
OKANAGAN TIMBER SUPPLY AREA
ARCHAEOLOGICAL OVERVIEW ASSESSMENT

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Arcas Consulting Archeologists Ltd.

OKANAGAN TIMBER SUPPLY AREA
ARCHAEOLOGICAL OVERVIEW ASSESSMENT

Prepared for:

MINISTRY OF FORESTS
Salmon Arm / Vernon / Penticton Districts

and

ARCHAEOLOGY BRANCH
Ministry of Small Business, Tourism and Culture
Victoria, B.C.

Prepared by:

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SUMMARY

Arcas Consulting Archaeologists Ltd. has developed an archaeological potential model for the Okanagan Timber Supply Area (Penticton, Vernon, and Salmon Arm Forest Districts). The model was designed for land-use planning and archaeological resource management. It is a tool in the planning process that takes place prior to forestry operations or other developments. The model works by determining the potential for impacting archaeological sites, which are protected under section 6 of the *Heritage Conservation Act (1994)*. If development lands are predicted to have potential for containing archaeological sites, the model recommends which actions should be followed.

The model assigns classes of archaeological potential to all lands within the Okanagan TSA. These classes are based on a total score resulting from the accumulation of individual scores assigned to various landscape or cultural features present at any given location. Attached to each potential class is a recommendation for action.

- **Class 1:** Lands with low potential for archaeological sites -- usually do not require additional assessment.
- **Class 2:** Lands with low-to-medium potential for archaeological sites -- some reconnaissance (not necessarily including a field survey) is recommended.
- **Class 3:** Lands with medium-to-high potential for archaeological sites -- some form of field reconnaissance should be required.
- **Class 4:** Lands within this potential class have high potential for archaeological sites -- formal impact assessments are required for any developments planned in these areas.

The scores underlying these potential classes are assigned either to landscape features which cover a particular area (for example, stands of Old Growth Cedar), or to buffers extending outward from the features. A typical stream will have 250 metre-wide buffers on either side of its centreline, and it is these buffers that are scored. Known archaeological sites, trails, certain environmental settings and forest stands, certain landforms, certain slope categories, lakes and ponds, rivers and streams, ungulate winter range, mountain passes, and sections of rivers where fish traps might be present form this set of variables. When applied to the Okanagan TSA, over 95% of the known sites in the region were incorporated within lands requiring some level of assessment (that is, archaeological potential Classes 2, 3, and 4).

Correct use of the model is a two-step process:

- Check the model as output on maps (1:150,000-scale paper maps or map datasets on CD-ROM), to see if the location of the development area lies within or is intersected by a potential area rated as Class 2 or higher.
- If so, review the recommendations for subsequent action.

A reconnaissance assessment is recommended for both Class 2 and Class 3 lands. In the case of Class 2 potential, an in-office review of detailed development plans may be all that is required. A rating of Class 3 potential should result in a recommendation that a Preliminary Field Reconnaissance (PFR) be required. A Heritage Inspection Permit issued by the Archaeology Branch (Ministry of Small Business, Tourism and Culture) is mandatory if subsurface testing is required. If archaeological sites are identified or their presence is considered to be likely, an Archaeological Impact Assessment (AIA) will be recommended. Lastly, an AIA is automatically recommended for all lands rated as Class 4 potential. AIAs must be carried out under a Heritage Inspection Permit.

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Several Ministry of Forests (MoF) personnel deserve mention for their assistance with this long project. In particular, we would like to acknowledge the efforts of Paul Birzins (Salmon Arm District), who acted as the MoF coordinator for this project, and Ross Porcheron (Penticton District), who coordinated GIS mapping and model application throughout the Okanagan TSA. GIS Analyst Tim Bouwmeester (Penticton District) was a great help throughout the project in helping us understand the capabilities of the GIS and in providing us with the many outputs we asked for. Aboriginal Liaison Officers Carl Mashon (Vernon District), Dave Nordquist (Salmon Arm), and Brent Turmel (Penticton) provided information about their respective districts when required.

A number of individuals took time to discuss the study with ARCAS staff. We are particularly indebted to those authorities who provided invaluable information from a local or regional perspective. Al Mackie (Archaeology Branch) provided information about undocumented archaeological sites on Sugar Lake, together with the name of an experienced local collector. Similarly, Ian Franck (Equinox Consulting Archaeologists) supplied information about the results of an unreported reconnaissance to Old Town Bay on Shuswap Lake. Jean Bussey of Points West Heritage Consulting kept us up to date on her work in the Penticton Forest District. Ethnographic sub-consultant Diana Alexander shared her opinions and expertise about traditional hunter - gatherer - fisher land use in the Southern Interior of B.C. Okanagan - Similkameen archaeologist Stan Copp (V.C.C. - Langara) kindly reviewed test plots of the model outputs and provided opinions about site potential issues in the southern Okanagan Valley and Similkameen River valley. A number of people responded with information about the location of anecdotal sites or unrecorded historical resources from regional museums -- Dan Bruce (Kelowna Centennial Museum), Joan Cowan (Enderby & District Museum Society), Randy Manuel (Penticton Museum), J. Smith (Naramata Heritage Museum Society), and Wayne Wilson (BC Orchard Industry Museum). These authorities pointed out that an overview of [primarily] historical cultural resources had been carried for the entire Kamloops Forest Region a few years ago. Following this lead, we were able to determine through John Stevenson (Heritage Conservation Branch)-that this project had been carried out by historian Justine Murdy.

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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 other individuals, groups, or institutions involved in the study. Arcas Consulting Archeologists is solely responsible for the contents of this report, including any errors, omissions, or shortcomings.

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1.0 INTRODUCTION

This report represents the results of an Archaeological Overview Assessment of lands within the Okanagan Timber Supply Area (TSA). Part of the Kamloops Forest Region in the Southern Interior of British Columbia, the study area is comprised of the Penticton, Vernon, and Salmon Forest Districts. The overview was conducted by Arcas Consulting Archeologists Ltd. (ARCAS) with the assistance of Diana Alexander (ethnographic research), Ken Favrholt (trails research), and Range & Bearing Environmental Resource Mapping Corporation (digitization of map coverages) for the Archaeology Branch, (Ministry of Small Business, Tourism and Culture) and the Salmon Arm Forest District (Ministry of Forests). The overview was prepared in accordance with the study proposal prepared by ARCAS (February 19, 1996), the guidelines for an Archaeological Overview Assessment in the *British Columbia Archaeological Impact Assessment Guidelines* (Apland and Kenny 1995a), issued by the Archaeology Branch, and the guidelines for an overview in the *Protocol Agreement on the Management of Cultural Heritage Resources*, jointly issued by the Ministry of Small Business, Tourism and Culture and the Ministry of Forests (July 1994).

The primary purpose of the overview was to provide written and mapped information in the form of a GIS-compatible, digitized model of archaeological resource potential in the TSA. This model is intended for use in future resource management and land use decision making. The overview consists of the following products:

- A report (this document), providing background information, describing the research methodology, and summarizing the results of the overview for the Okanagan TSA.
- A set of digitized maps, one for each of the three Forest Districts, displaying the distribution of known archaeological sites, recorded trails, and identifying locations of low, medium, and high archaeological potential, using archaeological potential polygons.
- Several relational databases linked to the digitized map sets, including: (i) information about each archaeological potential polygon, (ii) locational information about all recorded archaeological sites within the Okanagan TSA, and (iii) coverages for each of the variables used to construct the model.
- A CD-ROM for each Forest District, containing the digitized map information, archaeological databases, and model coverages.

1.1 DEFINITIONS

This overview is exclusively concerned with archaeological resources. It is not intended to provide a complete synthesis of information on all types of cultural heritage sites that occur within the TSA. In particular, Traditional Use Sites (defined below) are not dealt with in this study. Furthermore, this overview does not provide a thorough review of the history or ethnography of the TSA, though historical and ethnographic information has been incorporated into the study.

In order to predict archaeological potential, the overview relied on ethnographic, archaeological, and historical information:

- **Ethnography** refers to the description of the culture of particular ethnic groups through participatory observation and interviews with the members of that group.
- **Archaeology** seeks to understand the human past through the examination of the material remains of human culture.
- **History** can be defined as the study of the human past through the examination of documents and other written records.

In this overview, the term **archaeological resources** is synonymous with archaeological remains, that is, the physical materials resulting from past human activities. **Archaeological sites** are locations containing such material evidence, usually in the form of **artifacts** (discarded or lost objects manufactured by people), **faunal remains** (the butchered remains of animals used as food by people in the past), and **cultural features** (physical alterations to the landscape such as rock art, pithouse depressions, or bark-stripped trees). A single archaeological site may thus contain one or more types of archaeological remains. **Traditional use sites** are places that have been used by one or more ethnic groups for some type of traditional activity, frequently lacking *physical* evidence for past human use, but nevertheless of significant historical or cultural meaning to a living community or group.

1.2 OBJECTIVES

The primary purpose of the Okanagan TSA study was to provide a synthesis of cultural resource information about the distribution of archaeological sites in the Penticton, Vernon, and Salmon Arm Forest Districts, to assist in resource use and development planning. Specifically, the objectives of the study were to:

- Construct a GIS-compatible model, comprised of digitized biophysical attributes believed to influence the occurrence and distribution of archaeological resources, and apply it to the Okanagan TSA.
- Produce a report which describes the methodology used to construct the model and includes: (i) a summary of previous archaeological research in the Okanagan TSA; (ii) discussion of the nature and distribution of archaeological resources in the TSA; also (iii) a discussion of traditional land use by First Nation people in the TSA, and its affects on archaeological site distribution; (iv) identification of gaps in the existing archaeological site inventory for the TSA; (v) identification of gaps in digitized resource variable coverages; (vi) recommendations for additional archaeological inventory studies; and (vii) recommendations for appropriate utilization of the potential model in Cultural Resource Management.
- Produce a set of digitized maps from a base scale of 1:20,000, showing: (i) the distribution of known archaeological sites, (ii) attribute coverages which are believed to influence site potential, and (iii) archaeological potential polygons identifying locations of varying potential.
- Construct relational databases, electronically linked to the digitized map set, containing detailed information about known archaeological sites, the variables used to develop the model, and the archaeological potential polygons.

1.3 DEFINITION OF THE OKANAGAN TSA AREA

The Okanagan TSA covered by this overview is comprised of the Okanagan - Shuswap LRMP area, conforming to the boundaries of the Penticton, Vernon, and Salmon Arm Forest Districts (Figure 1). The boundary of the TSA (and its constituent Districts) is quite irregular, occasionally following political boundaries, but more frequently using natural divisions such as watershed divides. The total area of the TSA is 2,448,635 ha, divided among the Districts accordingly: (1) Penticton = 931,288 ha; (2) Vernon = 815,185 ha; and (3) Salmon Arm = 702,162 ha.

The Okanagan TSA study area is dominated by a broad valley (the Okanagan Valley) running up the centre of the TSA from Osoyoos at the International Boundary to O'Keeffe Ranch at the head of Okanagan Lake. Shuswap Lake and its tributaries occupy a series of narrow troughs radiating from the main lake north of the Okanagan Valley proper. Moderately-rolling upland plateaus (the Okanagan Highland, the Shuswap Highland, and the Thompson Plateau) flank the valleys to east, west, and north, and are dissected by several side valleys, most notably those of the Similkameen, Salmon, and Shuswap Rivers, and several rivers tributary to Shuswap Lake. High, rugged mountains are present in the extreme southwestern corner of the TSA (Okanagan Range) and along the eastern boundary of the Salmon Arm and Vernon Forest Districts (Monashee



Figure 1. Location of Okanagan TSA (1:2,000,000).

Ranges of the Columbia Mountains). Modern settlement is concentrated in valley bottom settings, with mid-elevation settings dominated by agricultural rangeland and recreational lands, while extractive industries and some recreational facilities are most characteristic of higher, montane settings.

