AND (SAL = 1 or SAL=2)
        AND (COA2 =3)
THEN ACT 6 = 2


If (SLO = 1)
        AND (SAL = 1)
        AND (COA3=4)

THEN ACT 6 = 1
```

Figure 11. Example of Logical Statements Used in the Overview Model.

Because the area covered by the Northern Nuu-chah-nulth hahoulthees is comprised of 64 TRIM mapsheets, two test areas (each comprised of two connected 1:20,000 scale TRIM mapsheets) were chosen from within the study area order to permit a manageable review of the preliminary application of the non-CMT and CMT models. Not only did the test areas provide a close-up view of the results at a reasonably large scale, but they also made computer processing tasks less onerous due to the lower volume of data involved. Obvious problems with the model could be detected, and revisions could be made to the model prior to its application to the entire study area. The test areas were also useful for reviewing the digital coverages of selected biophysical variables. Figure 12 indicates the location of the test areas within the Northern Nuu-chah-nulth hahoulthees.

- Test Area 1: TRIM sheets 92E.078 and 92E.079 - This test area is representative of an 'inside' environment with examples of inland waterways and interior rivers (Tlupana Inlet, Tlupana and Nesook Rivers), plus several small lakes. Figure 2 is a photograph of Nesook Bay which is located within Test Area 1.

- Test Area 2: TRIM sheets 92E.085 and 92E.095 - This test area is representative of the 'outside' environment with examples of the outer coast, small islands (Catala), an inlet (Port Eliza), and creeks draining into the ocean (Narrogut, Porrit, Tatchu).

Figure 3 is a photograph of the shore of Port Eliza which is located within Test Area 2.

The model was applied to these test areas on three separate occasions, and the results were output in paper and digital form. The results were reviewed to ensure that the GIS coverages were accurate and that the model was correctly applied. Errors in the GIS coverage and model statements were identified and corrected, and in some cases buffer widths were adjusted. When the modelled output met all expectations, the model was run against the entire study area.

3.8.2 Variable Coverages and GIS Modelling Outputs Review

During the preliminary stages of the project, and as new input data became available in digital format, hardcopy displays were produced for review. This allowed for error checking as well as assessing whether or not individual variables were being captured correctly. The same procedure was used in the initial modelling exercises, where the model statements were applied to the database records for the two test areas, and the results subsequently output in digital and paper form for review and revision.

3.8.3 Application of the Model to the Test Areas

Before applying the model to the test areas, each digital coverage (GIS map layer) was divided into a 30 m grid, creating millions of map 'cells' across the study area. As discussed earlier, this project used a grid based GIS modelling technique that allowed for each 30 x 30 m square to be updated based on the presence or absence of features at that location (see Figure 13). When all coverages were added together each resulting grid cell would show:

- The presence or absence of each feature and, in some cases, the specific type of feature;
- The results of testing for the combination of features and assigning a value to one or more of the traditional activity fields; and
- The highest value achieved for all ACT fields; this value becomes the overall potential value for this location.

The GIS created a database containing the codes for all the features present for each cell in all of the digital coverages used in the model, and then it applied the model statements to each database record. The results of this process were then used to classify the area into different classes of archaeological potential. This modelling process involved five main steps. Figure 13 presents a generalized example of these steps applied to a set of imaginary coverages:

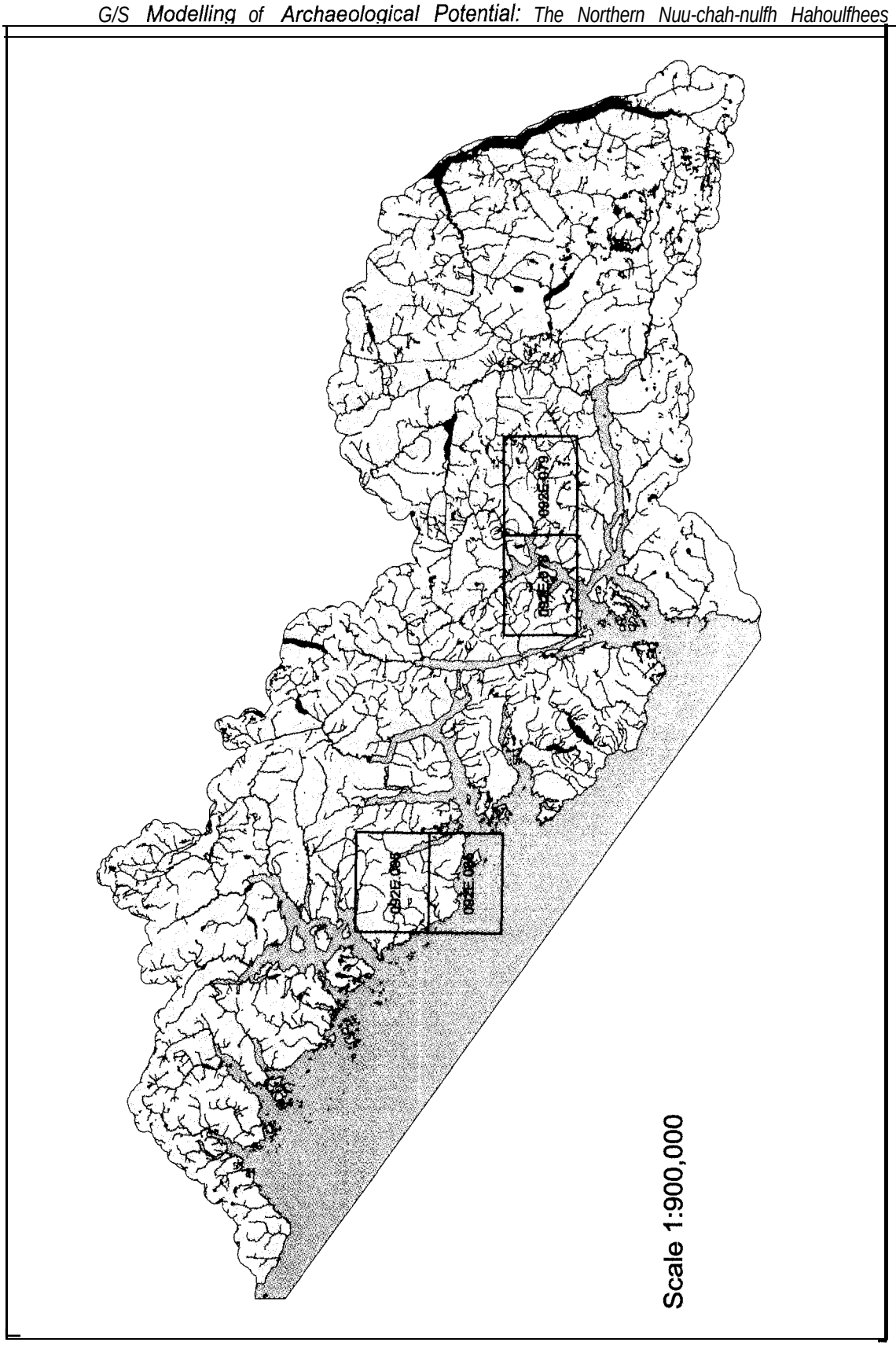


Figure 12: Test Area Locations Within the Northern Nuu-chah-nulth Hahoulthees.

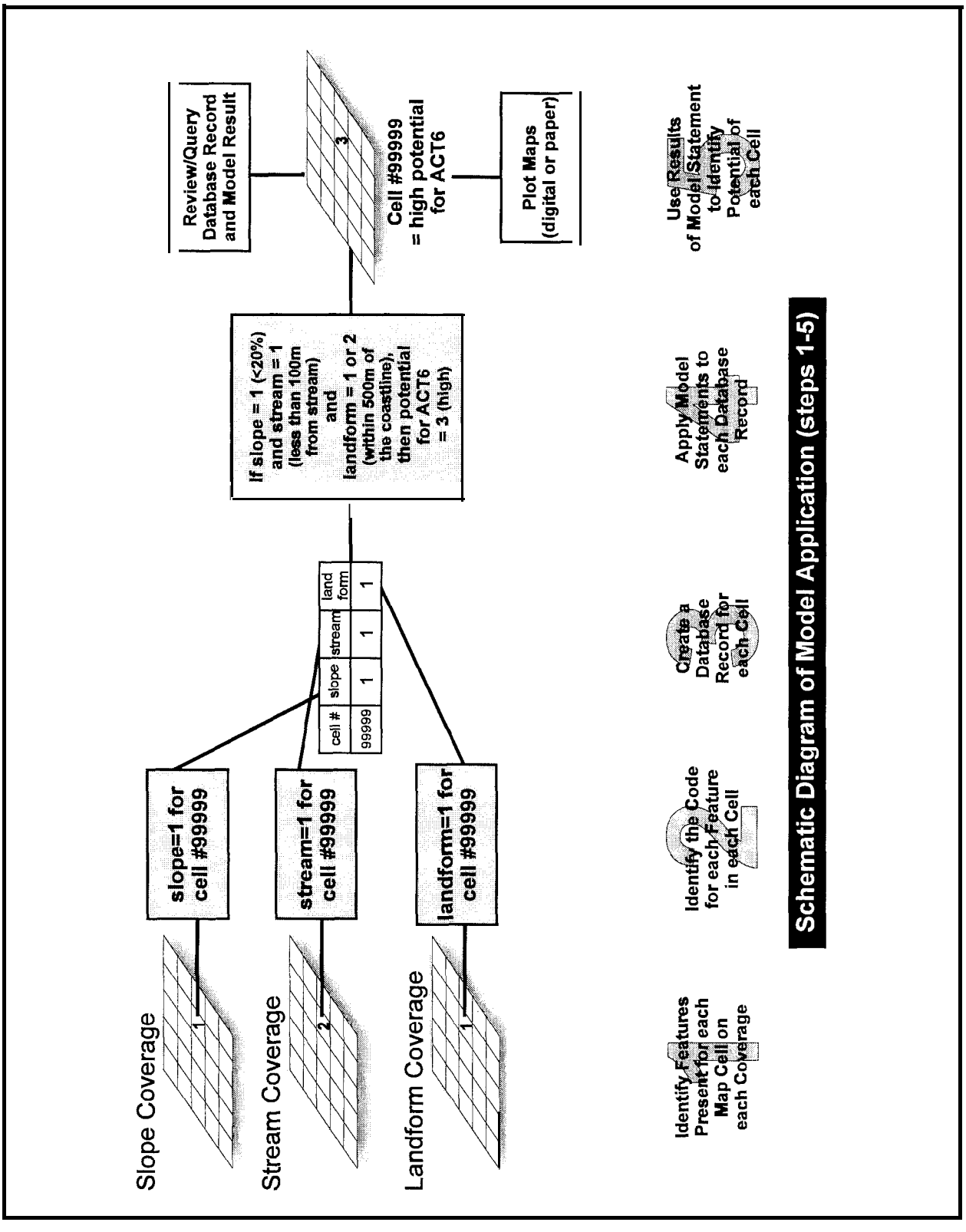


Figure 13. Schematic Diagram of Model Application.

- **Step 1:** Identify features present for each map cell on each coverage. The GIS searches each cell on each coverage to determine what features, if any, are present on each coverage for that specific cell.

  In Figure 13, a slope class is present for cell #9999 on the slope coverage, a stream buffer is present for cell #99999 on the stream coverage, and a landform is present for cell #99999 on the landform coverage. In this imaginary example, no features are present on the remaining coverages (i.e., ungulate coverage).

- **Step** 2: Identify the code for each feature in each cell. After the GIS has determined which coverages have features for each cell, the code of each feature on each coverage is identified.

  In Figure 13, the feature codes for cell #99999 are: slope=1 (the cell is found in slope class 1, which represents a slope of less than 20%); stream=1 (the cell is found in stream buffer 1, which is O-l 00 m from a stream with a slope of ≤ 20%); and landform=1 (the cell is COA1 which indicates that the cell is < 300 m from the coastline). This process is repeated for all of the cells in the study area.

- **Step** 3: Create a database record for each cell. The feature codes for each cell are output to a database, with a single record for each cell.

  For cell #99999 in Figure 13, the database record would include the codes for slope, stream, and landform (coastline). For all coverages which did not contain a feature in cell #99999, the entries in the database record would be '0'.

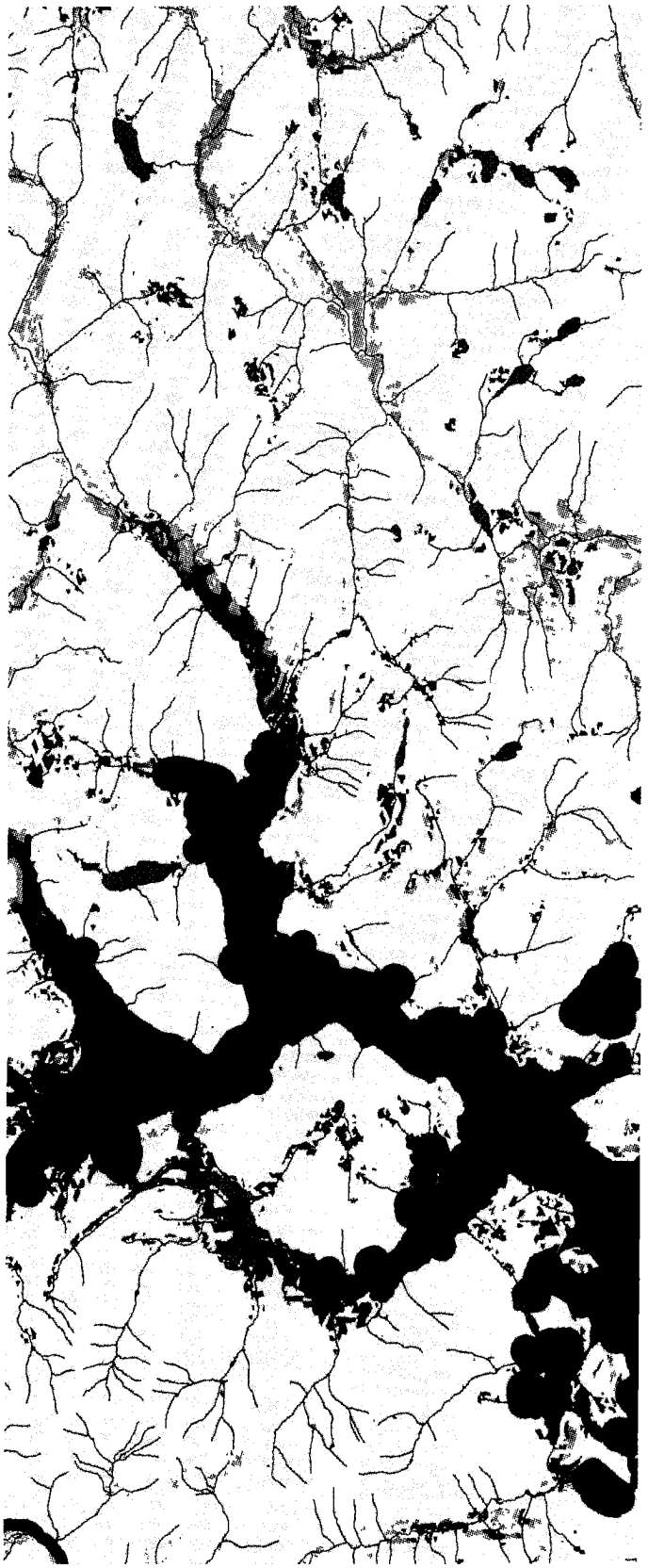
- **Step** 4: Apply model statements to each database record. All of the model statements are applied to each database record, resulting in a potential score for each site type for that particular cell.

  In the example in Figure 13, the model statement "If slope=1 and stream=1 and landform (coastline)=1, then potential for ACT6=3" was applied to the database record for cell #99999. The application of this model statement to the record resulted in a 'high potential' score for ACT6 (coastal shell midden) for cell #99999. During the modelling process, all model statements for other site types are also applied to this database record. The application of other model statements may result in the same or lower potential score for cell #99999. The potential score for each site type is then added to the end of the database record.

- **Step** 5: Use results of model statements to identify potential of each cell. The results of the model statements are used to classify the potential for each cell, and this information can be used to create maps of potential.

After the potential for each site type has been determined for each cell, the highest score for each cell is output to a new database field at the end of the record. This score is then used to plot (print) maps of potential for the study area, with each class of non-CMT potential a different colour on the map, and CMT potential indicated by hatchered lines overlying the three colours of potential. With the non-CMT model, for example, all cells with a score of '3' are coloured red, while all cells with a score of '1' are coloured light green (Figure 14). As the database record for each cell is linked directly to a point on the digital maps, any point on the digital maps can be queried to obtain the feature codes and potential scores.

Once a test run was completed, the output for each of the test areas was examined. The levels of CMT and non-CMT potential and known site locations were visually reviewed as a quick guide to the model's effectiveness. Figures 14 and 15 provide examples of how the non-CMT and CMT models translated visually within the test areas. Following each review, a request for changes was sent to Range & Bearing. When the modelled output met all expectations, the model was run against the entire study area and the results were mapped on a large scale map of the entire study area.



Low
Moderate
High

Scale 1:125,000

Figure 14: Test Area 1 Modelled for Non-CMT Archaeological Potential

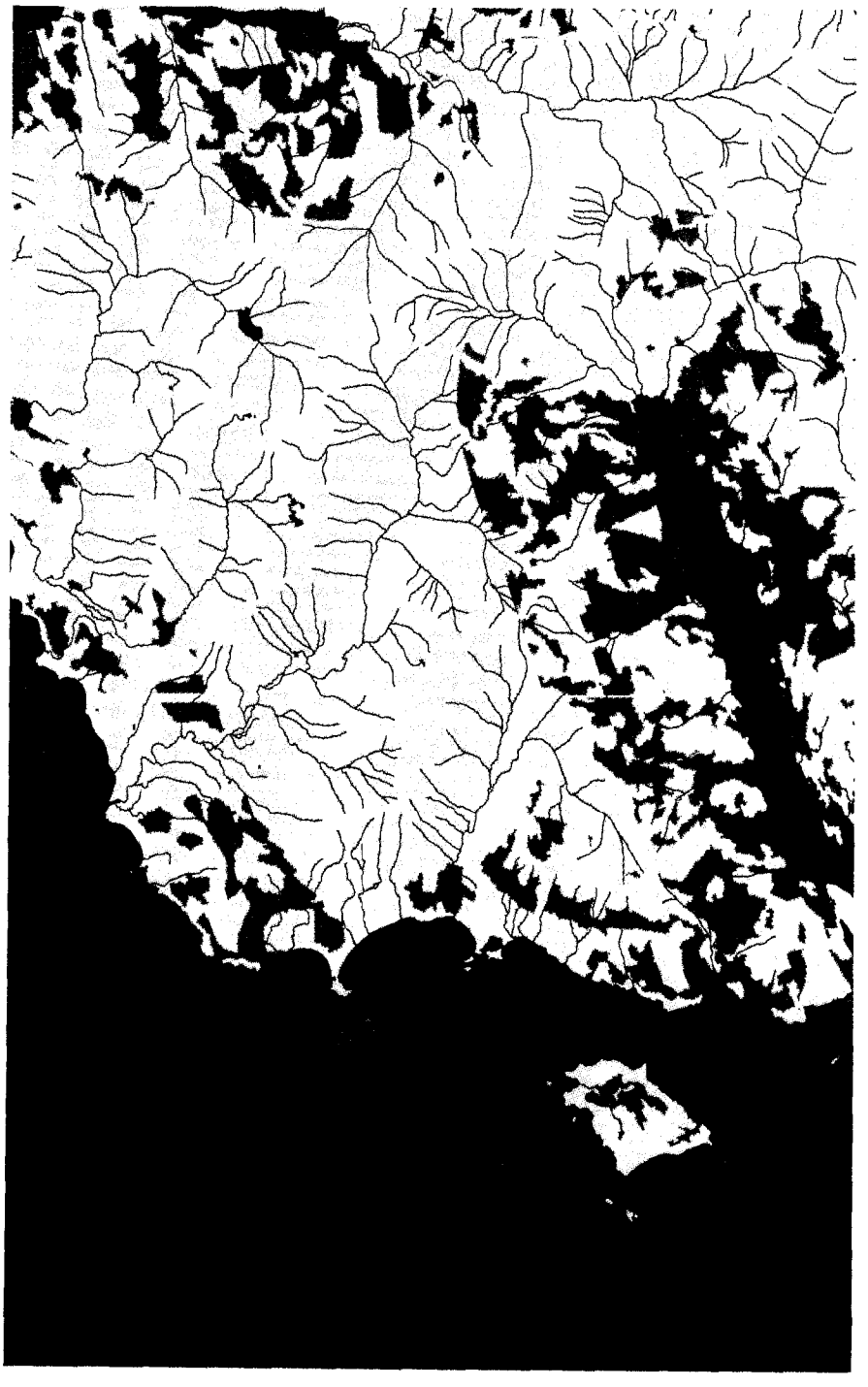


Figure 15: Test Area 2 Modelled for CMT Archaeological Resource Potential.

4.0 RESULTS OF ARCHAEOLOGICAL POTENTIAL MAPPING

4.1 Model Results

The GIS model used in the overview classified the entire study area into three classes of non-CMT potential: Class 3, (High potential, Low constraint); Class 2 (Moderate potential, Moderate constraint); and Class 1 (Low potential, High constraint); and two classes of CMT potential: Moderate-to-High, and Low. These classes are described in Chapter Two. "Potential" refers to the potential that a portion of the landscape has for supporting the types of traditional land use activities that would have resulted in the formation of archaeological resources. Overall for non-CMT archaeological resource potential, 9% of the overview area was modelled as having Class 3 potential, 8% was modelled as having Class 2 potential, and 83% was modelled as having Class 1 potential. Eight percent of the overview area was modelled as having Moderate-to-High CMT potential and 92% was modelled as having Low CMT potential (see Tables 6 and 7).

High potential areas are the most favourable for such activities, and therefore have the highest probability of containing archaeological sites. Although the highest overall density and frequency of archaeological sites should be found in Class 3 areas, sites are not necessarily present at all points within these areas. Conversely, Class 1 areas have the lowest probability of containing archaeological sites, and the lowest overall site density and frequency are expected in these areas. However, it is important to keep in mind that low potential areas do not have 'zero' potential, and archaeological sites may be present in Class 1 lands. Moreover, because significant archaeological data gaps exist, the distribution of currently recorded archaeological sites should not be considered as representative of the study area as a whole.

Table 6. Study Area Breakdown by Non-CMT Potential Class.

Potential Class (Non-CMT)	Area (in hectares)	Percent of Total Area
3 (High)	63,432	9%
2 (Moderate)	53,010	8%
1 (Low)	552,916	83%
Total	**669,358**	100%

Table 7. Study Area Breakdown by CMT Potential Class.

Potential Class (CN)	Area (in hectares)	Percent of Total Area
Moderate-to-High	50,328	8%
Low	619,030	92%
Total	**669,358**	**100%**

As shown in Table 6, 17% of the terrain in the Northern Nuu-chah-nulth hahoulthees falls in areas classified as Moderate to High potential (Classes 2 and 3) for non-CMT archaeological resources, and 8% of the terrain falls in areas classified as having Moderate-to-High potential for CMT archaeological resources. Currently it is difficult to compare these results with other overviews because this is the first GIS overview of a coastal landscape.

Although ground-truthing of the models was not included in the overview, an informal testing of the CMT model by Sue Woods (an Arcas senior archaeologist) took place during a two week training session held the last two weeks of March 1998 in Zeballos. The CMT model was able to capture all of the CMTs encountered during the teaching session.

4.2 Overall Modelling Limitations

The following limits to the models have been noted:

- Biophysical features used in the model (i.e., streams) were not ground-truthed in the test areas;
- The accuracy of slope classification was not field-checked;
- Some features which may affect potential were not used due to a lack of data or GIS limitations, including aspect;
- Insufficient palaeoenvironmental information is available for modelling environmental change over time;
- Insufficient site distribution data is available to confidently determine width of feature buffers;
- Accuracy of recorded site plotting is insufficient to allow confident assessment of site/slope associations; and
- The reliance on limited ethnographic and historic sources for modelling land use may not accurately reflect all precontact land use activities.

4.3 Data Gaps

While this study has benefited from the work done for previous overviews, and from a continuing improvement in the availability and quality of digital data, data gaps were encountered which imposed certain limitations to the archaeological potential model. Each of these presented particular problems for the modelling process; some were resolved during the project, and others

remain to be addressed in future studies of this nature. The following sections discuss the various data gaps encountered.

4.3.1 Archaeological Inventory

To facilitate resource management and land use decision making, it is important to be able to predict a landscape's potential for containing archaeological resources with reasonable certainty. The development of a good model is partially dependent on the availability of information about archaeological sites in a wide range of locations and types in order to better understand the level of constraint present. The information used to build the model should come from all parts of the study area, should represent all geographical settings within the area, and should not be biased towards certain types of archaeological sites.

Our review of the current state of knowledge about the geographic distribution of archaeological resources in the study area identified three gaps thought to be significant in the development of a good model. These are: incomplete geographic coverage in the existing archaeological site inventory; emphasis on particular types of sites and archaeological resources in the inventory; and deficiencies in available archaeological site information and recording procedures. Each of these perceived data gaps will be discussed below.

Large parts of the study area have not been systematically inventoried for archaeological resources. Only the Nootka Sound and Brooks Peninsula localities have been adequately examined, and in both cases, the surveys were continued to the shoreline and did not proceed far inland. Systematic coverage of inland areas is virtually non-existent. Exceptions are a few forestry-oriented assessments. Consequently, inland archaeological sites are inadequately represented in the current inventory. Furthermore, our understanding of the nature, frequency, spatial distribution, and antiquity of inland prehistoric archaeological resources is inadequate and hinders our ability to predict inland site locations.

Most of the archaeological surveys carried out in the study area have focussed on shoreline surveys and as a result some types of archaeological resources are not well represented in the current site inventory. These include: forest utilization sites, burial sites of various kinds, intertidal lithic scatters, intertidal 'wetsites', wooden weirs in creek estuaries, defensive sites, inland camps and resource sites, sites associated with ancient landforms such as raised marine beaches, all types of prehistoric subtidal remains, and nearly all types of historic archaeological sites. Prior to 1991, locations containing CMT resources were not entered in B.C. Archaeological Site Inventory. As a result, most archaeologists did not formally record CMT locations as archaeological sites, and many CMT sites identified in the past remain formally unrecorded.