1.4 STUDY TEAM

The members of the study team are listed on the Credit Sheet at the beginning of this report. Essentially, project co-ordination, model-development and review, archaeological background research, and reporting were the responsibility of ARCAS. Specialized subcontractors were employed for ethnographic and trails research to supplement the archaeological research. Range & Bearing was subcontracted to provide digitized coverages for the model developed by ARCAS. The Penticton Data Centre (Ministry of Forests) undertook to provide GIS-based services, including model input and implementation. Lastly, the Assessment and Planning Section (Archaeology Branch) reviewed model development on an ongoing basis and was responsible for preparing the Request for Proposals.

2.0 PHYSICAL SETTING AND ENVIRONMENTS

2.1 MODERN ENVIRONMENTS

The Okanagan TSA includes the entirety of what are colloquially referred to as the Okanagan and Shuswap regions of the Southern Interior. Small fractions of areas peripheral to these regions, such as the Similkameen River valley and the Monashee Mountains, occur around the margins of the study area.

2.1.1 Physiography

Most of the TSA is situated within the Interior Plateau physiographic region of B.C. A very small fraction of the Coast Mountain region (the Okanagan Range of the Cascade Mountains) is present in the southwestern extremity of the Penticton District. Lastly, the west ranges of the Monashee Mountains along the eastern boundary of the Vernon and Salmon Arm Districts lie within the Columbia Mountains - Southern Rockies physiographic region (Pojar and Meidinger 1991).

Pojar and Meidinger (1991) characterize the Interior Plateau as mature, low relief terrain, strongly dissected by major river valleys. Although much of the landscape is covered by a thick blanket of glacial drift, outcrops of bedrock commonly protrude through its surface in both lowland settings and steep, rocky slopes are not uncommon above the entrenched valleys.

The Cascade Mountains represent the landward edge of the Coast Mountain Belt. In the study area, this landscape is dominated by steep-sided mountains with distinctive rounded summits that were overtopped by alpine glaciers during the Ice Age. To the northwest, the Monashee Range becomes increasingly rugged from south to north, and extensive areas of bare, alpine tundra and glacial ice are present in these mountains north of Monashee Pass. To the south and southwest, the Monashee Mountains are conspicuously lower, with rounded summits that rarely extend above the treeline.

2.1.2 Bedrock Geology

The bedrock geology of the Okanagan TSA has been more or less completely mapped at differing scales by the Geological Survey of Canada (e.g., Geological Survey of Canada 1947, 1960, 1961). The valley occupied by Okanagan Lake and the Okanagan River represents a trench in the geomorphic sense, in that geological formations do not often appear on both sides of the valley. Such a relationship does not hold for the valley north of Vernon, however. Roed (1995) reports that the origins of the valley date to an episode of middle Tertiary vulcanism that influenced much of the Southern Interior of the province.

Generally speaking, the bedrock geology of the eastern half of the study area is dominated by metamorphic rocks, including the Precambrian-aged Monashee Group. Other metamorphics are characteristic of the Shuswap Highlands north of Shuswap Lake, though localized exposures of sedimentary rocks are also mapped in this part of the study area. South of Vernon, Cretaceous-aged Valhalla Plutonic Rocks are about equally common in the TSA east of the Okanagan Valley as metamorphic rocks.

Bedrock geology west of the Okanagan Valley is conspicuously more complex than to the east. In the Penticton and Vernon Districts, Cretaceous-aged Nelson Plutonic rocks are relatively abundant, and Triassic-aged Old Tom Formation igneous rocks dominate the southwestern portion of the TSA. Permian-aged Cache Creek Group sedimentary and metamorphic rocks are present in the western parts of the Vernon District, where Eocene - Oligocene-aged Kamloops Group volcanic and sedimentary rocks also occur. In the central Okanagan Valley, undated Coast Intrusive rocks extend right across the valley.

Except for the Kamloops Group, which includes extensive exposures of fine-grained basalts, none of the aforementioned geological formations is known to be a favourable host for the types of lithic raw materials attractive to pre-contact stoneworkers. However, numerous localized formations are distinguished by outcrops of silicious minerals like chert and chalcedony, which were especially prized. Such formations are most abundant in the Cascade Mountains and in the Thompson Plateau, and are rare in the Shuswap and Okanagan Highlands. Lithic raw material sources are not known from the strongly-metamorphized formations of the Monashee Mountains, but few efforts have been made by archaeologists to locate such sources in these settings.

2.1.3 Surficial Geology

Surficial geological materials are those which are believed to represent the effects of recent events on the landscape, including the action of Pleistocene (Ice Age) glaciers and Holocene climates, lakes, and rivers (over the last 10,000 years). In the study area, glacially-derived sediments tend to be dominant at middle and higher elevations, while lower elevations and valley bottoms predominantly represent Holocene landforms formed by the past and ongoing development of lakes and rivers. For the purposes of the overview, surficial sediments associated with the following types of landforms were believed to be significant for development of the model:

- **Lacustrine/Glaciolacustrine:** Sediments associated with lacustrine or glaciolacustrine landforms are typified by fine-textured silts, silty clay, or very fine sand. Lacustrine sediments are sometimes so compact that they impede drainage, and when dry tend to be extremely dusty. The well-known silt bluffs around the southern end of Okanagan Lake, between Summerland/Naramata and Penticton, are classic examples of lacustrine sediments in the study area.

- **Fluvial/Glaciofluvial:** Fluvial and glaciofluvial sediments are normally much more coarsely-textured than lacustrine materials, and range from fine sand to almost pure deposits of gravel and cobbles. Glaciofluvial sediments are normally more diverse in texture than modern stream deposits; Holocene sediments will vary based on the origin of the stream or river by which they were deposited. Fluvial sediments are normally quite well-drained, though glaciofluvial deposits may be quite compact and thus impede local drainage. River terraces along the Salmon and Shuswap Rivers, and the numerous stream deltas around the shoreline of Shuswap Lake, represent typical fluvial landforms in the Okanagan TSA.
- **Alluvial Fans:** Sediments deposited in ancient or modern alluvial fans tend to be poorly-sorted, coarse-textured, and very well-drained. Fans may be found at all elevations, but only those in or near valley bottoms are considered to have any potential for containing archaeological sites.
- **Aeolian Veneers on Low-elevation Moraines:** These are very fine-textured silts or fine sands deposited by winds on landforms created by melting (or ablating) glaciers. Most aeolian sediments were deposited during the early to middle Holocene, so archaeological sites contained within them can be of considerable antiquity. Landforms with sediments of this type are fairly characteristic of the rolling country north and east of Vernon, particularly in the Coldstream and Spallumcheen Valleys.

Other types of distinctive landforms in the Okanagan TSA were not regarded as significantly affecting archaeological site potential. For example, glacial moraines at middle elevations are so widespread that they were not useful for modelling. Some types of glacial landforms, notably eskers, would be considered to have considerable archaeological potential, but were not observed on any of the geological maps utilized for the overview.

A mosaic of surficial geological mapping distinguishes this class of biophysical data throughout the Okanagan TSA. Surface geology has been mapped at a variety of scales and in restricted areas, so there is no complete coverage of the entire study area. In particular, the southwestern and southeastern margins of the TSA are poorly served by such mapping. Table 1 summarizes the existing coverage of surficial geology in this region.

2.1.4 Modern Climates

The climates of the Okanagan TSA predominantly represent those characteristic of the Southern Interior Ecoprovince (see Section 2.1.6), while the Southern Interior Mountains Ecoprovince is notably moister and cooler. Generally, rainshadow effects dominate the Similkameen and Okanagan Valleys to the south, while an increasing gradient of moderately dry

Table 1. Summary of Surficial Geological Mapping in the Okanagan TSA.

Map Title	Map Unit	Scale	Map Type	Agency ¹
Surficial Geology - Seymour Arm	82 M	1:250,000	Topographic	GSC
Surficial Geology - Shuswap Lake	82 L/NW	1:126,720	Topographic	GSC
Surficial Geology - Vernon	82 L/SW	1:126,720	Topographic	GSC
Landforms and Slopes	82 M	1:50,000	Topographic	MoE
Soils of the Vernon Map Area	82 L	1:50,000	Topographic	MoE
Soils of the Penticton Map Area	82 E	1:50,000	Topographic	MoE
Surface Materials	82 L	1:20,000	Topographic	MoE
Surface Materials	82 E	1:20,000	Planimetric	MoE
¹ GSC = Geological Survey of Canada; MoE = Ministry of the Environment (B.C.)				

to wet, and warmer to cooler climates characterize the landscape from the Shuswap region to the Monashee Mountains.

Mean annual (July) temperature exceed 20 C in the southern Okanagan Valley and Similkameen River valley, decreasing to between 16 and 20 C for most of the rest of the study area. Mean July temperatures below 16 C typify the northern Monashee Mountains.

Climatic data also emphasizes a south-to-north and west-to-east moisture gradient across the study area. The south Okanagan and Similkameen River valleys receive less than 30 cm of precipitation per year. The remainder of the Okanagan Valley and the western part of the Shuswap region get between 30 and 50 cm, whereas the eastern Shuswap, the Monashee Mountains, and the highlands west of Okanagan Lake receive between 50 and 100 cm. Lastly, the northern Monashee Mountains get from 100 to 250 cm of precipitation annually.

2.1.5 Hydrology

The Okanagan and Shuswap regions are principally distinguished by the fact that the Okanagan lies within the Columbia drainage basin (via the Okanagan River), while the Shuswap is part of the Fraser drainage basin (via the South Thompson and Thompson Rivers). A short section of the Similkameen River -- and Canadian reaches of its last major tributary, the Ashnola River -- are present in the southwestern part of the Penticton Forest District, joining the Okanagan at Oroville, Washington. The headwaters of the Salmon River arise beyond the limits of the TSA study area in the Merritt Forest District. Lastly, the headwaters of the Kettle and West Kettle Rivers

(tributaries of the Columbia River in the neighbouring Boundary Forest District) arise in the eastern extremities of the Vernon and Penticton Districts, respectively.

A three-part system was used to describe lakes within the TSA. Large lakes are those greater than 5000 ha in area, medium lakes range from 500 to 5000 ha, and small lakes range from 1 to 500 ha in area. Only three large lakes are present within the study area, including Okanagan Lake, Shuswap Lake, and Mabel Lake. Medium-sized lakes are not significantly more abundant in the TSA, and include Osoyoos, Skaha, Pennask, Wood - Kalamalka¹, Sugar, Mara, White, and Hunakwa Lakes. Hundreds of small lakes are scattered throughout the study area, especially at middle and higher elevations, but notable small lakes include Vaseaux, Yellow, Hydraulic, Aberdeen, Oyama, Bouleau, Pinaus, Ellison, Swan, Gardom, Echo, Greenbush, Rosemond, Hidden, Three Valley, and Humamilt Lakes. If not connected to Kalamalka Lake by the Oyama Canal, Wood Lake would also be considered to be a small lake.

A similar system was used to classify watercourses. Primary streams are equivalent to double-line streams in the Ministry of Environment, Lands and Parks' 1:20,000-scale **Terrain Resource Information Management** (TRIM) base-mapping system. In the study area, they mainly include the major rivers of the TSA, including the Ashnola, Similkameen, Okanagan, Kettle, Shuswap, Salmon, Eagle, Perry, Anstey, and Seymour Rivers. However, some reaches of major creeks, notably Mission Creek and Scotch Creek, are output in the model as primary streams. Secondary streams are the equivalent of single line streams in TRIM, and include hundreds of named creeks in the TSA, and often include the upper reaches of many rivers (e.g., West Kettle and Ashnola Rivers). Intermittent and indefinite stream TRIM categories are the equivalent of the hundreds or thousands of ephemeral or seasonal watercourses within the Okanagan TSA, most of which are not named. Again, the highest reaches of primary and secondary streams might be considered to be this class of watercourse in the model.