It is important that the archaeological site inventory be complete, accurate, and current. Although this is an idealized situation, and no inventory ever totally attains these standards, the present inventory has some deficiencies that should be addressed. Sites identified before 1980 were

not usually recorded to contemporary standards and often lack information required by today's recording standards. Secondly, some fields on the B.C. Archaeological Site Inventory Forms have been recorded inconsistently. Thirdly, as GIS-based resource mapping continues to become an important tool in archaeological resource planning, it is crucial that the UTM information recorded on B.C. Archaeological Site Inventory Forms be based on not only the North American Datum of 1927 (NAD 27) as presently used, but also on the North American Datum 1983 (NAD 83) used on TRIM maps which form the digitized base mapping for most contemporary archaeological overviews.

In addition, the likelihood that the results of the present overview will be treated as definitive in future land use decisions making is a concern that should be addressed. Because of the gaps that exist in the information currently available for archaeological resources of the overview area, the present digitized maps and associated digital files should be considered initial rather than final statements of archaeological potential within the study area. As the inventory of known archaeological sites and associated landscapes is expanded, it will be important to update the overview. The overview is a preliminary study which will need to be periodically revised and ground-truthed.

4.3.2 Digital Mapping Information

A major problem encountered in this overview was the difficulty in obtaining correct digital forest cover data. The lack of digital data for harvested areas was a problem that was not solved during this overview. There is potential for the presence of CMT stumps and cut logs within logged areas, but because the stand type for logged out areas was not available in the digital forest cover, we could not model for CMT potential.

Unfortunately, due to budgetary and digital constraints it was not possible in this study to analyse the distribution of recorded archaeological sites in each archaeological potential class for the entire study area. This is a data gap that should be addressed if further funds are made available to the Ministry of Forest in the near future.

A preliminary attempt was made to model the potential for marmot hunting in the sub-alpine zone, but better digital information concerning granitic outcrops must be available to properly model for marmot hunting potential.

Although the ethnographic record provides information about the use of deadfall traps for the hunting and capture of land mammals, we could not model for dead fall traps due to a lack of specific information about exactly where in the physical landscape such traps could be placed.

Areas with potential for canoe portages could not be modelled for because the GIS was not able to pick out and separate these areas with the data currently available.

The digital forest cover data for Strathcona Park was not available, and the CMT model could not therefore be applied to that area. Strathcona Park only has the non-CMT model applied within its boundaries because the digital forest cover data was not made available until too late in the process.

Although information about karst topography was available, we were not able to incorporate the information into our model.

4.3.3 Data Gap Recommendations

The following recommendations are made in order to address these data gaps. A general recommendation as to future dealings with data gaps is provided in Section 5.3 of this report.

Archaeological Inventory

- To address the deficiencies in archaeological inventory data, we recommend that the Ministry of Forests initiate an application to FRBC for a systematic archaeological inventory of the overview area, particularly poorly represented inland portions.

Digital Mapping Information

- We recommend that prior to any future overview projects in British Columbia involving digital forest cover data, the location and condition of the data be clearly documented before project initiation in order to avoid cost overruns and time delays.
- If funding could be made available, it would be advised that the digital output from this overview be translated into vector files and an analysis of site capture be conducted in order to further strengthen any future changes to the model.
- Future model building should incorporate the digital karst topography data into any revisions of the model.
- The issue of modelling for CMT resources in harvested areas needs to be addressed. We recommend that the forest stand type of harvested areas be included in the digital forest cover data.

5.0 RESOURCE MANAGEMENT AND RECOMMENDATIONS

5.1 Archaeological Resource Protection

Archaeological resources are protected under the *Heritage Conservation Act* (1995), which is administered by the Archaeology Branch (Ministry of Small Business, Tourism and Culture). Provisions of the *Act* apply whether archaeological resources are located on public or private lands. Archaeological resources are protected through designation as "Provincial heritage sites" under section 11 of the *Act*, or through automatic protection under section 13 of the *Act* by virtue of being of particular historic or archaeological value. The *Act* protects a site from damage, alteration or removal if: the site was used or occupied prior to 1846; it is reasonable to assume, in the absence of absolute (i.e., calendar) dates, that the site was used or occupied prior to 1846; the site is a burial place, aboriginal rock painting, or aboriginal rock carving, regardless of age; the site is on a schedule of heritage sites that are of particular spiritual, ceremonial, or other cultural value to an aboriginal people with whom the Province has entered into a formal agreement regarding the conservation and protection of heritage sites.

A person may not alter, that is, change in any manner, a Provincial heritage site or an archaeological site protected under section 13 of *the Heritage Conservation Act*, without a permit issued by the Minister or designate under sections 12 or 14, or an order issued under section 14, of the *Act*. The *Act* affords considerable discretionary authority in determining if, and under what circumstances, such permits are to be issued.

A section 12 permit is also known as a site alteration permit and it authorizes the holder to alter an archaeological site when the alteration is not part of a heritage inspection. A forest utilization sites comprised of CMTs cannot be altered without a site alteration permit unless the CMTs are younger than 1846. It can be difficult to determine the age of a CMT without altering it in some way and this cannot be done unless a heritage inspection permit has been obtained. Examples of alterations to CMTs that could be authorized under a section 12 permit include: felling of standing CMTs, disturbing or moving CMT logs and stumps during yarding, removal of felled CMTs from the timber harvesting area, and the milling of CMTs. Alterations under a section 12 permit cannot be initiated until an archaeological impact assessment (see below for a definition) has been completed, reviewed and approved by the Archaeology Branch.

5.2 Archaeological Resource Management

The management of archaeological resources is the responsibility of the Archaeology Branch of the Ministry of Small Business, Tourism and Culture (MSBTC) on all provincial lands, both public and private. On public forest lands, archaeological resource impact management is shared by the MSBTC and the MoF. The MSBTC encourages and facilitates the protection and conservation of the province's archaeological resources through the Archaeological Impact Assessment and Review Process. Studies are initiated under this process in response to development

proposals which involve land alterations that potentially endanger archaeological resources. The process is described in the *British Columbia Archaeological Resource Management Handbook* (Apland and Kenny 1995b) issued by the MSBTC, whereas the *British Columbia Archaeological Impact Assessment Guidelines* (Apland and Kenny 1995a), also issued by the MSBTC, provides guidance to the studies conducted under this process.

On public forest lands, the MSBTC and the MoF share the responsibility for integrating archaeological resources and other cultural heritage resources into forest development plans. The roles and responsibilities of both parties is defined in *The Ministry of Small Business, Tourism and Culture and Ministry of Forests Protocol Agreement on the Management of Cultural Heritage Resources* (Revised October 1996). The need to address the management of cultural heritage resources, including archaeological, in forestry operations is clearly stated *in the Forest Act,* and the *Forest Practices Code of British Columbia Act* requires the inclusion of cultural heritage resources in both strategic and operational planning.

The *British Columbia Archaeological Impact Assessment Guidelines* define several kinds of studies that can be carried out in response to proposed developments:

- Archaeological Overview Assessment (AOA)
- Archaeological Impact Assessment (AIA)
- Archaeological Impact Management (AIM)

An AOA has been previously defined in Section 1 .O of this report. An AOA can be undertaken for large planning areas such as the Northern Nuu-chah-nulth hahoulthees, or for small development locations such as a proposed subdivision or new road alignment. The results from an AOA can be used to guide subsequent AIAs.

An AIA involves an inventory and impact assessment of a proposed development area. It is often required where the need for one has been identified in an AOA study, but can be ordered without an overview being conducted, especially in locations perceived as having "high site potential." An AIA usually addresses the full range of archaeological resource types possible in a development area. An AIA includes an archaeological resource inventory of the development area through a field survey (examination) of all or part of the area, evaluation of the significance of any archaeological resources present, assessment of potential impacts to resources present by proposed development, and recommendations for measures to manage adverse impacts (if any). The field survey often involves subsurface testing to determine if buried archaeological resources are present,

Archaeological impact management (AIM) involves the implementation of measures to manage adverse impacts to archaeological resources and are set out by the Archaeology Branch. Usually these measures are intended to avoid or reduce impacts. Other impact management options include data recovery through excavation, tree ring dating of CMTs, and monitoring of construction activities. Lastly, monitoring of development activities is sometimes ordered to ensure correct implementation of mitigative recommendations.

5.3 Archaeological Resource Management Recommendations

The results of the overview are presented in terms of three classes of archaeological resource potential for non-CMT resources: Class 1 (Low potential), Class 2 (Moderate potential), and Class 3 (High potential), with each level of potential represented on the map by a different colour. The archaeological resource potential for CMT resources is expressed as either Low or Moderate-to-High potential (the potential classes were defined in Chapter Two). On the maps, CMT potential is indicated by hachured lines which overlie the coloured non-CMT potential classes. The classes are mapped digitally across the study area.

All proposed developments should be reviewed to determine if any archaeological studies are required under the Archaeological Impact Assessment and Review Process (see above). The following is a list of management actions in response to a proposed development in the study area:

Non-CMT Resource Potential:

- If a proposed development is planned in an area with **Class 1 Potential, the** recommended management action is consultation with First Nations in order to gather local knowledge and identify possible conflicts known to the First Nations. If no conflicts or concerns are demonstrated, then it is recommended that no further archaeological management actions take place. If conflicts or concerns are demonstrated, then it is recommended that the proponent consider the need for an AFR or an AIA in consultation with the First Nations, Ministry of Forests, and the Archaeology Branch.

- If a proposed development is planned in an area with **Class 2 Potential,** the recommended management actions are: (1) consultation with First Nations in order to gather local knowledge and identify possible conflicts or concerns known to the First Nations, and (2) an AFR of the development area to identify the presence or absence of micro-features and assess their effect on the Moderate archaeological potential assigned to the area by the overview. If micro-features can be identified on air photos or maps then an in-office review is recommended. If these features are not present on air photos or maps than an AFR is recommended. We also recommend that the AFR be conducted under a heritage inspection permit.

- If a proposed development is planned **in an** area **with** only **Class 3 Potential** present, the recommended management actions are: (1) consultation with First Nations in order to gather local knowledge and identify possible conflicts or concerns known to the First Nations, and (2) an archaeological impact assessment (AIA) of the development area under a heritage inspection permit.

- If a proposed development is planned in an area with a combination of **Class 1 and 2 Potential, or Class 2 and 3 Potential, the** recommended management action is for

that of the highest class present, to be applied to the entire proposed development area, with the possibility for adjustments to the management action based on a field review.

CMT Resource Potential

- If a proposed development is planned in an area with **Low CMT Potential,** the recommended management action is consultation with First Nations in order to gather local knowledge and identify possible conflicts known to the First Nations. If no conflicts or concerns are demonstrated, then it is recommended that no further archaeological management actions take place. If conflicts or concerns are demonstrated, then it is recommended that the proponent decide on the need for an AFR or an AIA in consultation with the First Nations, Ministry of Forests, and the Archaeology Branch.

- If a proposed development is planned in an area with **Moderate-to-High CMT Potential,** the recommended management actions are: (1) consultation with First Nations in order to gather local knowledge and identify possible conflicts known to the First Nations, and (2) a CMT inventory in order to identify the presence or absence of CMTs. The CMT inventory does not have to be done under permit, but the results should be reported to the Archaeology Branch. Where the inventory identifies CMTs, a subsequent AIA may be required. The need for an AIA should be determined in consultation with the Ministry of Forests and the Archaeology Branch.

- If a proposed development contains areas with potential for both CMT and non-CMT resources the recommended management action is that an AFR or AIA be conducted under a heritage inspection permit, depending on the level of non-CMT potential.

The results of an AIA must be reported to the MSBTC, who will review the assessment and forward recommendations for the management of possible impacts to archaeological resources to the development proponent or regulatory agencies. It is possible that some impacts will be so severe that a development cannot proceed, but more frequently the development can proceed if design or development plans are modified to avoid or reduce adverse impacts.

As discussed in the above recommendations, a reconnaissance assessment can consist of a variety of activities. The main purpose of the reconnaissance is to "fine tune" the archaeological potential assessment for the development area, using detailed information that was not practical or available for use in the overview model development. Such information could include: aerial photographs, topographic and biophysical mapping at scales larger than 1:20,000, revised or more detailed forest stand data, and information about traditional use sites provided by First Nation communities. A reconnaissance assessment might include the previously discussed AFR as defined in the *British Columbia Archaeological Impact Assessment Guidelines.* An AFR could consist of a simple overflight or windshield survey of the development area, or pedestrian "ground-truthing" of the development area to accurately assess its archaeological resource potential. Shovel testing is

sometimes needed during an AFR to confirm site potential. If so, such an AFR must be conducted in accordance with a Heritage Inspection Permit issued by the MSBTC, pursuant to section 14 of the *Heritage Conservation Act*.

The reconnaissance assessment will result in recommendations either to conduct a full AIA or to carry out no further archaeological investigations for a particular development area. If no AIA is recommended, the reconnaissance assessment usually completes the archaeological work required for that development. The results of the reconnaissance assessment should be reported (see below).

5.4 Application of Overview Results

This overview was initiated and designed specifically for forestry planning. However, the results are equally applicable to management planning related to all forms of development in the study area, as well as to archaeological research and traditional use studies. We recommend that the model results be applied during development planning by all government ministries, government agencies, and industries responsible for overseeing or initiating land-altering activities, including Ministry of Forests, Ministry of Environment, Ministry of Transportation and Highways, BC Lands, BC Parks,-forestry licensees, mining companies, and tourism operators.

All proposed land-altering developments should be reviewed to determine if (and what type of) archaeological studies are required. The CMT and non-CMT potential classes are mapped digitally across the entire study area, and are available in the form of digital files or paper maps from the Ministry of Forests and Nootka Forest Products, in the following formats:

- "Complete" GIS data for each 1:20,000 scale TRIM mapsheet;
- "Dissolved" GIS data for each 1:20,000 scale TRIM mapsheet;
- Digital plot files at a scale of 1:20,000 (TRIM base); and
- Paper maps at a scale of 1:20,000 (TRIM base).

"Complete" digital GIS data in ArcInfo can be queried for modelling information, and is only available to the MoF. "Dissolved" GIS data and digital plot files cannot be manipulated or altered and have been stripped of archaeological site information. Dissolved GIS data can be used as a digital overlay on development plans or other data, while digital plot files can be used to produce acetate or additional paper copies of the maps. Dissolved GIS data, digital plot files, and paper maps will be made available to forestry licensees by the MoF on an as-needed-basis.

For the application of the overview results in forestry planning, we recommend that the steps indicated in Table 8 be followed. The Ministry of Forests is primarily responsible for overseeing

the application of the overview in forestry planning. For the application of the overview results in other development planning, we recommend that government ministries and agencies (other than the MoF) and development proponents (other than forestry licensees) contact the relevant First Nations for guidance.

Table 8. Recommended Steps for Application of Overview Results in Forestry Planning.

Step	Required Action
1	Identify the mapsheets for areas where proposed forestry developments (including roads, gravel pits, cutblocks, silviculture areas, etc) are located.
2	Obtain the appropriate digital files and/or paper maps from the MoF.
3	Using the digital or paper archaeological potential maps as an overlay on the development plan, determine the archaeological potential of the area affected by the proposed developments.
4	Determine the appropriate archaeological management action(s) for each development area or portion thereof (see Archaeological Management Recommendations above).
5	Obtain additional information necessary for determining the appropriate archaeological work in consultation with the MoF and relevant First Nations.
6	Where required, engage an archaeologist to conduct a field assessment or further research.
7	Report results of all archaeological fieldwork or research to the MoF, the Archaeology Branch, and the relevant First Nations so that they can be incorporated into future model revisions.
8	Determine the appropriate management actions for identified archaeological resources in consultation with the MoF, the Archaeology Branch, and the First Nations.

5.5. Model Revisions and Recommendations

The Northern Nuu-chah-nulth Overview presents the first attempt at a GIS-based archaeological resource potential assessment of the hahoulthees of the Northern Nuu-chah-nulth on the west coast of Vancouver Island. The overview results are partially limited by the digital information available for developing the potential model. Data gaps, with recommendations for addressing those gaps, are presented in Section 4.4. As new information becomes available through future archaeological studies, digitization of new datasets, and from First Nations communities, it is important that the model be revised, and that the revised model be applied to the overview. With this in mind, it is recommended that:

- The Archaeology Branch and the Ministry of Forests make a commitment to a yearly review in order to assess the models' success. The review should be conducted by a committee comprised of representatives from the First Nation communities, Ministry of Forest, Licensees, and the Archaeology Branch. The model should be revised

when, in the opinion of the review committee, there is sufficient new information to require such a revision. This review and revision process would be subject to the availability of funding.

- The Archaeology Branch and the Ministry of Forests support initiatives and studies required to address the data gaps identified in this overview; and

- Any revisions to the model be done under the direction or in consultation with the aforementioned review committee.

It is anticipated that AIAs for proposed forestry developments will be a critical source of information required to revise the model used in this overview. However, certain kinds of information about a development area need to be documented during an AIA if this information is to be of value for revising the model. In order to evaluate the model, each development area should be assessed in the field in terms of the criteria used by the model to determine potential. It will then be possible to compare archaeological potential as predicted by the model with archaeological potential as assessed in the field. Investigators also can use other criteria to assess potential, and these additional criteria could be included in future versions of the model. To ensure that the correct information is collected, it is recommended that:

- The Ministry of Forests require archaeologists undertaking AFR, CMT inventory, or AIA impact assessments of proposed forestry developments to complete, as part of the assessments, a form evaluating archaeological potential of the development area, in terms of the criteria used in the model plus any other relevant criteria. The form should be designed by the Archaeology Branch, be made available by the Ministry of Forests, and be attached to reports submitted to the Archaeology Branch.

In the past, reconnaissance assessments of proposed development areas, particularly timber harvesting blocks, were reported orally, or reported briefly in writing to the proponent, often in the form of a memorandum. These reports are seldom forwarded to the Archaeology Branch or, in the case of forestry developments, to the MoF. As a result, few archaeologists are aware of these reconnaissance assessments. To further complicate the matter is the introduction of CMT inventory projects and questions as to who will be responsible for compiling and reviewing the information gathered from future CMT inventories. To ensure that reconnaissance and CMT inventory data are available to assist in the development of archeological potential models, it is recommended that:

- The Archaeology Branch (and MoF, with respect to provincial forest lands) require that the results of all AFR and CMT inventory assessments be reported in writing and submitted to the Archaeology Branch.
- The Forest District should compile and maintain a list of all AIAs, AFRs, and CMT inventories conducted in the district. All reports should be kept on file at the district office.

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7.0 TECHNICAL APPENDIX

7.1 First Nation Groups

The study area is comprised of the hahoulthees of the Che:K'tles7et'h', Ehattesaht, Ka;'yu:'K't'h', Mowachaht, Muchalaht, and Nuchatlaht First Nations who are affiliated with the Nuu-chah-nulth Tribal Council (Figure 1). At the time of European contact in the late 1700s, the Nuu-chah-nulth peoples inhabited much of the west coast of Vancouver Island. They were formerly known collectively as the 'Nootka'. That name, however, is a non-native misnomer, which the Nuu-chah-nulth have rejected. In the late 1960s, they referred to themselves collectively, linguistically, and culturally as 'West Coast'. In 1978, a new collective name, 'Nuu-chah-nulth' was adopted by the Nuu-chah-nulth Tribal Council. This name translates loosely as 'all along the mountains' and refers to the west side of the mountain ranges of Vancouver Island that are common to all the Nuu-chah-nulth First Nations.

The Nuu-chah-nulth peoples speak three closely related languages that comprise the Southern Wakashan division of the Wakashan Language Family (Jacobsen 1979; Lincoln and Rath 1980). Drucker (195 1:4-6, map 1) separates the Nuu-chah-nulth into three major cultural groups: the Northern (north of Estevan Point), the Central (between Estevan Point and Pachena Point), and the Southern (south of Pachena Point). This study focuses on the area defined by Drucker as the traditional home of the Northern Nuu-chah-nulth people. The Northern Nuu-chah-nulth speak Nootka (recently also called T'aat'aaqsapa), the northernmost dialect of the language.

The Nuu-chah-nulth who live within the study area are the contemporary result of many tribes and groups that have amalgamated as a result of severe population decrease experienced after the introduction of disease by Europeans slightly more than 220 years ago. This process and tribal composition has been described elsewhere (see Drucker 195 1; Arima 1983; and Arima and Dewhirst 1990). Of the six First Nations, the Ka;'yu:'K't'h' and Che:K'tles7et'h', have amalgamated as one group, as have the Mowachaht and Muchalaht.

Because of the amalgamation process, the modem Nuu-chah-nulth people are not homogenous. Many component tribes and groups continue to exist as social entities. Each has its respective history, hereditary chiefs, hahoulthee, and ancestral rights. Aboriginal land use is intrinsically linked to the component tribes, and the completeness of ethnographic information on land and sea use depends on how well the respective histories from component tribes are taken into account.

The Nuu-chah-nulth believe that since time immemorial they are the original inhabitants of the west coast of Vancouver Island. They have no known legends of migration fi-om some other region to the west coast of Vancouver Island. Archaeological evidence indicates that Nootka Sound has been occupied for at least 4,000 years, and possibly much longer (Dewhirst 1978; McMillan 1996). The occupants of prehistoric Nootka Sound had an intimate relationship with the west coast environment, and were expert sea mammal hunters, fishers, and woodworkers. They developed an annual subsistence system that was scheduled to exploit the resources that were available on a

seasonal and sometimes fluctuating basis, such as herring, halibut, cod, salmon, whale, seal, sea otter, shellfish (including the highly prized dentalia shell), deer, berries, roots, medicinal plants, and cedar bark and wood.

7.2 Ethnographic Sources

The earliest reports by Europeans about the Nuu-chah-nulth people appear beginning in the late eighteenth century, These reports are observations made by Captain James Cook and his crew who were the second documented European (Juan Perez had been in Nootka Sound briefly in 1774) to visit Nootka Sound (In Beaglehole 1967). Several other 'explorers' quickly followed Cook onto the west coast of Vancouver Island and some wrote early accounts about Nuu-chah-nulth people including Meares (1791) and Moziño (1970). In 1803-l 805 a British man named James Jewitt was captured by Mowachaht Chief Maquinna and his people in Nootka Sound. Jewitt wrote about his experiences in his journal which has been recently published and illustrated by Hilary Stewart (1987).

A number of reports have been written about Nuu-chah-nulth culture and like most traditional 'Boasian' ethnographic works, these reports focus on attempting to recreate an ethnographic snapshot of traditional Nuu-chah-nulth prior to contact because it was assumed that First Nations culture were quickly disappearing and it was imperative to document the culture prior to the culture's demise. Most of the ethnographic research to date has focussed on traditional land use information, known to senior members of the community who lived off the land sometime during their past life. The information collected has been strongly biased by Euro-Canadian white male biases toward sites or settlements in land use. Less interest has been shown toward recording traditional use areas where resources were (are) collected and processed. Relatively less is known about those areas traditionally, and even less has been recorded for the period after 1960.

The ethnographies are an important source of information for this study because of the need to compile data about traditional Nu-chah-nulth activities and the physical places where these activities took place. The most comprehensive and pertinent report for this project was the work published Drucker (1951) and this monograph is the most important reference for the study area and was used extensively when compiling the traditional activities table. This is not to say that Drucker is the only appropriate source, there are several others. The following list highlights some of the ethnographic and anthropological work that has been conducted on the west coast of Vancouver Island within Nuu-chah-nulth hahoulthee: Arima (1983), Boas (189 1), Clarke and Clarke (1975), Curtis (19 16), Folan (1972), Inglis and Haggerty (1983), Kenyon (1980), Kool (1982), Koppert (1928, McAllister (1980), Mills (1955), Sapir (Sapir and Swadesh 1939, 1955), Turner (1975, 1978), Turner and Efrat (1982), Turner et al. (1983).

There is not a great deal of written information collected regarding the location of spiritual places such as ritual bathing places. This is to be expected, because knowledge of such places is private, held by persons and families.

Existing information collected on some places may be incomplete and not representative of the First Nation communities. Although the ethnographies identify traditional activities, this information has been gathered from a limited number of individuals or families and is not comprehensive nor necessarily representative of the entire community.

It was not the intent of this study to be limited by the ethnographic record, but obviously, the ethnographic record is the most comprehensive data available for this study. In-house field experience within the study area was also drawn upon in order to better deduce landscape constraints limiting the potential for the presence of archaeological resources. Regarding area1 coverage, the ethnographic record has little to say about the inland portions of the study area. There is no question that inland areas were used as indicated by the presence of hundreds of CMTs. This has more to do with 'topophilia' on the part of the anthropologists than with an absence of use by the Nuu-chah-nulth. Drucker (195 1:8-9) describes the inland environment of the Northern Nuu-chah-nulth hahoulthees in the following manner:

> The woods, seen from the water, seem to form an impenetrable mantle over the irregular surface of the land. After one finally breaks through the luxurious growth along the margin, he finds himself in a dark gloomy moss-covered world. Huge trunks rise straight and branchless, the crowns forming a high canopy almost, impervious to sunlight. Thin straggly young growth strives to reach the light above. Fallen timber--ranging from saplings that gave up the struggle to forest giants six and more feet through--hinder one's passage, for much of the wood, particularly the red and the yellow cedar, rots but slowly. One must climb over one windfall, duck under the next that lies over a big rock, and go around the third. The obstacle courses used at training stations in the recent war are the only things I know of that would prepare one for travel through the woods of Nootkan territory. And everywhere the scum of moss conceals the footing: in one place it slips underfoot from a glossy smooth slope of stone, at the next it covers equally a sound recent windfall and a rotten shell of tree trunk into which one sinks to the knees-it conceals crevices and pitfalls innumerable. And everywhere water drips from rocks, seeps through the moss, drips from branches overhead.
>
> It is scarcely to be wondered at, what with the ruggedness of the rockbound mountainous terrain and the dense tangle of vegetation, that the native population for the most part frequented the woods but little. The land game resources were fairly rich, but travel in the woods was difficult...