2.1.6 Ecoregion Zonation

The province of British Columbia has been subdivided into various Ecoprovinces and Ecoregions, which reflect landscapes containing similar patterns of climatic variation, though physiographic variation can be considerable. Hierarchically arranged within most Ecoregions are a number of distinct Ecosections, which are landscape divisions with minor climatic and physiographic variations (Demarchi, et al 1990). This is a more coarse-grained approach to ecosystemic classification than biogeoclimatic zonation, more accurately representing actual habitat preferences of plant and animal species (Cannings and Cannings 1996). Demarchi (1990) is the best summary of this system for British Columbia.

¹ Wood and Kalamalka Lakes are actually separate entities, joined by the Oyama Canal, but are output as a single unit in TRIM. Their natural drainage is into Okanagan Lake via Kalamalka Lake, but water from either lake can flow into the other at different times of the year.

The Okanagan TSA is predominantly situated within the **Southern Interior Ecoprovince**, though much of its eastern third is within the **Southern Interior Mountains Ecoprovince**. Within the latter Ecoprovince, only the **Columbia Mountains and Highlands Ecoregion** is represented, incorporating the following Ecosections:

- **Southern Columbia Mountains Ecosection:** Demarchi (1990) defines this landscape as an area of high ridges and mountains interspersed with wide valleys and trenches. The mountains become more prominent eastward. Precipitation is high on the mountain slopes but rainshadows are common in the southern valleys. In the Okanagan TSA, only the headwaters of the Kettle River in the Vernon District is within this Ecosection.
- **Shuswap Highlands Ecosection:** This landscape is a highland area intermediate between the plateaus to the west and the mountains to the east. The climate here is warmer and winters are milder than the Quesnel Highlands to the north (Demarchi, et al 1990). The Monashee Mountains north of Monashee Pass, Sugar Lake and Mabel Lake, the western part of Shuswap Lake (excluding Mara Lake), and the Shuswap Plateau represent some of the principle landscape features within this Ecosection.
- **Northern Columbia Mountains Ecosection:** According to Demarchi (1990), this Ecosection is an area of high, rugged mountains, many of which are ice-capped. It has the highest precipitation and coldest temperatures in the TSA. Within the study area, the northern Monashee Mountains east and north of Shuswap Lake are within this Ecosection.

Most of the Ecosections associated with the Southern Interior Plateau Ecoprovince are present within the Okanagan TSA. One undivided Ecoregion and four Ecosections of the **Thompson - Okanagan Plateau Ecoregion** are described within the study area:

- **Okanagan Range Ecoregion:** This Ecoregion lies in the strong rainshadow created by the Cascade Mountains and is very dry. It is the northern limit of an Ecoregion that extends along the dry eastern slope of the Cascade Range in Washington (Demarchi, et al 1990). In B.C., this Ecoregion is not differentiated into Ecosections. A limited area of montane terrain, predominantly bounded to the east and north by the Similkameen River, is the only part of this Ecoregion within the TSA.
- **Okanagan Basin Ecosection:** According to Demarchi (1990), this landscape is characterized as a warm and exceptionally dry area with a high diversity and abundance of wildlife. In the TSA, this Ecosection includes the Okanagan Valley from the border to Vernon.
- **Okanagan Highland Ecosection:** This is an area with long, rounded ridges and wide, deep valleys that is transitional in height between the Thompson Plateau to the west and the higher Columbia Mountains to the east. It has a moist climate (Demarchi, et al 1990).

This Ecosection includes all of the eastern part of the TSA east of the Okanagan Lake and south of a line drawn between Enderby and Lumby.

- **Southern Thompson Upland Ecosection:** This Ecosection is an area with flat plateau uplands, steep-sided plateau walls, and two large lowlands [not within the TSA]. It has the driest climate of any plateau upland in this region... (Demarchi, et al 1990). The western part of the Okanagan TSA, north of the Similkameen River and south of the Salmon River, is within this Ecosection.
- **Eastern Thompson Upland Ecosection:** Demarchi (1990) reports that this landscape is a dissected plateau with warm, dry summers and mild winters with relatively high snowfall. In the TSA, the remainder of the landscape north and northwest of Vernon and Lumby, including the lower Salmon River, Salmon Arm (of Shuswap Lake), and the western end of Shuswap Lake, is within this Ecosection.

2.1.7 Biogeoclimatic Zonation

Based on pioneering work by ecologist V.I. Krajina, the Ministry of Forests has subdivided the entire province into biogeoclimatic zones. In comparison with the Ecoregion - Ecosection system discussed previously, the B.C. biogeoclimatic zonation provides a more fine-grained description of a landscape. Within each zone there are a number of subzones, and many of these have distinctive variants that are also mapped. This system of classification is fully described in *Ecosystems of British Columbia* (Meidinger and Pojar 1991), and subzonal information can be found in Lloyd, et al (1990). Earlier studies on particular aspects of ecological classification in the Southern Interior can be found in Tisdale (1947), Tisdale and McLean (1957), and McLean (1970).

Despite a few exceptions (see Section 6.2), the relevance of subzonal and variant-level biogeoclimatic zonation to archaeological site potential is inconclusive. There would appear to be a natural relationship between particular vegetation associations and archaeological sites, but ecosystemic mapping at this degree of resolution is extremely rare in B.C. Within the TSA, the Ministry of Environment has prepared a vegetation classification study for the Vernon Map Area (Clement, 1981), which includes the northern Okanagan Valley and the southern part of the Shuswap region. No comparable recent work is available for the southern Okanagan and Similkameen valleys, although some of the earlier studies address vegetation associations (Tisdale 1947; Tisdale and McLean 1957; McLean 1970).

Of the 14 separate biogeoclimatic zones that exist in B.C., seven are present within the Okanagan TSA. They can be characterized as follows:

- **Bunchgrass Zone:** This is the hottest and driest biogeoclimatic zone in the province, but compared to the South Thompson and Fraser - Chilcotin Rivers, is of quite limited extent in the Okanagan TSA. Vegetation associations attributable to this zone are confined to valley bottom settings, usually on higher terraces with minimal influence from lakes and rivers. This zone is only present in the southern Okanagan River valley below Penticton, and the Similkameen River valley below Hedley, but there are also localized grassland variants associated with both the Ponderosa Pine and Interior Douglas-fir Zones. The Very Dry Hot Subzone is the bunchgrass subzone present in the study area. Zonal vegetation in this subzone is typified by (in descending order) bluebunch wheatgrass (*Agropyron spicatum*) and big sagebrush (*Artemisia tridentata*), with pasture sage (*Artemisia frigida*), rabbit-brush (*Chrysothamnus nauseosus*), Sandberg's bluegrass (*Poa sandbergii*), and needle-and-thread grass (*Stipa comata*). Desert-parsleys (*Lomatium* spp.) and bitterroot (*Lewisia rediviva* [sic]) are significant traditional plant resources associated with this subzone (Nicholson, et al 1991; Tisdale 1947; McLean 1970).
- **Ponderosa Pine Zone:** This is the driest and warmest forested zone in B.C. It is slightly more extensive in distribution within the TSA than the Bunchgrass Zone, being found throughout the Similkameen River valley and in the Okanagan Valley as far north as Kelowna. The Ponderosa Pine Zone will be found at higher elevations than the Bunchgrass Zone where both are present. Ponderosa pine forests are typically open and park-like, and may include small stands of Douglas-fir as well. Douglas-fir will also occur in moist settings such as streamside settings, along with birch trees and a diverse suite of shrubby species. The Very Dry Hot Subzone is represented within the Okanagan and Similkameen valleys. Characteristic zonal vegetation is dominated by Ponderosa pine (*Pinus ponderosa*), bluebunch wheatgrass, and rough or Idaho fescue [grass] (*Festuca scabrella idahoensis*), with timber milk-vetch (*Astragalus miser*), rabbit-brush, and arrow-leaved balsamroot (*Balsamorhiza sagittata*) as common co-dominants (Hope, et al 1991a; McLean 1970). The latter plant is a particularly important traditional food resource in the Southern Interior.
- **Interior Douglas-fir Zone:** This is the dominant mid- to low-elevation biogeoclimatic zone throughout the study area, and is particularly important in the Vernon and Salmon Arm Districts of the TSA. Forests within this zone are more dense than the Ponderosa Pine Zone, but are distinctly more open than other forested zones in this region. Upper elevations of this zone range from 900 to 1400 m above sea level (asl), so IDF forests are often associated with montane or upland settings in the TSA. Three subzones of the Douglas-fir Zone are present within the Okanagan TSA: (i) the Very Dry Hot IDF subzone occurs at lower elevations in the Okanagan Valley south of Enderby and in the Similkameen River valley, where its zonal vegetation is dominated by Douglas-fir (*Pseudotsuga menziesii*), pinegrass (*Calamagrostis rubescens*), birch-leaved spirea (*Spirea betulifolia*), and ponderosa pine; (ii) the Dry Mild IDF subzone is found in the Okanagan Highlands, with zonal vegetation dominated by Douglas-fir, pinegrass, kinnickinnick

(*Arctostaphylos uva-ursi*), soopollallie (*Shepherdia canadensis*), western larch (*Larix occidentalis*), and lodgepole pine (*Pinus contorta*), and (iii) the Moist Warm IDF subzone is found in the Southern Thompson Uplands west of a line drawn between Peachland and Salmon Arm, in which the zonal vegetation is typified by Douglas-fir, birch-leaved spirea, falsebox (*Paxistima myrsinites*), twinflower (*Linnea borealis*), and lodgepole pine (Hope, et al 1991b; Tisdale and McLean 1957).

- **Interior Cedar - Hemlock Zone:** This zone is characteristic of the Monashee Mountains (Shuswap Highland Ecoregion) and low to middle elevations in the eastern part of the Shuswap region (Eastern Thompson Upland Ecoregion). This is a high diversity, densely-forested zone reminiscent of coastal rainforests to the west. Although ICH forests are found in valley bottoms in the northern and eastern Shuswap, they typically represent montane forests throughout the northeastern part of the TSA. Three subzones of the Interior Cedar - Hemlock Zone are present within the study area: (i) the Moist Warm ICH subzone is found in southern Monashee stream valleys and around Shuswap Lake, and its zonal vegetation is typified by western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), Douglas-fir, and falsebox; (ii) the Moist Cool ICH subzone is typical of the northern part of the Shuswap Highlands, with zonal vegetation distinguished by the aforementioned species, plus hybrid white spruce (*Picea glauca x englemannii*), and subalpine fir (*Abies lasiocarpa*); and (iii) the Wet Cool ICH subzone is found in the northern Monashee Mountains east and northeast of Shuswap Lake, where its zonal vegetation is dominated by red cedar, western hemlock, devil's-club (*Oplopanax horridus*), oak fern (*Gymnocarpium dryopteris*), and lady fern (*Athyrium filix-femina*) (Ketcheson, et al 1991). Despite the high diversity of plant species, there are no traditional plant resources which are unique to this zone.
- **Montane Spruce Zone:** This is a middle- to high-elevation montane biogeoclimatic zone, present in the Southern Thompson Upland Ecoregion and the Okanagan Highland Ecoregion, south of a line drawn between Vernon and Lumby. Typically, MS Zone forests are altitudinally sandwiched between lower IDF and higher ESSF forests. This is probably the least-productive zone for traditional resources in the entire TSA. The Dry Mild MS subzone appears to be the only subzone present in the study area; its zonal vegetation is dominated by hybrid white spruce, lodgepole pine, subalpine fir, Douglas-fir, falsebox, black huckleberry (*Vaccinium membranaceum*), and grouseberry (*Vaccinium scoparium*) (Hope, et al 1991c).
- **Englemann Spruce - Subalpine Fir Zone:** This is the uppermost forested zone present in the Okanagan TSA, where it is normally found between 1200 and 2300 m asl. ESSF forests are found throughout the TSA at high elevations, primarily in the Monashee Mountains in the eastern parts of the Vernon and Salmon Arm Districts, and in the Okanagan Range Ecoregion in the Penticton District. Some subzones and subzonal variants of the ESSF zone have abundant plant resources which could have been exploited

by First Nations people. In particular, parkland and grassland settings near timberline would have been important locations for traditional resource harvesting, and processing of food plants harvested in higher alpine settings. There are three ESSF subzones present within the TSA: (i) the Very Dry Cold ESSF subzone occurs in the rainshadow of the Coast Mountains in the southwestern corner of the Penticton District, where its zonal vegetation is typified by subalpine fir, grouseberry, Englemann spruce (*Picea englemannii*), and five-leaved bramble (*Rubus pedatus*); (ii) the Dry Cold ESSF subzone is also found in the Coast Mountains rainshadow area in the western extremity of the TSA, and its zonal vegetation is typified by subalpine fir, white-flowered rhododendron (*Rhododendron albiflorum*), Englemann spruce, and grouseberry, and (iii) the Very Wet Very Cold ESSF subzone is characteristic of high snowfall areas of the Monashee Mountains, and its zonal vegetation is dominated by subalpine fir, Englemann spruce, black huckleberry, five-leaved bramble, white-flowered rhododendron, false azalea (*Menziesia ferruginea*), oak fern, and mountain hemlock (*Tsuga mertensiana*) (Coupé, Stewart and Wikeem 1991; McLean 1970).