The Nuu-chah-nulth themselves were also consulted to learn of their views concerning traditional land use practices as reflected in the traditional activities table submitted for inspection at various times throughout the project. All comments and suggestions were incorporated into the final table.

For an example of how traditional and contemporary Nuu-chah-nulth life continues see Marshall (1993) or Kenyon (1982). It should be noted that while the traditional use information recorded to date is extensive (when compared to other less-studied areas of British Columbia), the paucity of data on recent and contemporary Native land use is misleading, because it could imply that the Nuu-chah-nulth no longer use the land or sea. Potentially there may be large numbers of contemporary traditional use sites that need to be recorded before a more complete record of First Nation use can be compiled.

7.3 Ethnographic Villages (by John Dewhirst)

The major settlements of the Northern Nuu-chah-nulth area are relatively well reported in the available literature. The late 18th century literature describes a number of settlements in Nootka Sound, Esperanza Inlet and Zeballos Inlet, but provides little site specific information on them. The 19th century literature, apart from Department of Indian Affairs documents on the establishment of Indian Reserves, has relatively little site specific information on aboriginal settlements. The 20th century literature provides the most information on settlements. Materials of the Royal Commission on Indian Affairs for the Province of British Columbia focus on Indian Reserves, but additional land applications also refer to some off-reserve settlements. Most settlement information was collected from elderly informants by 20th century "recall ethnographic" studies that go back to about the 1870s, although most of the reported settlements were used prior to 1870. The relevant sources of site specific settlement information are cited in the table and reported in the bibliography.

In historical coverage, the reported settlements in most cases go from the early 20th century back to the early contact and prehistoric periods. In those times the population is estimated to have been ten times greater than reported in the late 19th century. Undoubtedly many small settlements used in the late 18th century and earlier were abandoned as a result of severe population reduction, and therefore are not reported in the literature.

Geographical coverage of settlements in the Northern Nuu-chah-nulth area is very good, especially along the outside coast, inside coast, and estuaries, but two particular areas are probably under represented. The inland Muchalaht groups who occupied the Gold River valley and Muchalat Lake region had a number of villages and camps that are poorly reported and remain largely unlocated. Settlements of the Checkleset groups of the Brooks Peninsula, Checkleset Bay, Ououkinsh and Malksope Inlets are also under reported.

7.4 Ethnographic Village Site Inventory (by John Dewhirst)

The following table was compiled by John Dewhirst of Archeo Tech Associates in order to provide information about the known villages present in the study area. Figure 7 visually presents the known ethnographic villages as recorded for this study.

Table 9. Ethnographic Villages.

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92/E9	001	tcecTs	Muchalaht	lg, tv	w, sp, f	several houses- 700 people in 1778	Suggested to have 700 inhabitants in spring of 1778 (Beaglehole 1967:304). Originally winter home of an independent Muchalaht local group. In late 19th century, Muchalaht tribe moved to tcecTs, where they built a winter village of several houses." (Drucker 1951:232, 234). Remains of at least 6 structures identified archaeologically (Marshall 1992: 282).
92/E9	002	màtchT Borden No.: DjSm3	Muchalaht	lg fs	w f	2 houses in 1893	"...winter home of an independent group." (Drucker 1951:232) "[When Indian Reserve #13 was surveyed in 1893 there were potato gardens and two houses on the site." (Marshall 1992:190)
92/E9	003	a'aminqàs Ahaminaquus Borden No.: DkSm4	Muchalaht	lg t	w yr (mid 19th cent.)	5 houses in 1893 one big house (mid 19th century)	"...cedar timbers around the one house they all lived in." (Drucker 1951:232-4) Violet and Sam Johnson, Solomon and Alice Mark, Maggie and Tommy McLean and John and Justine Charlie lived here in the 1950's. (Marshall 1992:268) During prolonged warfare in mid 19th century, the tribe wintered here instead of tcecTs. Fall fishing and trapping during winter (Arcas Ltd.1 994:7).

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92/E9	005	mb'ya Mooya Borden No.: DjSo6	Muchalaht	lg fs	w, sp f	est. 1,000 people in 1778; 1893 - 1 house	(Drucker 1951:232); James Cooks officer King described visiting a large village located in a deep bay on the East side of Nootka Sound which he guessed 1,000 people lived (Beaglehole 1967:1404). Map of 'King George's Sound' (Skelton 1955 Plate L). 1893 - one house (40x50 ft) was recorded in 1893. In 1940s and 50s Arnold James and his sister Gloria Maquinna both remember visiting Tommy and Maggie McLean, at their fishing cabin on the Mo'ya Reserve." (Marshall 1992:204). Fall fishing and trapping during winter (Arcas Ltd. 1994:7).
92/E9	006	ɬiptɬ Kleeptee Hleepte Borden No.: DjSo3 and DjSo4	Muchalaht	lg fs	w f	1893 - 1 house 2 houses in early 20th century	(Drucker 1951:232); "Folan (1972:68) mentions that Kleeptee was noted for its 'runs of chum salmon in October and November'. When Devereux surveyed the reserve in 1893 he recorded one house." (Marshall 1992:198); "[A] large area of timbers indicating a collapsed but once substantial house. Larry Andrews' identified this structure as his mothers father, cha-with Tuda. Andrews told that a second house belonging to Muchalat Jim used to stand beside his grandfather's house." (Marshall 1992:200); Fall fishing and trapping during winter was done. (Arcas Ltd. 1994:7)
92/E9	007	a'ōs A'uus Borden No.: DjSo9	Muchalaht	lg fs	w f	1893 - one house	Drucker unclear on whether the site was winter village or fishing camp. "Tradition relates that a'ōs was the winter village of a local group that was exterminated by their neighbours the mátcɬath." (Drucker 1951:232); "When IR #17 was surveyed in 1893 there was one house. Folan (1972:68) reports it was a village where 'large runs of chum salmon go upstream." (Marshall 1992:208); Sam Johnson said chum went up Silverado creek and there was a settlement at the mouth of this creek, but no one lived there in his lifetime. (Arcas Ltd. 1994:9)
92/E9	008	mōktas	Muchalaht	fs	f		"camp site" (Drucker 1951:233)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92/E9	009	tcexła Borden No. DjSm6	Muchalaht	fs			"camp site" (Drucker 1951:233) "[Described by Drucker and Folan as a fishing camp. [A] group of at least six bark stripped cedar trees were found. All bark strips appeared to be fairly old as they had large scar lobes and several were quite extensively rotted out. Four still had clear axe marks. Folan (1972:68) reports that there are salmon runs in both of creeks in Jacklah Bay." (Marshall 1992:194)
92E/9	***085***	tso-hah-goh	Muchalaht	v			'Jerry Jack located this village at the confluence of the Ucona and Gold Rivers. He was told about this place by 'Queenie' [Mrs. Louis George]. AJ visited [this site] in 1988, recalled seeing house posts and a large black pot. Sam Johnson told us the present day trail which ran along the east bank of the Gold River was used for hunting." (Marshall 1992:158)
92E/9	***087***	Borden no.: DkSm3	Muchalaht	defens ive site			"[Drucker] describes how during the Mowachat-Muchalat wars of the 19th century, the Muchalaht people moved away from Ahaminaquus to 'an old site just across the river which they considered to be more defensible' (Drucker 1951:360-l). Drucker states that this was where the people were living where the Mowachaht chief ciwuc was killed (1951:361)." (Marshall 1992:161)
92E/9	093	Kumtapi	Muchalaht	v			"Dewhirst describes Kumtapi as 'a habitation site on Gold River a short distance upstream from Ahaminaquus'. (Marshall 1992:158) "klum-tah-pi" (Jerry Jack in Marshall 1992:158)
92E/9	094	Clum-hah-kess Kloomhakis Borden No.: DjSm2 and DiSm4	Muchalaht	fs			Tsim-a-ha-kis can, with confidence, be equated with either site DjSm2, or DjSm4, or both." (Marshall 1992:188)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/9	095	near Ous Point Borden No.: DjSo8	Muchalaht	fs	w, sp	one house in early 20th century [?]	"Jerry Jack told us that Tommy and Maggie McLean lived here during late winter in the early to mid 20th century. They fished for winter, spring salmon which followed the herring into this bay. There are also historic CMT's." (Marshall 1992:206). This site could be confused with the McLean's smokehouse and trapping cabin at Mooya Bay. (Arcas Ltd. 1994:10)
92E/9	103	none known Borden No.: DjSp20	Mowachaht	v	s	1786 - 15 houses/80-90 people	This is the only substantial archaeological location for the village described by Alexander Walker in 1786, as 15 houses with 80- 90 inhabitants (Fisher & Bumsted 1982:45).
92E/9	109	šo'T̄s sho'is	Mowachaht	fs	f		A camping ground where people went to take chum and coho from the nearby river (Folan 1972:64). Location from Folan (1969).
92E/9	112	Borden No: DkSo32	Muchalaht	lg?	sp		Observed by Cook in spring of 1778. Map of 'King George's Sound' (Skelton 1955:Plate L) Folan (1972:68) mentions a village located NW of tcecT̄s.
92E/9	114	qT̄psiɬ kipsitl	Mowachaht	fs	f		A village where chum and coho were taken from a nearby river (Folan 1972:64). Located by Folan (1969).
92E/9	115	Nusmoq Borden No.: DkSp17	Mowachaht	v	w, f		Located by Folan (1969). A village where chum and coho were harvested. Hair seals were hunted nearby, and herring and berries were also collected (Folan 1972:64). Archaeological site located by Marshall (1992:334).
92E/9	121	tsitsminimoq	Mowachaht				A campsite below qT̄psiɬ; no stream runs there so all fishing has to be done offshore (Folan 1972:64). Located by Folan (1969).
92E/9	139	Borden No.: DkSm2	Muchalaht		?		defensive site; Jerry Jack said Muchalat people used to place a wooden box drum on the hill above this site and would beat it to warn people up the Gold River of enemies (Marshall 1992:264).

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/10	011	c'as	Mowachaht	lg	yr sp, s in late 19th century	1893-4 houses	"They lived the year around on the outer beaches. The c'as people were either formed of two local groups, or split into two." (Drucker 1951:228) Remains of two 20th century houses exist. Devereux noted 4 houses and two potato patches in 1893. (Marshall 1992:254)
92E/10	012	tsaxsis Tsarksis	Mowachaht	lg	yr sp, s in late 19th century	1893-3 houses	"They lived the year around on the outer beaches. The tsaxsis people became the nayitsa'àptakàmłàth and the saiyatcapath." (Drucker 1951:228) Marshall (1992:256) records 15 house depressions.
92E/10	013	kūptī Coopte Borden No.: DkSp1	Mowachaht	tv	w	1893-7 houses	"This group gave the right to a house site at kūptī to a yałūactakàmłàth chief as part of a dowry, and later to chiefs of other groups, so that the site became a tribal winter village." (Drucker 1951:231) Devereux mapped 7 houses in 1893 (Marshall 1992:312).
92E/10	014	ō'wīs Hoiss Borden No.: DkSp2	Mowachaht	tv	w	1893-8 houses	"[The people gave rights to build winter houses at [ō'wīs] to hisnit, tsaxhō', ta'atis, hisàq, and ʟūis. This tribe had no single summer village, but obtained rights to places along the east shore of lower Nootka Sound, and moved in summers to a series of camps along the beach as far south as hōmīs." (Drucker 1951:229, 230) Devereux mapped 8 houses in 1893 (Marshall 1992:314)
92E/10	015	mawun Borden No.: DjSp5	Mowachaht	lg	f	one house in early 20th century	Local group site (Drucker 1951:229). Chief Ambrose Maquinna informed that his uncle had a house here when Ambrose was a boy (Marshall 1992:216); Map of 'King George's Sound' (Skelton 1955 Plate L). Located by Folan (1969; 1972:58).
92010	016	ʟūis Borden No.: DkSp7	Mowachaht	lg	w, f	several houses	Described by Drucker (1951:229-230) and (Marshall 1992:320). Located by Folan (1969).

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/10	017	yūkwot Yuquot Borden No.: DjSpl	Mowachaht	cv	sp, s	13 big houses early 19th century 1893-27 houses	"The chief gave house sites for summer dwellings at yukwot to his fellow chiefs." (Drucker 1951:230-231) "In 1893 when the Reserve was surveyed 27 houses and one church were recorded (Marshall 1992:212); Map of 'King George's Sound' (Skelton 1955: Plate L)
92E/10	086	Tuquatis Borden No.: DjSr2	Mowachaht	v	s		Alexander Walker refers to a small village near the waterfall in summer of 1786 (Fisher & Bumsted 198253). 'Outside' spring camp site. Folan records a camping place named Tuquatis at the mouth of Calvin Creek (197256). Archaeological site located by Marshall (1992:262)
92E/10	096	Tsa'tsil	Mowachaht	fs	f		A "few poor houses" were observed by Walker in 1786, probably at this spot (Fisher & Bumsted 1982:52). Folan locates a 'camp" here (Folan 1969) and notes river important for chum (Folan 1972:55) Three cabins recorded in the general vicinity of site DjSp3 but it is not known [ifj they are of Native or European origin (Marshall 1992:214).