- **Alpine Tundra Zone:** This zone occurs on high mountains where they are present within the TSA -- primarily in the Okanagan Range Ecoregion and the Northern Columbia Mountain and Shuswap Highland Ecoregions. In the southern parts of the TSA, the AT Zone occurs at elevations above about 2250 m asl; in the northeast, above 1650 m asl. The AT Zone has not yet been differentiated into subzones. This zone is by definition treeless, but stunted or *krummholz*-form trees may be present near its normal lower elevation. Three vegetation patterns (not equivalent to subzones) are frequently found in alpine settings -- alpine scrub or dwarf shrubfields, alpine grassland, and alpine herb meadows. The former is not usually found in the study area, but the remaining two are most representative of the AT Zone in the TSA, with grasslands being more or less restricted to the southwestern part of the Penticton District and meadows being found more or less throughout in moist settings (Pojar and Stewart 1991; McLean 1970).

2.2 ANCIENT ENVIRONMENTS OF THE OKANAGAN TSA

There is spotty coverage of Pleistocene and post-Pleistocene geology in the Okanagan TSA. The most thorough treatment is Fulton's monograph for the Nicola-Vernon Area (1975), which covers the northern Okanagan Valley and most of the Shuswap region. Surficial geology of the northern part of the study area is mapped at a small scale (Geological Survey of Canada 1986). Nasmith (1962) is a summary of valley-bottom surficial geology for the entire Okanagan Valley, including locations further south than are covered by Fulton's study. No comparable study has been carried out for the Similkameen River valley. Lastly, Kershaw (1978) and Roed (1995) are popular treatments of Quaternary geology of the Okanagan region.

2.2.1 Post-glacial Geomorphology

Recent palaeoenvironmental studies indicate that the Cordilleran Ice Sheet of the Vashon Stade covered all of southern British Columbia until about 12,000 years ago (Ferguson and Osborn 1981, Hebda 1982; Clague 1981). The Okanagan Lobe of the Fraser Glacier was the last advance of glacial ice in the study area (Kershaw 1978; Roed 1995). Geologists believe that it existed between about 25,000 and 12,000 years ago, with the most intensive glacial conditions beginning around 19,000 years ago (Kershaw 1978; Roed 1995), and reaching its maximum extent near the town of Chelan, on the Columbia River in northern Washington about 15,000 years ago (Carrara, Kiver and Stradling 1996; Mack, Rutter and Valastro 1979). Sediments from the earlier Okanagan Centre Glacier (beginning ca. 50,000 BP) and Olympia Nonglacial Interval (ca. 100,000 BP) are exposed at several places within the TSA (Fulton and Smith 1978), though for the most part they were dispersed by the last Fraser Glacier (Roed 1995).

Most upland areas of south-central B.C. were deglaciated between 12,000 and 11,000 years BP; however, large ice-masses remained in the major valley bottoms until as late as 10,000 years BP (Clague 1981; Hebda 1982, Mathewes 1985; Fulton and Smith 1978; Mathewes and Rouse 1975). Down-wasting of ice masses first occurred in the hilly uplands, leaving behind trunk-valley glaciers, stagnant blocks, and a piedmont apron of ice along the eastern and western fronts of the Coast and Columbia Mountains, respectively (Clague 1981). As the ice-sheet wasted away, meltout drift punctuated by kettle and kame topography and coarse-grained meltwater deposits were left behind. The results can be seen in the uplands dissected by the Salmon River valley, the Spallumcheen Valley between Vernon and Armstrong, and middle elevations of the Okanagan Valley west of Summerland, which are characterized by small deltas, ice marginal terraces, kettled topography, and veneers of lag gravel. The gravel deposits were formed during deglaciation while ice occupied the valleys and depressions, and most drainage paralleled the ice margins. Terraces and abandoned channels indicate that silt-laden meltwater flowed (some of the time) through the Okanagan Valley from the South Thompson River drainage east of Kamloops (Fulton 1969; Kershaw 1978).

In the TSA, deglaciation began around 11,000 years ago and had been largely completed by 9000 years ago. Deglaciation proceeded more quickly in the uplands marginal to the valley, and the main body of what is now the Okanagan Valley was choked by stagnant ice long after surrounding upland regions were ice-free. Before deglaciated locations were covered by recolonizing vegetation, fine-textured silts and sandy sediments were removed by winds and deposited in veneers and dunefields around the Okanagan and South Thompson River valleys (Kershaw 1978).

As down-wasting glaciers freed the uplands, stagnant ice tongues remained in the valleys, obstructing meltwater flow and producing glacial lakes (Fulton 1969). The main and tributary valleys of the central and northern Okanagan were filled with a gigantic lake known as Glacial Lake Pentiction. At its highest stands (the Grandview Flats and B.X. Stages), this lake stood at

an elevation of 457 m asl (about 100 m higher than the modern elevation of Okanagan Lake) (Roed 1995). These stages of Lake Penticton extended from the present-day location of Enderby, south to an ice dam near Okanagan Falls (possibly at McIntyre Bluff), and east to the upper reaches of the Shuswap River and Mabel Lake (Fulton 1965; Roed 1995). This glacial lake gradually receded to the current limits of Okanagan Lake by about 8900 years ago (Kershaw 1978). Up to 150 m of light-coloured silts were deposited in the bottom of Lake Penticton, and today form conspicuous eroded bluffs throughout the southern Okanagan Valley. A much smaller glacial lake (Lake Oliver) was present in the southern end of the Okanagan Valley (Geological Survey of Canada 1968; Nasmith 1962; Kershaw 1978). This lake extended approximately from the location of McIntyre Bluff north of Oliver to an ice dam just south of the U.S. border, and occasionally drained into the Similkameen River valley via the so-called Yellow Lake Channel to Keremeos (Nasmith 1962).

A sequence of very large glacial lakes also occupied the valleys in the Thompson - Shuswap drainage basin. The most significant of these was Glacial Lake Thompson (South Thompson and Niskonlith Stages) (Fulton 1965, 1969), which drained east and south into Lake Penticton (Grandview Flats and B.X. Stages) around a number of ice dams that filled the present basin of Shuswap Lake. At its maximum extent, Lake Thompson extended from the valleys of the Deadman and North Thompson Rivers to the middle Salmon River valley (between Armstrong and Falkland) and connected with Lake Penticton (Fulton 1969; Farley 1979). Glacial Lake Thompson eventually diminished into Lake Deadman, but continued to drain east to the Shuswap - Okanagan system via the South Thompson River and a high stand of Shuswap Lake that extended to Monte Creek. When Lake Deadman receded to the approximate elevation of modern Kamloops Lake, headward erosion up the valley of the South Thompson River quickly captured the Shuswap drainage from the Okanagan (Fulton 1969). Extensive silt bluffs along the South Thompson River mark the maximum elevation of Lake Thompson, which cannot have been lower than about 500 m asl (Fulton 1965).

The timing of the various events that affected development of the Southern Interior glacial lakes is not well known. However, it is likely that Lake Penticton only existed for about 1000 years (Roed 1995), and was drained by about 8900 years ago. Modern drainage patterns in the TSA were firmly established between 8500 and 7000 years ago, and most aeolian deposition had ceased by about 6000 years ago (Alley 1976; Kershaw 1978). Lastly, rivers throughout the Southern Interior achieved their bedrock-controlled modern channels by about 5000 years ago, creating stabilized watercourses into which populations of anadromous salmonids could run. Permanent barriers to spawning salmon are present at two locations within the Okanagan region, on the Similkameen River below the International Boundary and at Okanagan Falls near the foot of Skaha Lake. These barriers would have impeded fish running into these waters at the time that the rivers reached their bedrock-controlled channels, so local salmon runs probably have not been available in the central Okanagan Valley or the Similkameen River valley for at least 5000 years.

It is likely that ancient First Nations people would have regarded the glacial lakes as inhospitable environments. In their early stages, the centres of these lakes would have been distinguished by long, narrow islands of stagnant ice. Moreover, throughout their existence, they would have been deep bodies of very cold, turbid water with few nutrients available for aquatic organisms. Rolling upland plateaus flanking the main valleys -- particularly those with steppe tundra grasslands, which would have been excellent grazing lands for extinct bison and other ungulates -- would probably have been more favoured by First Nations people during this period.

2.2.2 Palaeoenvironments of the Okanagan TSA

The palaeoenvironmental history of British Columbia has recently been summarized by Hebda (1995), and a popular account of ancient environments in the Okanagan is presented in Roed (1995). Earlier studies of particular relevance to this region include Alley (1976), Hansen (1955), Mack, Rutter and Valastro (1979), and Mathewes and King (1989).

As uplands within the Okanagan TSA began to deglaciate (between 12,000 and 11,000 BP²), plant and animal populations re-established themselves from refugia situated beyond the limits of glacial ice and cold in Washington and Oregon. During this Early Neoglacial interval (Roed 1995), the study area consisted of a treeless landscape consisting of cold-adapted, pioneering grasslands (so-called steppe tundra) in the uplands and extensive relict ice and glacial lakes in the valleys (Hebda 1982, 1995). Sparse coniferous forests dominated by lodgepole pine and spruce became established between 12,000 and 10,000 years BP, and grasslands developed in the valley bottoms as they were cleared of relict ice (Hebda 1982, 1995). Near the end of this period (approximately 10,000 BP in the Okanagan Valley of Canada, probably later in the Shuswap region and Monashee Mountains), a shift to a significantly warmer and drier climate began, signified by increases in ponderosa pine, grasses, and sage, and a corresponding decrease in lodgepole pine (Mathewes 1985; Mack, Rutter and Valastro 1979; Roed 1995). Between 10,000 and 7500 BP sage grasslands became wide-spread throughout the Southern Interior, especially at lower elevations. In particularly arid settings, valley-bottom grasslands probably expanded upwards to merge with alpine grasslands (Hebda 1982, 1995). Forest vegetation in such conditions would have been restricted to upper elevations and moist, north-facing slopes. Shortly after or near the end of this period (5000 to 4000 years BP) the climate again shifted, gradually becoming moister and cooler (Alley 1976; Mack, Rutter and Valastro 1979; King 1980; Hebda 1982, 1995; Mathewes 1985; Roed 1995). The end of this interval, known as the Hypsithermal, coincides with a massive fall of tephra (volcanic ash) from the eruption of Mount Mazama (Oregon) around 6600 BP.

² - Radiocarbon years **B**efore **P**resent, where present = AD 1950.