92E/10	097	none known Borden No.: DjSpl 1	Mowachaht				"[Historic occupation include[s] a campsite structure with a birdhouse beside it, also two piles of red bricks discarded in the intertidal zone. One bark stripped cedar tree was identified behind the site." (Marshsall:220)
92E/10	098	Suyacktis Borden No.: DjSp12	Mowachaht	fs			Whaling station; "A village named Suyacktis, located on Bligh Island is mentioned in a passing reference by Curtis (1916:69), and Folan (1972:66) records that the haiyanuwactakamlath group of Tlupana Inlet 'once had a whaling station on Bligh Island'. DjSp12 is located exactly where Folan (1976) places Suyacktis. (Marshall 1992:222)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/10	*099*	none known Borden No.: DjSp14	Mowachaht			1 small house in first half of 20th century	"Behind the tiny cobble beach, is a small village measuring about 30 by 20 m. [A]n irregular area cleared of stones and some piled stones on the beach suggest a canoe skid. Ray Williams informed that Jacob Louis used to live at this site and that was why the island was known locally as Jacob's Island. August Dick informed that Jacob lived here until about 1945. Jacob Louis' house was built on the front of the site protruding over the front scat-p." (Marshall 1992:224)
92E/10	*101*	A'muktis Borden No.: DkSp10	Mowachaht	fs	v		Located by Folan (1969). Folan (1972:58) describes it as a village used for the herring fishery and a ritual bathing place. Terry Williams reported that her father, Harry Dick, lived here briefly when he was a small child (Marshall 1992:322).
92E/10	102	A'oqtsis Borden No.: DjSp19	Mowachaht	fs			Located by Folan (1969). Formerly a village used primarily for fishing for chum and coho and later was used for Native living quarters for the fish cannery (Folan 197258). A fish trap is at the mouth of Boca del Infiemo Bay (Marshall 1992:230).
92E/10	106	none known Borden No.: DjSp26	Mowachaht	c	?	?	Camp site for Ray Williams and his family when collecting clams and oysters. N of the site are ten bark-stripped cedar trees (DjSp27) which all have thick scar lobes (Marshall 1992:240).
92E/10	107	none known Borden No.: DjSp31	Mowachaht	v	s	f	"Folan (1972:66) records an unnamed village located at the mouth of the Escalante River, where chum salmon were taken and smoked." (Marshall 1992:244)
92E/10	*110*	Aa'pswinis Borden No.: DjSr1	Mowachaht	v		3 or 4 houses ridges	Located by Folan (1969). Camping place (Folan 197256). Archaeological site located by Marshall (1992:260)
92E/10	113	none known Borden No.: DkSp11	Mowachaht			1 or 2 houses; 1 family	Exclusively historic site, occupied by Terry Williams aunt, Heesh-kock (Nootka Jenny). August Dick lived this place as a child - remembers only one house (Marshall 1992:324)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/10	116	Tcitits Borden No.: DkSr35	Mowachaht	v	s		Located by Folan (1969). Village used for halibut fishing and hunting sea mammals and deer (Folan 197256). Archaeological site located by Marshall (1992:346);
92E/10	122	mowinis	Mowachaht	fs	f		(Folan 1969; 1972:55)
92E/10	123	ka'ati	Mowachaht	c	s		Chief Maquinna stayed here in the summer when the Spanish occupied Yuquot, 1789-l 795; possibly a place of refuge in time of war (Folan 1972:55-56). Location from Folan (1969).
92E/10	124	katskwàtčū	Mowachaht	c	s		Located by Folan (1969). A camp used for sea otter hunting (Folan 1972:56).
92E/10	140	TcĪtus	Mowachaht	v	fs	f	Located by Folan (1969). Fishing station for chum, pinks, hair seals; halibut offshore (Folan 1972:66).
92E/14	037	tcisyb'qwis	Nuchatlaht	lg fs	sp, s		Located and identified by Drucker (1951:226).
92E/14	038	dhkac [ohkac]	Nuchatlaht	tv fs	w, f		Located and identified by Drucker (1951:226).
92E/14	039	tatcū	Ehattesaht	lg, tv cv	yr (18th cent.) s (hist. period)		"[T]he ha'wehtakàmlàth (people of tatcū and woxns'a' came[to hōhk] seeking a place to stay. Wintering on the open coast was too much of a hardship, they said. Before that, the Ehetisat had no 'outside' place of their own for summer fishing except a camping site at ō'pnit." (Drucker 1951:226)
92E/14	040	woxns'a'	Ehattesaht	lg fs	yr (I 8th cent) s (hist. period)		"[T]he ha'wehtakàmlàth (people of tatcū and woxns'a' came[to hōhk] seeking a place to stay. Wintering on the open coast was too much of a hardship, they said. Before that, the Ehetisat had no 'outside' place of their own for summer fishing except a camping site at ō'pnit" (Drucker 1951:226).
92E/14	052	cahqos	Ehattesaht	fs	s		"camp site for dentalia fishery" (Drucker 1951:226)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/14	053	cahqos Grassy Island	Ehattesaht Kyuquot	f s	s		IR 17; Small habitation site; deep sea fishing station; fur seal hunting base (Arcas Ltd.1995:65); "camp site for dentalia fishery" (Drucker 1951:226).
92E/14	054	cahqos	Ehattesaht	fs	s		"camp site for dentalia fishery" (Drucker 1951:226)
92E/14	073	na'mint	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92E/14	118	none known	Ehattesaht	v	?	3 big houses	Three houses plotted on Eliza and Malaspina's map of Nootka Sound, 1793 (Eliza & Malaspina 1793). Approximate location.
92E/14	120	Tashaaqtu	Ehattesaht	v			Julia George, Earl Smith had heard of a former village site here, which would agree with the village identified on the Spanish charts of 1791 (Eliza & Malaspina 1791). (Arcas Ltd. 1993:27)
92E/15	018	hatɔq Borden No.: DkSq1	Mowachaht	lg	f		Located by Drucker (1951:229) and by Folan (1969). Chum salmon are said to have run in the stream at Blowhole Bay (Folan 1972:60). Archaeological site located by (Marshall 1992:344).
92E/15	019	tsawun Borden No.: DkSp3 (Tsawwin DkSp14)	Mowachaht	lg fs	f, w	1893-2 houses	Located by Drucker (1951:229). Devereux recorded 2 houses in 1893 (Marshall 1992:316). Collapsed remains of a cabin; 17 stumps with springboard notches; and one bark-stripped cedar tree. (Marshall 1992:330)
92E/15	020	amitsa	Mowachaht	lg			Located bv (Drucker 1951:229)-- approximate location.
92E/15	021	tacTs Borden No.: D1Sp1	Mowachaht	lg fs	f, w	1893-3 houses	Located by (Drucker 1951:229) Devereux reported three houses and extensive gardens in 1893 (Marshall 1992:350).
92E/15	022	hisnit Borden No.: DkSp5	Mowachaht	lg fs	f	1893-2 houses	Located by Drucker (1951:229). Devereux mapped 2 houses in 1893 (Marshall 1992:318).

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/15	027	apàqtū	Nuchatlaht	tv	w		"The old winter village was at apàqtū, where the local groups residing on Centre Island and Nuchatlitz Inlet assembled" (Drucker 1951:227).
92E/15	028	tcatcatcinik	Nuchatlaht	tv fs	w, f		Located and identified by Drucker (1951:226).
92E/15	029	ō'astea	Nuchatlaht	lg fs	f		Located and identified by Drucker (1951:226).
92E/15	030	aqi	Nuchatlaht	lg fs	f		Located and identified by Drucker (1951:226).
92E/15	031	tca'ta	Nuchatlaht	lg fs	f		Located and identified by Drucker (1951:226).
92E/15	032	yūtckhtōk	Nuchatlaht	lg fs	f		Located and identified by Drucker (1951:226).
92E/15	033	cō'ōma	Nuchatlaht	lg fs	f		Located and identified by Drucker (1951:226).
92E/15	034	ōɬàktcī	Nuchatlaht	lg fs	f		Located and identified by Drucker (1951:226).
92E/15	035	ɬūpàtcsis	Nuchatlaht	cv	sp, s		"The groups at the heads of Port Eliza and Espinosa Arm formerly wintered in their respective places, joining the others at the summer village of ɬūpàtcsis for sea hunting and fishing." (Drucker 1951:227)
92E/15	036	nūtcàɬ	Nuchatlaht	cv	yr modem		"The present village of nūtcàtɬ is of little antiquity, having been founded only two or three generations ago" (Drucker 1951:227).

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/15	041	hōhk Hohk	Ehattesaht	tv, cv	w	14 big houses	"[Flour local groups, with the addition of the haqumtstisath, and hūphōɬàth, had winter quarters at hōhk. [A]fterward, the ha'wehtakàmlàth (people of tatcū and wɔxne'à') came. So the Ehetisat chief gave them a place to stay at hōhk." (Drucker 1951:226) The Queen's Cove group or tribe [048], remained apart for a long time although always friendly with the Ehetisat. It was only 50 or 60 years ago that they moved into hōhk to live." (Drucker 1951:227)
92E/15	042	hūphōɬ	Ehattesaht	lg, fs	f		Located and identified by Drucker (1951:226).
92E/15	043	ehstis Ehattis	Ehattesaht	lg fs	f		"The original tribe seems to have consisted of three local groups, the people of ehstis, the icsaath, and the atcinath." (Drucker 1951:225).
92E/15	044		Ehattesaht	fs	f	1 big house	A big/house smokehouse that was part of "Little Zeballos" in the early 20th century.
92E/15	045	àtcin	Ehattesaht	lg fs	f		The original tribe seems to have consisted of three local groups, the people of ehstis, the icsaath, and the atcinath." (Drucker 1951:225)
92E/15	046	haqumts	Ehattesaht	lg	f		Located and identified by Drucker (1951:226).
92E/15	047	maxteas	Ehattesaht	v v	sp, s yr modem		Located and identified by Drucker (1951:226). Formerly spring and summer village of Chinakhint (Queen Cove) tribe, now part of Ehattesaht First Nation.
92E/15	048	tc$\bar{T}$nexnit	Ehattesaht	tv	w, f		"The Queen Cove group or tribe, remained apart for a long time although always friendly with the Ehetisat. It was only 50 or 60 years ago that they moved into hōhk to live" (Drucker 1951:227).
92E/15	049	Klitsis	Ehattesaht	fs	f		Located by Drucker (1951:226). Julia George was told there were a "number of houses on the beach. The houses probably were extant in the late 19th, early 20th century" (Arcas Ltd. 1993:24)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/15	050	b'pnit	Ehattesaht Nuchatlaht	fs	s		"Before [the settlement at hõhk], the Ehetisat had no 'outside' place of their own for summer fishing except a camping site at õ'pnit" (Drucker 1951:226).
92E/15	051	ʟīttcya	Ehattesaht	lg fs	f, w	2 houses in early 20th C.	Located and identified by Drucker (1951:226) Moses Smith recalled two houses at klichya (1920's). The smaller house was occupied by Steve Jackson's family in the fall to catch and smoke dog salmon, and later in the year for trapping (Arcas Ltd. 1993:22).
92E/15	104	tsusnit Borden No.: DkSp26	Mowachaht	fs	f		Folan (1972:60) describes tsusnit as a camp site owned by the tukwittakamlath, and notes that dog salmon ran in Santiago Creek during the fall. (Marshall 1992:338)
92E/15	105	tsisa	Mowachaht	lg fs	f		approximate location: The Leiner River bordering tsisa is noted for large runs of chum from Sept. to Dec. and of pinks during Sept. and Oct. Lots of herring in Nov. and Dec. Site also good for roots, berries, hunting and trapping in fall (Folan 1972:61)
92E/15	119	Tlulthuwa	Ehattesaht	fs	w		In the 1920's, Moses Smith was told an old couple used to winter at this site. In 1910 or earlier, Julia George's grandparents trapped in the Inlet, and may have used this site. The John family still operates the trapline today. (Arcas Ltd. 1993:23)
92E/15	138	icsa Ishsaa Little Zeballos	Ehattesaht	lg fs	f		"The original tribe seems to have consisted of three local groups, the people of ehstis, the icsaath, and the ȧtcinȧth." (Drucker 1951:225).
92/E16	004	tsaxana Borden No.: DkSm5	Muchalaht	lg	yr	houses	"Dewhirst (1988:7, 17-18) locates this village in Gold River township [sic] and Folan (1972:251) locates it in the area now known as Peppercorn Park in the township of Gold River." (Marshall 1992:155) 'tsoh-ah-nah' (Jack, Johnson in Marshall)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Sire	Comments
92E/16	010	hilūwe'ta	Muchalaht	v	s, f		"village far upstream on Gold River." (Drucker 1951:232). Exact location not known. "Hihlweehta" (Dewhirst 1988) "hithl-weh-tuh" (Jack, Johnson in Marshall 1992:153)
92E/16	023	nisåq Nesuk Borden No.: DkSo4	Mowachaht	lg fs		1893 - one house	Located by Drucker (1951:229) Devereux recorded one small house in 1893. Resources include salmon, deer, elk, berries and roots (Folan 1972:63). Archaeological site located by Marshall (1992:280).
92E/16	024	mōwatcà Borden No.: DkSo1	Mowachaht	lg fs		*1893-3* houses	"[T]he haiyanūwɔctakàmłàth owned a fishing station at mōwatcà." (Drucker 1951:230). Devereux noted 3 houses in 1893 (Marshall 1992:274).