Between 4000 and 3500 BP, montane grasslands receded and dryland species (e.g., sages) were largely replaced by mesic-adapted grass species (Hebda 1982, 1995; Mack, Rutter and Valstro 1979). Expansion of ponderosa pine and Douglas-fir forests occurred throughout upland and northern areas and eventually descended to elevations just above modern levels (Hebda 1982). These changes signify a return to cooler and moister conditions, and is referred to by geologists as the Mid-Neoglacial Interval, marked by pronounced advances of mountain glaciers throughout the Pacific Northwest (Roed 1995). The cool and moist climate persisted until about 2000 BP, and mountain glaciers again began to advance during the last, or Late-Neoglacial Interval (the Little Ice Age) between 900 and 100 BP (Roed 1995). During this last Neoglacial period, grasslands became restricted to the valley bottoms. Soon after this the climate became slightly drier, and modern vegetation boundaries were established. Historic colonization and land development have profoundly affected the modern distribution of vegetation. In particular, there is evidence that timber harvesting and cattle ranching may have resulted in increased abundance of sagebrush at the expense of grasses and trees (Anderson 1973; Cawker 1978). Land clearing for farming has also resulted in increased populations of poplar, alder, willow and weedy herbs throughout the region.

3.0 ETHNOGRAPHIC OVERVIEW by Diana Alexander

3.1 SCOPE AND OBJECTIVE OF THE ETHNOGRAPHIC OVERVIEW

This overview examines aspects of the ethnographic and ethnohistoric record that are most effective in predicting the location of late prehistoric First Nations sites in the study area. It contains little information on First Nations political organization, mythology, art, music, ritual, and religion, since many social and religious practices did not result in the formation of archaeological remains, and it is generally difficult to predict the location of such activities. The overview focuses on an analysis of environmental data and traditional land use patterns -- that is, subsistence and settlement patterns as they existed before the arrival of Euro-canadians in the early 1800s.

All First Nations groups on the Interior Plateau followed the same general land use pattern, but the importance and timing of certain activities varied slightly from group to group, depending on local availability and abundance of traditional resources. Detailed information on localized land use practices and on the use of specific locations, would greatly assist in modelling prehistoric site potential. Unfortunately, the ethnographic and ethnohistoric records rarely describe the practices of individual bands or regional groups, and provide little information on the use of specific localities. Most recent work by ethnographers and First Nations communities has focussed on collecting band-specific information, but for bands in the Okanagan TSA this information is available only in largely unrecorded oral histories of First Nations elders. Ideally, any study of traditional land use should combine consultation with First Nations elders and archival research, but the terms of reference for this study precluded such work. Consequently, research for this overview was limited to an examination of materials from the University of British Columbia Library, and in-office libraries of ARCAS and the author.

3.2 FIRST NATIONS GROUPS IN THE STUDY AREA

Before discussing First Nations land use patterns and their implications for the archaeological record, it is necessary to establish which First Nations groups occupied lands in the study area, since cultural practices vary from group to group. Moreover, an examination of traditional social organization and property rights is needed, to establish whether access to the land and its resources was limited within the group, and whether access was denied to outsiders.

This is not a simple task, since most First Nations groups in the Okanagan TSA have made changes to both their resource-procurement territories and village locations over the last 300 years. The stimulus for some of the earlier recorded movements -- beginning in the early 1700s -- is unknown. Changes made in the early 1800s appear to have been largely the result of three factors:

- The introduction of the horse, which led to heavy competition for grazing land and allowed easier access to lands away from major waterways.
- The beginning of the Euro-canadian fur trade, which led to greater competition for the lands where animals could be trapped and hunted.
- The introduction of infectious diseases after Contact, which led to major population declines, followed by coalescence and shifting of First Nations populations.

Given these changes in traditional territories, the distribution of the First Nations described below should be seen as a rough extrapolation. The conclusions drawn in this overview are not intended to be used as the basis for land claims settlements or for aboriginal rights claims.

Based on the available information, four ethnolinguistic groups were occupying or using lands within the Okanagan TSA at Contact in the early 1800s (see Table 2). Lands in the northern third of the TSA were occupied by the **Secwepemc** (Shuswap) peoples, while the **Okanagan-Colville** used most of the remaining lands (Teit 1909). A few **Nlaka'pamux** (Thompson) used lands along the western border of the TSA (Kennedy and Bouchard 1987a). Secwepemc, Okanagan-Colville, and Nlaka'pamux represent three of the four languages that make up the Interior Salish division of the Salish language family (Duff 1969). An isolated group of linguistically-extinct Athapaskan-speakers, known as the **Nicola-Similkameen**, also occupied the Similkameen River valley in the southwestern corner of the study area (Kennedy and Bouchard 1985). Because Nlaka'pamux use of the TSA was marginal and little has been documented about the Nicola-Similkameen, this overview focuses on the land use patterns of the Okanagan-Colville and the Secwepemc.

3.2.1 Group Composition and Ownership of Resources

The Secwepemc were divided into seven geographically and linguistically distinct regional groups or divisions (Teit 1909:450). One of these regional groups -- the **Shuswap Lake** -- claimed territory in the study area. Of seven Okanagan-Colville regional groups, the **Northern Okanagan, Similkameen, Lakes**, and possibly **Colville** were using lands within the study area at Contact (Turner, Bouchard and Kennedy 1980; Bouchard and Kennedy 1984a). The Nlaka'pamux were also divided into regional groups, but it is unclear which group used lands in the study area. The occurrence of two different named groups (Kennedy and Bouchard 1985) suggests that the Nicola-Similkameen were also divided into two separate regional groups -- one in the Similkameen Valley and the other in the Nicola Valley.

These **regional groups** were comprised of neighbouring bands, linked to each other by marriage, kinship, and frequent association. Bands within these regional groups tended to share resources with each other more frequently than with other local bands. First Nations within each

ethnolinguistic and regional group shared the same language, culture and history, but these groups did not function as social or political units (Duff 1969; Hudson 1990).

Each band was comprised of a group of closely related families who usually wintered at, or within a few kilometres of a larger village (Dawson 1892; Teit 1900, 1909, 1930; Ray 1939; Hudson 1990). Bands were social communities with common interests, but they were not political units. Band membership could change; for instance, Okanagan-Colville families sometimes spent the winter with one band and the summer with another (Teit 1930). Secwepemc people from a small village equidistant from two main villages also sometimes changed affiliation from one band to another (Teit 1909). The lands commonly used by these people were claimed by the band with which they were affiliated. As a result of these changing affiliations, the territorial boundaries of a band could shift with time (Alexander 1992a). Borders along major waterways, where villages and salmon fishing stations were located, were usually clearly marked. However, the borders of the more remote hunting and other resource harvesting areas were often poorly defined, and peripheral locations were often used by one or more neighbouring bands (Ray 1936, 1939; Teit 1909). The bands known to have occupied the Okanagan TSA in 1850 are listed in Table 2.

The village was the basic political unit, with each village having a number of leaders or chiefs selected for their skills in fishing, hunting, war, or oratory. Each band also had a hereditary chief, who gave advice on internal matters, regulated some of the seasonal pursuits, and helped settle disputes. However, the chief had no means of enforcing his decrees, and important decisions were made communally, with each adult male having equal rights and responsibilities. The extended family, or household, also had a headman who coordinated family activities and served as their spokesman (Teit 1909, 1930; Hudson 1990; Walters 1938).

Hunting and trapping grounds, trails, berry-picking areas, and root-digging grounds were the common property of the ethnolinguistic group, although each band had their own habitual resource areas near their homes (Teit 1900, 1909, 1930; Boas 1891; Alexander 1992a). Dawson states that all the Shuswap formerly had hereditary hunting grounds, each family having its own peculiar hunting place or places (1892; see also Boas 1891). However, Dawson was probably referring to the former system of hunting stewards; that is, hunting at specific locations was regulated by individual hunting stewards who inherited their position and whose family habitually used these locations. However, they did not own the land and they allowed others access to their area (Romanoff 1992). Those caught hunting without permission were merely required to share the meat with the steward (Dawson 1892). Similarly, Okanagan-Colville bands allowed neighbouring bands access to the resources in their territory, but only after obtaining consent from a chief (Hudson 1990; Teit 1930).

Trap lines, deer fences, fish weirs, and fish traps (all of which required some construction or seasonal maintenance) were owned by the individuals or families who built or maintained them (Teit 1909, 1930; Ray 1932). Snares, deer nets, weapons, dogs, and horses were also private property. Among Lillooet peoples, some fishing stations were individually owned, while other

stations were owned by residence groups or the larger ethnolinguistic group (Kennedy and Bouchard 1992). It is possible that the Okanagan-Colville and Secwepemc followed similar practices (Bouchard and Kennedy 1990), but most evidence suggests ownership by the ethnolinguistic group. For example, the salmon fishery at Sicamous Narrows was not the exclusive property of any one band, but used by people from seven Secwepemc bands (Bouchard and Kennedy 1986).

There is no evidence to suggest that access to a band's territory was denied to others outside the band, unless they were strangers, that is, unrelated people from another ethnolinguistic group. In fact, in some particularly resource-rich areas, members of different bands would hunt together, or sequentially, without arousing any intergroup animosity. Travel by individual families to hunt and trade in the territories of other ethnolinguistic groups was also common (Teit 1930). Only strangers caught trapping, hunting, or plant gathering within the traditional territory of another ethnolinguistic group would sometimes be driven off or even killed (Bouchard and Kennedy 1984a; Teit 1900, 1909, 1930). The frequent friendly contact and exchange of ideas and technology between neighbouring groups is doubtless a significant contributor to the consistent land use pattern throughout the Interior Plateau.

In summary, all territorial lands and resources may be seen as the common property of the ethnolinguistic group, while specific locations were still regulated, though not owned, by individual families or bands. The regulation of hunting in a specific location would tend to prevent over-depletion of game resources in that locality, while habitual use by a specific family would help keep a band's members dispersed throughout their traditional territory.

3.2.2 Distribution of First Nations Groups

Oral traditions and historic observations indicate that in the past 300 years, some of the lands in the Okanagan TSA have been claimed by two or more ethnolinguistic groups. Although many of these distribution variations were the result of contact with Euro-canadians, some changes must have occurred prior to Contact. These population shifts probably also occurred in the unrecorded past as local populations and resource abundance expanded and receded due to cultural and natural factors. An examination of distributional changes will help to clarify which First Nations groups were using the study area, and therefore which ethnographic reports should be examined for evidence of traditional land use patterns. Moreover, it will clarify which lands are likely to contain archaeological evidence attributable to more than one ethnolinguistic group.

At contact, the Okanagan-Colville ethnolinguistic group occupied most lands in the southern half of the TSA. The **Northern Okanagan** regional group claimed all lands in the Okanagan Valley from the International Boundary to the northern end of Okanagan Lake (Teit 1930). The **Similkameen Okanagan** used lands along the Similkameen River downstream from Keremeos (Bouchard and Kennedy 1984b). The **Lakes** primarily resided in the Columbia River drainage,

but would also have utilized montane settings along the eastern edge of the TSA. Three Valley Lake on the Eagle River was conventionally regarded as the boundary between the Lakes and Secwepemc (Bouchard and Kennedy 1985, 1986). Although most ethnographers assign the Kettle Valley to the Lakes, some evidence exists for its use by the **Colville**, who lived outside the study area -- on the Columbia River below Kettle Falls (Bouchard and Kennedy 1984a).

The western Shuswap drainage was occupied by the **Shuswap Lake** regional group of the Secwepemc. The **South Thompson** band wintered on the South Thompson River below Little Shuswap Lake, the **Adams Lake** band had villages near lower Adams Lake and occasionally on the Shuswap Lakes, the **Shuswap Lake** band wintered in a number of localities on Shuswap Lake, and the **Spallumcheen** band lived on the Shuswap River near Enderby (Teit 1909). Their combined hunting territory is assumed to have included all lands in the Thompson - Shuswap drainage, with the exception of some eastern borderlands claimed by the Lakes.

In the early 1800s, the Northern Okanagan began to expand their territory northward to Douglas Lake, where they eventually displaced the neighbouring Nlaka'pamux, Secwepemc, and Nicola-Similkameen (Teit 1930). The introduction of the horse, and the abundance of grazing lands in the Nicola Valley seem to have been the primary motives for this move, though this area also contained important spring hunting and fishing locations. The Northern Okanagan initially used the area only in the summer, but eventually established permanent settlements there (Kennedy and Bouchard 1987a). This northward expansion also seems to have included their takeover of lands on the upper Salmon River above Yankee Flats, as well as the upper Shuswap River above Mabel Lake (Turner, Bouchard and Kennedy 1980; Dawson 1892).

Major population declines also seem to have resulted in a general contraction of hunting territories in the 19th century. The Lakes peoples first experienced smallpox epidemics in about 1780 and 1790; other Okanagan-Colville groups were afflicted in 1832, and the Secwepemc in 1857 and 1862 (Teit 1930; Bouchard and Kennedy 1985). Table 2 provides pre-Contact population estimates for some of these groups. These estimates may not be very reliable, but they suggest that the Secwepemc and Lakes populations in the study area were reduced by 50% to 60%. First Nations informants have estimated that the Okanagan population was reduced by about 75% (Teit 1930).

Other territorial shifts occurred prior to Contact. In the distant past, the Okanagan Lake area was primarily a hunting ground for the Okanagan-Colville, whose winter villages were restricted to the lower Okanagan Valley (Teit 1930). By 1700, the Similkameen Okanagan had moved up the Similkameen River to Keremeos, displacing the resident Nicola-Similkameen (Kennedy and Bouchard 1985). By 1750, the Northern Okanagan were settled at the head of Okanagan Lake, though this settlement also included many Secwepemc people, as well as a few Nlaka'pamux and Nicola-Similkameen. However, the Okanagan-Colville hunting territory did not extend more than a few kilometres landward of the lake. The surrounding lands were claimed by the Secwepemc who hunted in the country east of Okanagan Lake south to a point due east of Penticton, including

a large part of the headwaters of Kettle River (Teit 1930). They also hunted in all the lands along the northeastern margin of the TSA, as well as lands within the Southern Thompson Upland from the Salmon River to the Similkameen River (Teit 1930).

The origins and history of the Athapaskan-speaking **Nicola-Similkameen** are not well known, and the length of their occupation of the Nicola and Similkameen River Valleys is uncertain (Boas 1896; Kennedy and Bouchard 1987a, 1985). However, fragmentary linguistic information suggests that their closest affiliation was to the Chilcotin (Kennedy and Bouchard 1985), and ethnographers suggest they moved into the area only several hundred years ago (Teit 1979).

One account relates that the Nicola originated from a Chilcotin warparty who moved into the unoccupied Upper Similkameen Valley as recently as the mid 1700s (Dawson 1892; Kennedy and Bouchard 1985). However, research suggests the Nicola-Similkameen had a much longer history in the area, and that their southern boundary once extended nearly to the mouth of the Similkameen River (Kennedy and Bouchard 1985). In the more distant past, their territory may even have included the Okanagan Valley from Penticton to Oliver (Bouchard 1993).

About 1700, the Okanagan-Colville drove most of the Nicola-Similkameen upstream to Keremeos, and the few remaining Nicola-Similkameen on the lower Similkameen River were absorbed by the Similkameen group of the Okanagan-Colville (Kennedy and Bouchard 1985). Similarly, the Nicola-Similkameen on the upper Similkameen River were absorbed by the **Nlaka'pamux** after the latter people extended their hunting and fishing territory to a point between Hedley and Keremeos in the mid 1700s, and later settled in the area (Teit 1930). According to a recent ethnographic account (Kennedy and Bouchard 1987a), Nlaka'pamux use of lands within the TSA was limited to border lands in the Similkameen River valley. Nevertheless, despite encroachment by other First Nations people and a smallpox epidemic, a small group of Nicola-Similkameen was still living between Hedley and Keremeos in 1800 (Bouchard and Kennedy 1984b).

The Nicola-Similkameen in the Nicola Valley suffered a similar fate. In the late 1700s, they had two pithouse villages, at either end of Nicola Lake, with a population of between 50 and 60 people residing at each (Teit 1930). However, in the early 1800s, all those at the upper end of the lake (plus 100 Nlaka'pamux fishing nearby) were killed by a group of Kamloops Secwepemc (Smith 1900). The Okanagan-Colville then moved into the area, however the Nlaka'pamux continued to hunt and fish in the area until the 1870s (Teit 1900, 1930). The Nlaka'pamux, who had previously maintained permanent settlements only on the lower Nicola River, began establishing settlements in the upper valley in the 1850s, and eventually absorbed the remaining Nicola-Similkameen (Teit 1900; Kennedy and Bouchard 1985).

In 1850, only about 60 Athapaskan-speaking people still lived in the Nicola and Similkameen River valleys, mostly in the latter. By 1900, only a fragmentary knowledge of the language remained, and through intermarriage with the Nlaka'pamux and Okanagan-Colville, none of the

Nicola Valley people were more than one-quarter Nicola-Similkameen. The last person with any knowledge of the language died in the 1940s (Kennedy and Bouchard 1985; Teit 1979).

In summary, at Contact (ca. 1810 in this region) the Similkameen River valley below Keremeos was occupied by the Similkameen Okanagan-Colville, and the upper valley was primarily occupied by the Nlaka'pamux. Prior to 1700, the Nicola-Similkameen claimed the entire valley. Before the arrival of the Nicola-Similkameen -- perhaps several hundred years earlier -- the upper Similkameen River valley was reportedly unoccupied (Kennedy and Bouchard 1985). However, it is probable that the valley was used at least as a hunting ground and lithic resource procurement area by the Okanagan-Colville and/or Nlaka'pamux.

The Okanagan-Colville were using lands at the headwaters of Keremeos and Trout Creeks at Contact, but as late as 1750, the Secwepemc claimed these areas as hunting territories. Sometime prior to this date, the Nicola-Similkameen used these lands (Teit 1900, 1930). Before the arrival of the Nicola-Similkameen, they may have been used as a hunting ground by the Okanagan-Colville, the Nlaka'pamux, or the Secwepemc.

At Contact, the southern Okanagan Valley was used by the Okanagan-Colville, but as recently as the 1750s they only claimed lands immediately adjacent to the lake. The Secwepemc used the surrounding lands as far south as Penticton. Moreover, the Nicola-Similkameen may have once used the lands from Penticton south. This evidence suggests that the Okanagan Valley north of Penticton may have primarily been used as a hunting ground until the Okanagan-Colville moved in, perhaps as recently as 200 years ago.

The Kettle River valley was claimed by the Okanagan-Colville at Contact (though it is unclear if the Lakes or Colville were the primary users). However, as late as 1750, the upper valley was used as a hunting ground by the Secwepemc.

Most of Thompson -Shuswap drainage basin was claimed by the Secwepemc at Contact. However, the Lakes regional group of Okanagan-Colville had hunting grounds along the upper Shuswap River above Mabel Lake, along the Eagle River east of Three Valley Lake, and in the headwaters of Perry River and Ratchford Creek. The Northern Okanagan had also taken over lands on the upper Salmon River above Yankee Flats, and the upper Shuswap River above Mabel Lake. Prior to 1800, all these lands appear to have been used by the Secwepemc as hunting grounds, with the closest village on Shuswap Lake (Teit 1930).

Table 2. First Nations groups in the Okanagan TSA.

Language Family	Language Division	Ethnolinguistic Group	Regional Group	Bands, ca. 1850	Pre-Contact Population (estimate)	Population, 1903 Census	Modern First Nations	Population, 1996 Census
Salishan	Interior Salish	Secwepemc (Shuswap)	Shuswap Lake	South Thompson	400	154	Neskonlith (Neskainlith-Halaut)	499
				Adams Lake	400	189	Adams Lake (Sahkalktum)	570
				Shuswap Lake	200	83	Little Shuswap	258
				Spallumcheen	300	140	Spallumcheen	574
		Okanagan-Colville	Similkameen	Upper Similkameen		181	Upper Similkameen*	41
				Ashnola				
				Lower Similkameen			Lower Similkameen*	313
			Lakes	unknown	800	342	Colville (USA)	?
			Northern Okanagan	Komaplix		239	Okanagan	1367
							Westbank	484
				Penticton		147	Penticton	675
				Inkameep		65	Osoyoos	316
				Douglas Lake		192		
		Nlaka'pamux (Thompson)	unclear	unclear			Upper Nicola*	715
Athapaskan		Nicola-Similkameen	unknown	unknown				

Information for this table compiled from Duff (1964:31-32; Teit (1909:450, 455, 461-62, 466); Teit (1930:203-13); Ministry of Aboriginal Affairs (1996); Bouchard and Kennedy (1985:71-74).

* The Nicola-Similkameen no longer exist as a separate group, but some members of the Upper Nicola First Nation claim descent from them. The Upper Nicola band is now considered primarily to be a Nlaka'pamux band, though it also contains members who are descendants of the Northern Okanagan (James and Oliver 1991:18-19). Some of the Nicola-Similkameen were also absorbed into the Similkameen River bands. In the 1920s, the Upper Similkameen and Ashnola bands were primarily Nlaka'pamux, while the Lower Similkameen band was primarily Okanagan-Colville (Teit 1930:204).

The foregoing evidence of shifting territorial boundaries has important implications for the archaeological record in the Okanagan TSA, including:

- In the distant past, lands in the Okanagan Valley north of Penticton may have been used primarily as a hunting area, suggesting that lands north of Penticton will have fewer sites containing housepits or matlodge platforms than lands to the south.
- Lands in the Similkameen River valley above Keremeos and near the head of the Nicola Valley were important hunting areas sought after by many different groups, suggesting that relatively high densities of sites may be present, though few sites with housepits or matlodge platforms might be present.
- With the exception of lands north of Enderby, all lands within the TSA have been used by two or more ethnolinguistic groups in the last 300 years. The patterning of late prehistoric archaeological remains on these lands may reflect use by more than one culture.

3.3 SUBSISTENCE STRATEGIES ON THE INTERIOR PLATEAU

It is common to organize a discussion of ethnographic data according to ethnolinguistic group, but on the Interior Plateau, differences in the subsistence and settlement practices of bands within the same group are often greater than those between bands from different ethnolinguistic groups. Moreover, with shifting territorial boundaries and natural fluctuations in the resource base, the land use pattern of a band sometimes changed through time. To clarify discussion, First Nations peoples in the study area are grouped into two divisions -- River and Lakes Divisions -- representing two major subsistence strategies.

3.3.1 River Division

The River Division includes bands for whom salmon was the most abundant and sought after food. Salmon spawning rivers within their territories had substantial runs every year. They could catch and dry enough salmon in one or two months to not only provide themselves with enough food to survive the next year, but also to acquire a food surplus that could then be traded with neighbouring bands.

In the Okanagan TSA, all bands using lands within the Thompson- Shuswap drainage, along the lowermost reaches of the Similkameen River (below Similkameen Falls in Washington), and along the lower Okanagan River (below Okanagan Falls) are considered to belong to the River Division. Based on the distribution of First Nations groups in 1800, the following regional groups and bands are included in this division: (1) all Secwepemc bands including South Thompson,

Adams Lake, Shuswap Lake, and Spallumcheen, and (2) some Okanagan-Colville bands including Penticton, Inkameep, Douglas Lake, and Lower Similkameen.