92E/16	025	ta'atis Borden No.: DkSo2	Mowachaht	lg fs			Located by Drucker (1951:229). Local group village occupied for harvesting chum salmon from the Canton River (Folan 1972:63). Archaeological site located by Marshall (1992:276)
92E/16	026	tsaxhō Borden No.: DkSo3	Mowachaht	lg fs		1893 - one house	Located by Drucker (1951:229) Devereux noted one house described as a 'tumble down shack' (25 x 35 ft) in 1893 (Marshall 1992:278). The village was used when fishing for chum and other salmon from the Sucwoa River (Folan 1972:63-64).
92E/16	*089*	moth-goh-sa	Muchalaht	v			"Jerry Jack was told of this place by 'Queenie' the late Mrs. Louis George. Moth-goh-sa is the name of a village located at the confluence of the Gold and Upana rivers. [C]onstruction of roads and two bridges have completely altered the natural terrain." (Marshall 1992:155)
92E/16	*090*	Tsah'tah	Muchalaht	v			"Both Jerry Jack and Dewhirst (1988) locate this village at the junction of the Gold and Heber Rivers, thus its' name meaning 'river flowing over'. A nearby location called kee-nuh-us was also mentioned by JJ but no further information was obtained. " (Marshall 1992:156)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92E/16	091	Titseeta	Muchalaht	v	s, f		Village on the south side of the 'big bend' of the Gold River (Dewhirst 1988:18).
92E/16	092	CMT/ possible village site	Muchalaht	v	?		"Jerry Jack thought this may have been a village location and it could be the location of the place requested by Muchalat Peter as a reserve [to Royal Commission]. " (Marshall 1992:154)
92E/16	108	ca'cisūq Borden No.: DkSo7	Mowachaht	c fs	f		Located by Folan (1969). People who stayed at this village fished and hunted land mammals; during chum runs, they would fish the Tlupana River (Folan 1972:63). Archaeological site located by Marshall (1992:284).
92E/16	111	Huacuk Borden No.: DkSo22	Mowachaht	fs	f		Located by Folan (1969). "Fall camping ground where chum, pinks, and coho were taken from a nearby river" (Folan 1972:63). Two CMT's identified (Marshall 1992:296).
not plotted		apuc	Muchalaht	v	worfs		Drucker unclear whether this site was a winter village or simply temporary fishing site. (Drucker 1951:232). Location not known.
not plotted		ō'Ts	Muchalaht		worfs		"...a different site from that where the Tlupana tribe wintered. [Not] clear whether [this site was a] winter village or simply [a] temporary fishing site." (Drucker 1951:232). Location not known.
92L/3	055	maxqet Markale	Kyuquot	tv	w	probably at least 12 big houses in early 19th C. 1890-7 houses	"There were 4 tribes composed of 14 local groups with winter quarters at hōpsitas, maxqet, ca'wispa, and qwixqo." [3 local groups identified that wintered at maxqet.] (Drucker 1951:222). The four local groups consisted of 12 identified houses in early contact period. Rev. J. Nicolaye notes there were 7 houses in 1890 (Moser 1926).
92L/3	056	ca'wispa Chamiss 'Sha: we:s 7pa:	Kyuquot	tv	w	probably at least 6 big houses in early 19th C.	Probable habitation site (Guillod Point). (Arcas Ltd. 1995:66); "There were 4 tribes composed of 14 local groups with winter quarters at hōpsitas, maxqet, ca'wispa, and qwixqo." [4 local groups identified that wintered at ca'wispa.] (Drucker 1951:222)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92L/3	057	qwixqo Cachalot	Kyuquot	tv	w		"There were 4 tribes composed of 14 local groups with winter quarters at hdpsitas, maxqet, ca'wispa, and qwixqo." [3 local groups identified that wintered at qwixqo.] (Drucker 1951:222)
92L/3	058	hdpsitas Houpsitas	Kyuquot	tv	w	probably at least 7 big houses in early 19th C.	IR 6; Winter village; fishing and trapping station (Arcas Ltd. 1995:65); "There were 4 tribes composed of 14 local groups with winter quarters at hōpsitas, maxqet, ca'wispa, and qwixqo." [2 local groups identified that wintered at hōpsitas.] (Drucker 1951:222)
92L/3	059	tacƮs	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	060	a'ʟic	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	061	yȧ'qō	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	062	qa'ōq	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	063	qa'ōpinc	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	064	qaqciʟ	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	065	qa'yōkw	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	066	ca'wis	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	067	yȧ'qȧts Yakats	Kyuquot	lg fs	f		IR 5; Habitation site; trapping base (Arcas Ltd. 1995:65); located and identified by Drucker (1951:224).
92L/3	068	kūtsū	Kyuquot	lg	s		Habitation site (Arcas Ltd. 1995:65); (Drucker 1951:224)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92L/3	069	amai	Kyuquot	lg fs	f		Located and identified by Drucker (1951:224).
92L/3	070	tił Machta	Kyuquot	lg			Located and identified by Drucker (1951:224).
92L/3	071	aqtɬ̄s Actis Aktis	Kyuquot	cv		32 big houses in early contact period 32 houses in 1890	IR 1; "[T]he four tribes were united through sharing a summer village site on aqtɬ̄s" (Drucker 1951:222). "Two or three generations ago, the Kyuquot began to winter on aqtɬ̄s. There were two yà'qats house groups, who had no houses on the island. [The tacɬ̄s chief gave them sites for two houses [at aqtɬ̄s]." (Drucker 1951:225) [1890 - 32 houses recorded by O'Reilly]
92L/3	072	Kukamacamayis	Kyuquot	cv	sp, s	1890 - 35 houses	Mission Island IR 2; Village; graveyard; timber source; herring fishing and drying station (Arcas Ltd. 1995:65); "tcaxhwataqt" (Dewhirst, notes in Drucker 1951:224); Rev. Nicolaye notes 35 houses in 1890 (Moser 1926).
92L/3	075	àpsūwɬ̄s Upsowis EaSv3(part)	Checkleset	tv			IR 6; "The summer site of the tribe was at àpaūwɬ̄s, which is the modern permanent village." (Drucker 1951:222)
not plotted	076	ʟitsʟihwàkt	Checkleset	fs	s		"They had an 'outside' site for halibut fishing and sealing at ʟitsʟihwàkt" (Drucker 1951:222).
92L/3	077	hisnit	Checkleset	fs	s, f		IR 4; "There were five fishing stations: hisnit, a stream that flowed from a lake in which sockeye spawned" (Drucker 1951:222)
92L/3	078	maqtsūp Malksope	Checkleset	fs	f		IR 7"There were five fishing stations: maqtsūp, in which coho and dog salmon ran." (Drucker 1951:222)
92L/3	126	7lcha:s (Echass)	Kyuquot	v			Village site (Arcas Ltd. 1995:66)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Sire	Comments
92L/3	127	Granite island	Kyuquot	v			IR 4; Habitation site: cedar source for canoes: timber source; trapping area. (Arcas Ltd. 1995:65)
92L/3	128	Easy Creek	Kyuquot	fs	f		Fishing station (Arcas Ltd. 1995:65)
92L/3	129	ououkinsh ō'ō'kinàc	Checkleset	fs	f		IR 5; "There were five fishing stations: ō'ō'kinàc, in which coho and dog salmon ran." (Drucker 1951:222)
92L/3	130	Wachts-pa-home	Checkleset	fs	f		"Dog salmon fishing station; habitation site" (Arcas Ltd. 1995:64)
92L/3	137	'Sha7ush	Kyuquot	fs			Probable fishing station (Arcas Ltd. 1995:65).
92L/4	074	ai'qō'às Acous FaSv1 (part)	Checkleset	tv	w	1893 - 15 bldgs.	IR 1; "The Checkleset were a single tribe with but one winter village, ai'qō'às." (Drucker 1951:222); Devereux's survey map records 15 structures. (1893)
not plotted	080	ō'was	Checkleset	fs	f		"There were five fishing stations: ō'was, in which coho and dog salmon ran." (Drucker 1951:222); Not located - probably a stream in Nasparti Inlet Arcas Ltd. (1995:68).
92L/4	081	ma'uxpɬ Mahope	Checkleset	fs	f		IR 3; "There were five fishing stations: ma'uxpɬ, in which coho and dog salmon ran." (Drucker 1951:222)
not plotted	082	tsatsinɬ	Checkleset	refuge site			"Near ai'qō'às was a refuge site called tsatsini to which the tribe moved when an attack was expected. Difficult to access unless one knew the channel well." (Drucker 1951:222); Not located - is near Acous (Arcas Ltd.1 995:68)
not plotted	084	a'aiʟ	Checkleset	fs			"There were no villages along the cape [Cook] except for naspat, and a'aiʟ, near the cape, where some Checkleset families went to fish for halibut." (Drucker 1951:222)
92L/4	1131	Hub-toul	Checkleset	fs	s		IR 2; A Fishing station: trolling grounds (Arcas Ltd. 1995:64)
92L/4	132	not recorded	Checkleset				Possible habitation site; possible herring fishing station and trapping base. Approximate location. (Arcas Ltd. 1995)

Map Sheet	Place No.	Place Name	Affiliation	Type	Season	Size	Comments
92L/4	133	Naspat (Naspahtee)	Checkleset	v			Village; fishing station. (Arcas Ltd. 199568); "There were no villages along the cape [Cook] except for a small station called naspat, which they used occasionally, and a'aiL." (Drucker 1951:222).
92L/4	134	Quineex	Checkleset				IR 8; Habitation site; halibut fishing area: trapping base (NOTE: This description may refer to Naspat) (Arcas Ltd. 199565)
92L/4	135	Checkaktis island	Kyuquot	v	s		IR 9; Ancient village; deep sea fishing station; clam source (Arcas Ltd. 1995:65)
92L/4	136	not recorded Bunsby Isl.	Checkleset				Possible habitation site; possible herring fishing station and trapping station. Approximate location. (Arcas Ltd. 199564); Houses; herring? (Fieldnotes, West Coast Project File: RBCM Human Historv File)

Legend: **Type:** **tv = tribal village cv = confederacy village v= village fs = fishing station lg = local group**
Seasonality: **yr = year round sp = spring s = summer f = fall w = winter**

7.5 Traditional Activities/Material Culture

The following table was compiled based on information gathered about traditional activities undertaken by Nuu-chah-nulth people within the study area. The data was assembled in a table format because it was thought that a table format would be more visual and provide a better idea of how the actual traditional activity becomes something that can be used for creating a model able to predict archaeological potential based on the physical characteristics of the landscape and the constraints they provide for human activity.

7.6 Archival Trails Research (by John Dewhirst)

Aboriginal trails in the Northern Nuu-chah-nulth area are poorly reported in the literature, and the available information must be considered severely deficient for the whole Northern Nuu-chah-nulth area. The map holdings of the Surveyor General Branch, in particular, were combed thoroughly, and found very little information on aboriginal trails. The paucity of information is the result of historical and demographic circumstances. It was not until the turn of the century that detailed land maps were prepared for much of the Northern Nuu-chah-nulth area. By this time the aboriginal population was literally decimated and tended to be concentrated in larger settlements. Smaller numbers of people travelled inland and many trails known from later ethnographic sources grew over. Aboriginal trails, in places, also followed game trails. Maps that show trails are usually associated with early homesteading and land surveying, particularly just before World War I. Parts of those trails may have had an aboriginal origin, but it is unclear. Indian Reserve maps show aboriginal trails extending for a short distance beyond the Indian Reserve boundary, and one is left wondering where and how far they went. Sources with site specific information on aboriginal trails are cited in the table and included in the bibliography.

Table 1 1 . Archival Trails Research.

Map Sheet	Trail No	Affiliation	Aboriginal Trail Status	Trail Accuracy	Comments
92E/10	T01	Mowachaht	Unconfirmed	2* map & text	From Friendly Cove westward there is a good trail for about 7 miles. Supplies were packed over the trails to each individual pre-emption. (Clague 191360) Map 12 T 6: West Coast, #105774
92L/3 92L/2	T02	Kyuquot	Confirmed	2 map rendering & text	From the mouth of the "Tarshish" River, a trail leads 4 miles upriver on the north bank, then winds east to follow the river for a number of miles before reaching a cataract 25-30 ft tall. After crossing the river, the trail continues in northeast for 2 miles, crossing the river back and forth, then west for 5-6 miles to Lake Atluck. (Hankin 1862) Map 9 T 1 - 54, Kayuket Inlet, #107422; Rupert map 17 T 4.
92E/9 92E/15	T03	Muchalaht	Confirmed	2 text & map	A "fairly good" trail up the west bank of the Gold River for 8 ½ - 9 miles up to the forks where the Upana River joins Gold River, where from the trail continues up the west bank of the Gold River for 2 ½ miles. (Holmes 1927:122); Up the "Mutchalat River" [Gold River], there is a canyon. "This cation is altogether impracticable for canoes - a well beaten Indian mountain trail exists, over which we travelled for a mile and a half on the right bank, striking the river again about 4 miles from Muchalat. Beyond that for 4 miles we travelled over large bars and benches: sometimes up the mountain side, sometimes in the river, and camped at a place which we have called 'Earthquake Camp' - close to an Indian salmon-weir of curious construction. Distance travelled about 11 miles.." (Torrens 1865)
92E/9	T04	Muchalaht	confirmed	2 map doesn't show full trail	1893 Surveyor's map of Moo-yah IR 16 shows partial trail running from the now Mooyah River, through the southeast corner of the reserve, and ceases to map the trail as it heads north along a meadow of "marsh grass" (Devereux 1893c).