With substantial and reliable salmon runs, and possessing the technology needed to catch and store this resource in quantity, the River Division bands were able to become more sedentary, maintain a higher population density, and devote more energy to trade than the Lakes Division bands. This sedentary trend is well-exemplified among the Canyon Shuswap -- a Secwepemc regional group on the Fraser River outside the study area. The Canyon Shuswap made a large profit acting as middlemen between the other Secwepemc bands and the Chilcotin. They gave all their energies to salmon-fishing, the preparation of oil, and trading, and did very little travelling and hunting. They were almost completely sedentary, most of them living summer and winter in the same locality (Teit 1909:535). River Division groups in the TSA, particularly those dependent on the Okanagan and Similkameen systems, may not have been as sedentary as the Canyon Shuswap, because salmon runs on the Okanagan River system were smaller and less dependable (Manzon and Marshall 1980).

3.3.2 Lakes Division

Salmon was also an important food for many Lakes Division people, but the smaller and/or undependable salmon runs in their territory necessitated a greater dependence on other resources. For some, harvesting of resident freshwater fishes may have dominated the subsistence economy, while others were more dependent on hunting. For example, people in the upper Similkameen River valley, who had limited access to salmon, depended heavily on hunting (Teit 1930; Bouchard and Kennedy 1985).

Within the study area, the Lakes Division includes all bands with territories restricted to lands on the Similkameen River above Similkameen Falls, the Okanagan River drainage above Okanagan Falls, and the upper Kettle River valley. Based on the distribution of First Nations groups in 1800, the following regional groups and bands are included in this division: (1) Okanagan-Colville bands north of Okanagan Falls, and (2) the Upper Similkameen and Ashnola band of Nicola-Similkameen and Nlaka'pamux people.

The Lakes Division bands lacked the abundant and reasonably reliable salmon resource available to the River Division bands, and were obliged to live in smaller, more widely-dispersed groups in pursuit of a much wider range of dispersed and less-predictable food resources. Being more nomadic, they were less likely to revisit the same campsites every year than would River Division bands. Moreover, very small groups could not always afford the time and energy necessary to build a pithouse when it might be occupied for only a short time each year. It was also possible that the pithouse would have to be abandoned the following year if localized food resources failed to supply subsistence needs (e.g., Choquette 1985). Therefore, in contrast to River Division bands who almost always lived in pithouses (Teit 1909), Lakes Division bands

were more likely to winter in matlodes (Bouchard and Kennedy 1984a, 1985; Teit 1930). In other words, although all groups in the TSA built pithouses, lodges were the preferred dwelling in locations with restricted access to salmon, at least in the late pre-Contact and proto-historic period.

Lack of available salmon resources may have meant that food shortages were more common for the Lakes Division bands. However, the environmental settings (particularly Okanagan Range Ecoregion and Okanagan Basin Ecoregion) occupied by these groups are characterized by some of the highest biodiversity in the Southern Interior of the province (Demarchi, et al 1990), which may have somewhat mitigated the absence of salmon. Although game animals were dispersed and usually difficult to catch in large numbers, they were probably present in great abundance, especially in grasslands and grassland - forest ecotonal settings. At contact, ungulates in the lands occupied by the Lakes Division bands would have been dominated by mule deer and elk, with mountain goats available in the Okanagan Range and bighorn sheep common in the Okanagan Basin and Highlands. In the distant past, when grasslands covered a much greater expanse than at present, bison and even pronghorn antelope probably colonized the Okanagan Valley from the Columbia Plateau. Large populations of resident fresh water fish, dominated by trout, charr, suckers, and some larger cyprinids (i.e., minnows), existed in most of the low-elevation lakes and some middle-elevation lakes as well. The overall biomass of spawning fresh water fish populations would have been much smaller than salmon runs, but every permanent stream tributary to a lake would have supported a predictable run of one or more fish species during the year. High biodiversity in this region is most obviously exemplified by large stands of edible plants available to First Nations people, notably associated with riparian settings along lakes and tributary streams.

Notwithstanding these relative advantages, all groups were vulnerable to periodic failures of food resources. To alleviate resource fluctuations in poor years, members of these bands traded with, or occasionally lived with the River Division groups. Raiding was another means of attempting to resolve food shortages (Cannon 1992; also see Chatters 1985, 1986a; Chatters and Zweifel 1987). The favoured option in this part of the TSA, however, was to catch salmon in the territory of a neighbouring band with close kinship ties. For example, salmon was the most important food resource for the Northern Okanagan, though only an insignificant number of salmon were able to ascend Okanagan Falls and reach Okanagan Lake (Teit 1930). Many people who lived upriver on Skaha and Okanagan Lakes went to Okanagan Falls, the confluence of the Okanagan and Similkameen Rivers, or even to Kettle Falls on the Columbia River to catch their salmon (Teit 1930; Bouchard and Kennedy 1984b). Some of the Similkameen Okanagan also went to the Thompson or Nicola Rivers (Teit 1930), while the Lakes people normally went to Kettle Falls to fish with the closely related Colville (Teit 1930; Bouchard and Kennedy 1985).

There is also a possibility that some of the waterways available to Lakes Division bands formerly had dependable salmon runs (Kew 1992; Salo 1987). Any bands with access to large salmon runs in their territory would doubtless have adopted subsistence and settlement patterns

like those described for the River Division. This scenario has been evoked by some authorities to explain why prehistoric pithouse villages with large and numerous pithouses are found in locations which currently have small or even no salmon runs.

3.4 RECONSTRUCTING TRADITIONAL SUBSISTENCE - SETTLEMENT PATTERNS

This study used historic and contemporary ethnographic data to reconstruct Late Prehistoric and Proto-historic land use patterns. This was not a straightforward task, given the territorial shifts noted previously and many other changes to First Nations cultures in the last 150 years. The fur trade, outbreaks of epidemic diseases, and Euro-canadian settlement of the Okanagan TSA have all had a profound effect on First Nations lifeways (e.g., Duff 1969; Turner 1992; Mellows 1990). A reconstruction of traditional land use patterns must take into account cultural changes in population density, diet, technology, storage, and transportation. The distribution and abundance of resource species has also been profoundly altered by ranching, timber harvesting, commercial fishing, and urban development. Nevertheless, many traditional activities are still practised, or have been practised within the living memory of contemporary First Nations elders (Turner 1992). Many of the traditional subsistence and settlement patterns that are no longer remembered or practised, have been recorded in early ethnographic reports from the study area. By combining data from these early reports with more recent studies and environmental data, it is possible to reconstruct most traditional land use patterns with reasonable confidence.

An ethnographic reconstruction of traditional First Nations land use practices in the study area, with derivative predictions for archaeological site locations, is primarily applicable to the Late Prehistoric period. For example, Kew (1992) points out that there are many factors that could have significantly altered prehistoric salmon populations. It is highly likely that prehistoric First Nations groups in the TSA witnessed many variations in the species of salmon present, in the size and cyclical dominance patterns of these salmon, and in the time and duration of the salmon runs. Given a strong dependence by many groups on salmon as a food source, changes in salmon runs would either have restricted or encouraged expansion in the local population, villages, and social groups, and perhaps resulted in corresponding changes in social complexity. Site distribution, technology, and degree of dependence on other resources may also have been affected by variations in salmon runs. For example, some fishing stations may only have been suitable for catching one species of salmon, and would not have been used at all if numbers of that species declined. As a general rule, the more distant the time period, the greater the likelihood that the environment and associated cultural adaptations, would have changed. Thus, the traditional land use pattern described herein may not accurately describe prehistoric activities over 300 or 500 years old.

It is suspected that certain criteria were likely considered by all First Nations groups when selecting the site of a camp or village, including: (1) the presence of a dry, level camping ground, (2) the proximity of trees for fuel, shelter, and construction, (3) proximity to potable drinking

water, (4) the abundance, variety, and accessibility of local food resources, and (5) access to trade and transportation routes (Tyhurst 1992). The location of resource procurement sites, that is, the places where plants were collected or fish and animals were caught, was almost exclusively determined by the accessibility and abundance of those resources. Archaeological sites should be anticipated at any location within the study area meeting these basic criteria.

3.5 LOW- AND MID-ELEVATION WATERCOURSES

Secwepemc, Nicola-Similkameen, Nlaka'pamux, and Okanagan-Colville subsistence was based on a combination of hunting, fishing, and plant gathering. In the winter months, they congregated in multi-family winter houses. During the warmer weather, families travelled throughout their band's territory, dispersing and regrouping to make the most efficient use of seasonally available resources. Much of the food was dried and stored for use during the winter months. Much of this activity took place near rivers, lakes and streams, and the following section of the report outlines the archaeological expectations for these environments, based on available descriptions of traditional land use patterns within the TSA.

3.5.1 First Nations Use of Low-Elevation Riparian Settings

This section examines traditional First Nations use of lands adjacent to low-elevation lakes, rivers, and streams, that is, waterways below 760 m asl. Much of these lands are distinguished by broad, gently sloping to level terraces and benchlands. Salmon runs within the Okanagan TSA are restricted to these waterways (Manzon and Marshall 1980).

In the southern half of the Okanagan Valley (south of Kelowna), these lands are predominantly within the Bunchgrass (BG) and Ponderosa Pine (PP) biogeoclimatic zones. In the northern half of the TSA, these lands more typically occur in the Interior Douglas-fir (IDF) and Interior Cedar-Hemlock (ICH) zones, with the ICH dominant to the east and northeast.

3.5.1.1 Winter Villages

November -- which typically brought the first snows -- was the month when most Interior Plateau peoples moved into their winter dwellings (Dawson 1892; Teit 1909; Post 1938). According to First Nations informants, the decision of where to build a village was determined by both environmental and social considerations. The most basic physical needs included a close source of potable water, and trees for construction and firewood (Walters 1938; Teit 1900). Where salmon played a crucial role in subsistence, efforts were usually made to locate the village close to fishing stations (Teit 1900). Archaeologists have speculated that close proximity to the fishing station ensured that the salmon did not have to be carried very far (Blake 1974), and dried

salmon cached near the river could be easily guarded from raiding parties or scavenging animals. Moreover, they would have been able to protect their privately-owned fishing stations from unauthorized use by others (Nastich 1954). Villages were also located close to berrying and root-digging grounds (Smith 1899), presumably for similar reasons. It was preferred to select a site with a southern exposure, a sheltered location that afforded protection from chilling winter winds that funnelled through the river valleys (Bouchard and Kennedy 1990; Dawson 1892; Teit 1895, 1900, 1909, 1930; Hudson 1990). Lakes Division bands were more likely than River Division bands to run out of preserved foodstuffs before the winter ended, and it was important that their villages had access to good ice fishing and winter hunting locations.

Many traditional residential structures were excavated into the ground, so it was very important that the location chosen for a village possessed well-drained sandy or gravelly soil that could be dug easily. During the winter, the majority of the River Division peoples and many of the Lakes Division peoples lived in circular or rectangular, earth-covered, semi-subterranean pithouses (Teit 1895, 1900, 1909; Post and Commons 1938; Dawson 1892; Bouchard and Kennedy 1990). The resulting depressions were often between 1 and 2 m deep. A few River Division families and most Lakes Division families lived in smaller, rectangular to conical lodges with a pole framework covered in mats, bark, poles, branches, or earth. These temporary structures were more typically used in the spring and summer, when smaller family units dispersed to hunt and gather plants in montane or valley settings, or in the fall when most people were fishing in rivers and lakes. The lodges inhabited during the winter had an foundation excavated to about 15 cm deep (Teit 1930, 1900, 1906, 1909).

Underground ovens used to cook food and cache pits used to store dried food also produced depressions (Teit 1930). These pits ranged from about 0.9 to 5.0 m in diameter were between 0.3 and 1.8 m deep (Alexander 1992a). Cooking features were usually located away from dwellings, but close to water near the root digging grounds. Storage pits were usually common around village, and near the fishing stations and root digging grounds (Turner, Bouchard and Kennedy 1980; Dawson 1892; Hill-Tout 1907).