92E/9	T05	Muchalaht	confirmed	2 map only	1893 Surveyor's map of Match-lee IR 13 shows two small trails which run off of Matchlee Creek, one cutting through the N end of the reserve, the other runs S but is not within reserve boundaries (Devereux 1893b).
92L/4	-06	Checkleset	confirmed	2 map only	1893 Surveyor's map of A-co-us IR 1 shows a short trail which extends off of the reserve in a westerly direction. (Devereux 1893a)

***Trail Accuracy:**
1 = good information; trail plotted within 100 m of its actual location on the TRIM maps
2 = okay information; trail plotted within 500 m of its actual location on the TRIM maps
3 = poor information; trail plotted within 1 000 m of its actual location on the TRIM maps

7.7 Community Trails Research

The focus of the community trails research component was to talk to people who had used trails or had knowledge of people who had used trails in the past. Sheila Savey brought 1:50,000-scale maps to each community and talked to people who were said to have knowledge about trails. The trails were traced onto the maps and digitized. The following table has been compiled from the data gathered by Sheila during the project.

Table 12. Community Trails Research.

Map I.D. Number	NTS Map Number	Activity	Geographical Description	Source*	Comments
CT01	92E/10	Hunting, Trapping, Fishing, Harvesting	From Tuquatis (waterfalls) to Crawfish Lake	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt and trap deer, bear, ducks; fish for coho, sockeye; pick berries, roots, and grasses. When tide was out, looked under rock for octopuses.
CT02	92E/10	Hunting, Trapping, Fishing, Harvesting	From Nootka Cannery to outside beaches	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt and trap deer, bear, mink, martens, and racoon. Gathered many seafoods.
CT03	92E/10	Hunting, Trapping, Fishing, Harvesting	From Yuquot to Tsatsil (Lagoon)	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt and trap deer, mink, marten, racoon, and bear. Gathered many seafoods. Access trail to outer beaches,
CT04	92E/10	Shelter	From Dallas Cove to Yuquot	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to shelter boats in storms, could walk home from there.
CT05	92E/10	Hunting	From one end of Strange Island to the other	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt deer. Could be picked up at the other end of the island.
CT08	92E/10	Hunting	Fox Island	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt seals (seal cave).
CT09	92E/10	Hunting, Trapping, Fishing	From Burwood Point to Estevan Point, and Escalante River	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt and trap all wildlife. Fished in river for al fish including steelhead.
CT10	92E/9 and 92E/10	Hunting, Whaling, Fishing	From Cheeshish, Hleeptee, Mooyah and Ous to Escalante Point	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used for hunting all kinds of wildlife, fishing, and whaling. Water route to Escalante Point.

Map I.D. Number	NTS Map Number	Activity	Geographical Description	Source*	Comments
CT11	92E/14	Hunting, Trapping	From Tatchu Point along rocks and shoreline to Sandstone Point	Moses Smith-E	Used to hunt and trap, bear, deer, mink, and racoon.
CT12	92E/15	Hunting, Visiting	From Ehattesaht to Kyuquot Boundary	Moses Smith-E	David John hunting ground. Used to hunt bear and deer. Could walk along beach and rocks when tide out.
CT13	92E/15	Visiting	From Little Espinosa Inlet to Ehatis IR#11	Moses Smith-E	Canoe on both sides. Took water route to a village called Klitshia.
CT14	92E/15	Hunting, Trapping	From Mary Basin to Inner Basin	Moses Smith-E	Used to hunt and trap land otter, racoon. and mink.
CT15	92E/15	Hunting, Trapping	From Blowhole Bay to Next Lake	Moses Smith-E	Old Captain Jack's trapline. Used to hunt and trap martens.
CT1 6	92E/15	Hunting, Fishing	Tsowwin River	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt deer and fish along river.
CT17	92E/15 and 92L/2	Hunting, Trapping, Trading	From Tahsis Lake to Woss Lake, from Woss Lake to Nimpkish Lake	Ambrose Maquinna-M/M, Wilfred Andrew-M/M	Used to hunt and trap deer, mink, and marten. Used to trade herring eggs, animal skins, and eulachon (tle-nah oil.
CT021	92L/4	Hunting, Trading	From East side of Brooks Peninsula to Cape Cook	Mike Oscar-C/K, Hilda Hansen-C/K	Used to trade with Quatsino people. Used to hunt bear.
CT023	92L/4	Hunting	From Nasparti Inlet, along rivers and lakes	Mike Oscar-C/K, Hilda Hansen-C/K	Used to hunt elk.
CT024	92L/4	Hunting, Seine Fishing	From Johnson Lagoon, along rivers and lakes	Mike Oscar-C/K, Hilda Hansen-C/K	Used to hunt elk and for seine fishing
CT032	92L/3	Hunting	From Ououkinsh Inlet, along rivers and lakes	Mike Oscar-C/K, Hilda Hansen-C/K	Used to hunt elk.
CT036	92L/6	Trading	From Nimpkish Lake through creeks to Tashish Lake	Mike Oscar-C/K, Hilda Hansen-C/K	Used for trading.

*C/K-Che:k:tles7et'h'/ Ka;'yu:'K't'h'
E- Ehattesaht
M/M-Mowachaht/Muchalaht

7.8 Review of Archaeological Sources

Prior to a discussion of the archaeology of the overview area, the Borden Site Designation Scheme must be introduced. Archaeological sites are numbered according to the Borden Site Designation Scheme which is used throughout Canada. This scheme is based on the maps of the

National Topographic System and uses latitude and longitude to pinpoint a site's location, The four alternating upper and lower case letters (for example Dj Sp 1) designate a unique 10' latitude by 10' longitude 'Borden Block'. Sites are numbered sequentially within a block, based (usually) on their date of discovery (for example DjSp 1 was the first site recorded in block DjSp).

A major excavation in 1966 identified a 4,200-year old occupation at the summer village of Yuquot (DjSp-1) in Friendly Cove on Nootka Island (Dewhirst 1978, 1980), and test excavations at the village of Kupti (also known as Coopte) by John Dewhirst in 1966 (Marshall 1992:49) and by Alan McMillan in 1968 (McMillan 1969) established at least 1,200 years of occupation at this site. These are the only two excavations to have taken place within the study area.

Few wide-area surveys have been conducted on the west coast of Vancouver Island north of Clayoquot Sound. Nonetheless, more than 200 archaeological sites have been recorded along the shores of southern Nootka Sound, primarily the result of a 1989-1992 systematic intensive shoreline survey conducted by Yvonne Marshall for her dissertation research (Marshall 1992, 1993). Among the significant discoveries resulting from Marshall's project was the recording of important scatters of potentially early stone tools in intertidal contexts around Nootka Sound. This may represent the earliest evidence for prehistoric human occupation configured to lower relative sea levels on the west Coast of Vancouver Island.

Surveys of the study area have also been completed for the Brooks Peninsula and sections of traditional Che:k:tles7et'h' and Ka;'yu:'K't'h' hahoulthees (Haggerty 1997, Haggerty and Inglis 1984, 1997), and sections of traditional Ehattesaht hahoulthee shoreline (Arcas and Archaeo Tech 1993). Other surveys in the area include the Mahope River and Battle Bay (Rousseau and Howe 1987) and a judgemental survey of Senicio Ridge on the Brooks Peninsula (Keddie 1988). Besides this overview project, there has been two other smaller overviews conducted within the study area. Arcas and Archaeo Tech conducted a cultural heritage overview of Checleset Bay and Outer Kyuquot Sound (Arcas and Archaeo Tech 1995), and the Silverado Watershed (Arcas and Archaeo Tech 1994).

Keddie (1994) has conducted research in the alpine and subalpine areas of Vancouver Island in order to discover prehistoric use of the Vancouver Island marmot by Nuu-chah-nulth people. This information was used to allow the model to predict areas with potential for containing archaeological evidence of prehistoric marmot utilization.

Much of the recent archaeological work conducted in the study area has been happening away from the shore inside the forest. Archaeological impact assessments for proposed forestry developments in the study area have been completed for the following groups: MoF (Arcas 199 1, 1997b, Eldridge 1989), International Forests Products Limited (Arcas 1995a, 1996a, 1997c) and Doman-Western Lumber Limited {formerly Pacific Forest Products Limited (Arcas 1995b, 1996b, 1997d, 1998c)}. As a result of these studies, inland forest utilization sites have been identified throughout the study area including: on Bligh Island (Arcas 1991; Eldridge 1989), at Allman Lagoon (Arcas 1994c), Mooyah Bay (At-cas 1994d), along Port Eliza, Esperanza Inlet, Tlupana Inlet, Hanna

Channel, Tahsis Inlet, Muchalat Inlet (Arcas 1995b, 1996b, 1997d, and 1998c), Kyuquot Sound (Arcas 1997b), Amai Inlet (Arcas 1997b), and Soatwoon Lake (Arcas 1997b).

7.9 Regional Archaeological History

The regional sequence is only known from the excavations at the Yuquot site conducted by John Dewhirst in 1966 (Dewhirst 1978, 1980). The archaeological deposits at Yuquot consisted of four major zones which represented continuous occupation at the site for more than 4300 years. Over 3000 artifacts were recovered from the excavation. The artifact assemblage is characterized by the near-absence of chipped stone and ground stone artifacts throughout time. The sequence has been divided into the following four periods of time and occupation: Early Period (pre-4300 to 3000 B.P.), Middle Period (3000 B.P. to 1800 B.P.), Late Period (1800 B.P. to 200 B.P.), and Historic Period (200 B.P. to 30 B.P.). Fragmentary human remains were recovered in all four zones, but only one late prehistoric burial was present, and no information on prehistoric burial practises was obtained. Dewhirst believes that the continuity present in the Yuquot archaeological sequence results from the way change occurred rather than from a lack of change. Artifact types evolve through time from the simple to the more complex (Dewhirst 1980:336).

No excavations have yet been undertaken on the west coast of Vancouver Island north of Nootka Sound. The only other excavation that has taken place within the study area was initiated in 1966 by John Dewhirst and continued in 1968 by Alan McMillan at the large village site of Kupti (McMillan 1969). Additional investigations (not involving excavations) were carried out at Kupti by Yvonne Marshall in 1990 and 1991. Carbon dating reveals at least 1200 years of continuous occupation with the oldest deposits at the site undated (Marshall 1993:33). The artifacts recovered from Kupti are comparable to those from the same time period present at Yuquot. No prehistoric burials were reported. Marshall's more recent work at Kupti focussed on the intertidal zone, where a remarkable assemblage of chipped stone artifacts has been recovered, in marked contrast to the virtual absence of chipped stone artifacts in the artifacts recovered from the Yuqout and Kupti artifact assemblages (Marshall 1992). Marshall also obtained three radiocarbon age estimates from samples collected by McMillan in 1969; these ranged from an early date of 3090±90 BP to a later date of 490±75 BP (Marshall 1990: Table 4.3).

As discussed by Marshall (1993:38) the cultural sequence from the Northern Nuu-chah-nulth area has been summarized as being representative of relatively little change throughout the entire prehistoric period. In fact, the 4000 year prehistory for the entire Nuu-chah-nulth area is placed into a single "West Coast Culture Type" in the recently compiled ***Handbook of North American Indians*** (Mitchell 1990:356) because in Mitchell's opinion there is little evidence (as demonstrated by the artifact types or fauna1 remains) for change in subsistence or other aspects of technology throughout prehistory. This assertion of continuity has been made based on very little information, and it is uncertain whether the excavations at Yuquot and Kupti are representative of the entire Norther Nuu-chah-nulth area throughout all of prehistory. As indicated by Marshall's work in the intertidal zone at Kupti, chipped stone artifacts are certainly present on the west coast of Vancouver Island and this

new information needs to be used to re-evaluate the assertion that there was very little change in prehistory on the west coast of Vancouver Island. It is tentatively suggested that at least some of the flaked stone tools from intertidal environments in Nootka Sound, and perhaps elsewhere on the west coast of Vancouver Island, represent early period sites configured to the lowstand of relative sea levels in this region, which were subsequently inundated during resubmergance after about 7000 BP.

7.10 If... Then Statements

The following examples demonstrate the 'If...Then' statements used during the creation of the Non-CMT and CMT models used for this overview.

Non-CMT Model Example

```
/***
/*** 6: Midden - Coastal
/***

Reselect COA3 = 4 and SLO = 1 and ( SAL = 1)
Calculate ACT6 = 1
```

CMT Model Example

```
Reselect COA2 = 3 and SLO = 1 and ( SAL = 1 or SAL = 2 )
Calculate ACT6 = 2

/***
/*** 2: Bark Stripping - Yellow Cedar
/***

Reselect FC2 = 1 and CMTCOA = 1 and ( SLO = 1 or SLO = 2 or SLO = 3 ) and EL = 3
Calculate CMT2 = 1

Reselect FC2 = 1 and ( CMTCOA = 3 or CMTCOA = 4 or CMTCOA = 5 ) and ( STR = 1 or DBL
= 1 ) and ( SLO = 1 or SLO = 2 or SLO = 3 ) and EL = 3
Calculate CMT2 = 1
```