Other structures that may be identified at archaeological sites include:

- small, dome-shaped sweat houses made from a bent-sapling frame with a bough, bark or earth covering;
- conical puberty huts of fir branches;
- menstrual huts built like small shelters or pithouses; and
- smudge pits, frames used to smoke hides, and trenches used for the processing of berry crops (especially huckleberries).

All these structures are associated with small pit features (Teit 1900, 1909; Rice 1985).

Defence may have been another consideration in deciding where to locate a village. Raiding was one means of acquiring food when supplies were scarce, either by capturing the stored food itself or by claiming (by force), rights to ownership of fishing stations and hunting areas (Nastich 1954; Teit 1906; Cannon 1992). First Nations groups attempted to minimize raids from near neighbours by establishing friendships through trade and intermarriage (Nastich 1954). However, if they possessed a wealth of a highly-desirable resource like salmon, they could expect to be on the receiving end of such incursions. The greater the perceived wealth, the more likely it was that such groups would choose a well-protected and secluded location for a village -- or at least a site where the inhabitants could not be easily surprised. However, this need for defence had to be weighed against the desire for trade. Surplus resources were of little value for the owner(s) unless part of them could be traded for luxury and prestige items. Successful trading demands that the trader be easily located by potential customers and that the village be conspicuously placed. Defensive fortifications may have provided the necessary compromise between high visibility for trade and protection against enemy attacks (Nastich 1954; Teit 1900, 1909). The Secwepemc, Nicola-Similkameen, and Similkameen Okanagan are all reported to have constructed fortified houses (Bouchard and Kennedy 1984b; Kennedy and Bouchard 1987b; Teit 1909). Islands, though not common within the TSA, were also used as defensive refuges (James and Oliver 1991).

Based on the preceding considerations, traditional village sites should be concentrated on rivers and lake shores; the largest villages should be associated with waterways with significant salmon runs. Sheltered locations on level ground, close to the edge of surrounding forests, should be favoured, and depending on the defensive strategy chosen, villages might be found either in secluded locations, or conspicuously astride trade routes. The location should also be dry, with well-drained sandy or gravelly soil.

Traditional villages within the Okanagan TSA were generally located on or near large lakes or rivers, or near the major trade routes that paralleled waterways in the Okanagan and Shuswap River valleys. Traditional Okanagan-Colville settlements included 13 documented villages (Teit 1930; Hill-Tout 1978):

- six on Okanagan Lake: (i) at the head of the Lake, (ii) near Kelowna, (iii) at Kelowna, (iv) near Westside, (v) near Westbank, and (vi) near Penticton);
- two just north of Okanagan Lake, one of them on a small lake;
- two villages at either end of Kalamalka Lake;
- one village at the southern end of Wood Lake;
- one at the southern end of Skaha Lake; and
- two villages on Osoyoos Lake: (i) on the eastern side of the Okanagan River at the head of the lake, and (ii) at Osoyoos.

All documented Lakes traditional villages were beyond the Okanagan TSA in the Columbia River drainage. The Nlaka'pamux had five small villages and the Similkameen Okanagan had six on the Similkameen River between Hedley and the U.S. border (Teit 1930). The Secwepemc had

villages in the following locations (Teit 1909; Kennedy and Bouchard 1987b; Bouchard and Kennedy 1990):

- along both sides of the South Thompson River below Little Shuswap Lake;
- on Little Shuswap Lake, including its outlet;
- along the Little River connecting Shuswap Lake with Little Shuswap Lake;
- around the lower end of Adams Lake;
- on the Shuswap River near Enderby; and
- various locations on Shuswap Lake, including Salmon Arm.

Two areas that either have no, or at most minor salmon runs -- the Kettle River valley and the Shuswap River above Shuswap Falls (Manzon and Marshall 1980) -- have no reported traditional villages. Much of the northern Okanagan Valley -- with restricted access to salmon -- has few villages. However, two localities with little or no salmon nevertheless possess a distinct concentration of villages -- the northern end of Okanagan Lake and the Similkameen River valley. The former may reflect access to the significant salmon runs on the Shuswap River. Village sites on the Similkameen River were made feasible, at least in part, by access to salmon runs in the lowermost reaches of the river in Washington. However, it is also possible that the concentration of village sites may reflect a different settlement pattern in this area, made possible by abundant ungulate populations.

3.5.1.2 Salmon Fishing Stations and Basecamps

Salmon was the most important and most abundant food resource in much of the TSA, and was found exclusively in low-elevation lakes, rivers, and streams. Spring salmon (*Oncorhynchus tshawytscha*) arrived in June (Curtis 1911; Bouchard and Kennedy 1984a), but were generally caught in low numbers at this time of year. July was the warmest month, and marked the arrival of the largest salmon runs, both in the Columbia - Okanagan and Thompson -Shuswap drainage basins (Bouchard and Kennedy 1984b, 1990). For most bands in the study area, July and August were devoted almost entirely to catching and drying salmon, principally sockeye (*Oncorhynchus nerka*) (Dawson 1892; Teit 1909). Coho (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*) also ran in the summer, but were rarely caught due to their low numbers. Starting in mid-July, spring salmon customarily keep to deeper water than sockeye, and, being further from the shore, were infrequently caught (Bouchard and Kennedy 1990).

Families camped at the fishing stations as long as the runs were good, or for as long as it took to catch and dry enough fish for winter. Conditions for drying salmon were excellent in the valleys, where the hot, dry weather and strong winds quickly dried the salmon without supplementary smoking. The September salmon runs were usually poor, and families generally moved away from the fishing basecamps in August, after preparing salmon oil and storing dried salmon in elevated caches and storage pits near the fishing stations (Dawson 1892; Teit 1909;

Bouchard and Kennedy 1984a). In October, some families exploited a major sockeye run on the South Thompson River, or a small coho run on the Columbia River (Bouchard and Kennedy 1990; Chance, *et al* 1977; Post 1938). Lakes Division families who did not have access to large salmon runs sometimes focussed on hunting and catching resident freshwater fish during these months.

Social activities such as visiting, dancing, gambling, and arrangement of marriage alliances took place at the fishing camps, since everyone was gathered in one place, and food was plentiful. Trading was also common, especially at the most important fishing sites (Alexander 1992a). For example, a village site associated with the major fishery at Okanagan Falls was also an important trading centre, and located on a major trade route as well (Teit 1930; Hill-Tout 1978).

The technique used to catch fish varied according to the setting. First Nations people caught fish in lakes using nets with floats and sinkers. From the shore and in shallows, they used single and double pointed spears with detachable heads. From canoes, through the ice, and from rocks beside the water, two or three-pronged spears were used. Spears were used by torchlight on lakes and some rivers, hooks and lines were used to catch small fish, and spears and bone gaff hooks to catch salmon trapped below fish weirs and in shallow water (Teit 1900, 1909, 1930; Kennedy and Bouchard 1992). Wooden platforms were sometimes built over the water to aid in the harpooning and netting of fish from steep river banks.

Where rivers were turbid or rapid, dip nets and set nets were the most effective means of catching salmon, and preferred netting locations were along narrow reaches of the river possessing rocky outcrops. Steep river banks in these locations induced the fish to travel closer to the bank where they were more easily caught, while associated back eddies encouraged the fish to congregate in large numbers and rest. The turbulent water prevented the fish from seeing the nets. Salmon also congregated in large numbers at lake outlets. In narrow rivers and streams, weirs and basket traps were commonly used. Caught salmon were dried on racks set up at basecamps adjacent to the fishing stations. The foregoing suggests that narrow and rapid stretches of rivers, as well as lake outlets/inlets are the most likely locations in which to find prehistoric salmon fishing sites. These sites may be associated with summer fishing basecamps or, where suitable conditions prevail, with winter villages.

The Okanagan River fishery in the TSA was concentrated at Okanagan Falls, but extended several kilometres downstream, including a dip net site at McIntyre Bluff and four fish traps north of Oliver (Bouchard 1993). Only the fishery at Okanagan Falls was clearly associated with a winter village site. Many Okanagan-Colville people from the study area travelled to the mouth of the Similkameen River for the salmon fishing, where it was estimated that 3000 to 4000 First Nations (from Westbank, Vernon, Penticton, and Oliver) gathered. Similkameen Falls, approximately 14 km up that river from its confluence with the Okanagan, prevents salmon from ascending the Similkameen into the study area (Bouchard and Kennedy 1984b). The headwaters of the Kettle and West Kettle Rivers in the TSA are also devoid of salmon, being blocked by a waterfall at Cascade, just south of Christina Lake.

A few salmon managed to get above the falls to spawn in Skaha and Okanagan Lakes. However, in the fall, kokanee (land-locked sockeye salmon) were caught at the mouths of many creeks tributary to Okanagan Lake. For example, people from as far away as the head of the lake would gather at the mouth of Trepanier Creek, camping along the northern side of the creek where they had drying racks. Fish were caught with dip nets or traps as far upstream as the falls on the creek (Kennedy and Bouchard 1987a). Important fall kokanee fishing sites were also located at the mouths of Mission Creek (near Kelowna) and Trout Creek (near Summerland) (Hudson 1990). The Secwepemc caught resident Shuswap Lake kokanee near the mouth of Eagle River, further upstream at Malakwa, and near Kay Falls (Bouchard and Kennedy 1986).

The major Secwepemc fisheries were on the South Thompson and Adams Rivers -- at the outlet of Little Shuswap Lake, along the Little River, and at the mouths of Adams River and Scotch Creek (Kennedy and Bouchard 1987b; Bouchard and Kennedy 1990). Shuswap Falls was also an important fishery (Hudson 1990). In August, a fish weir and trap was used to catch spring salmon at Sicamous Narrows between Mara and Shuswap Lakes. Secwepemc people from seven different bands came to use the weir which was dismantled after four days, with everyone getting an equal share of the salmon caught (Bouchard and Kennedy 1986).

First Nations groups are often claimed to have originated at important salmon fishing sites. For example, one First Nations informant claimed that Okanagan Falls was the ancient headquarters or place of origin from which the Okanagan people derived their name (Teit 1930). Other informants placed this headquarters further south, at the mouth of the Similkameen River (Bouchard and Kennedy 1984b; Dawson 1892; Curtis 1911; Teit 1930; Spier 1938).

The evidence supports the conclusion that prehistoric salmon fishing localities and associated fishing basecamps should be concentrated at narrows and falls on rivers, at the mouth of streams, and at the inlets and outlets of large and medium lakes.

3.5.1.3 Other Fishing Stations and Basecamps

In milder weather, the winter dwelling could be used as a basecamp from which the men could go ice fishing on the lakes. Resident trout, suckers, and whitefish were the most common catch of this fishery. Ice fishing was probably best in early December and March when the ice was not as thick. Historic accounts describe winter fishing by individual men during day trips from winter villages (Alexander 1992a). Women also used a hook and line to ice fish, sometimes building a small fir bough shelter for themselves over the hole (Kennedy and Bouchard 1992). Large beds of freshwater mussels were found in some settings (notably the Okanagan River) and were eaten when other foods were scarce in the winter (Bouchard and Kennedy 1984b).

Many people visited the lakes in late April and May to catch a variety of spawning fresh water fish species (listed below) (Dawson 1892; Teit 1909; Bouchard and Kennedy 1975; Kennedy

1975; James and Oliver 1991; Post 1938). Large numbers of these fish were caught at the mouths of inlet and outlet streams, and along the shore. Species spawning in this region during May and June, and commonly caught by First Nations groups on the Interior Plateau include: rainbow trout (*Oncorhynchus mykiss*), largescale sucker (*Catostomus macrocheilus*), longnose sucker (*Catostomus catostomus*), bridgelip sucker (*Catostomus columbianus*), northern mountain sucker (*Catostomus platyrhynchus*), peamouth chub (*Mylocheilus caurinus*), northern squawfish (*Ptychocheilus oregonensis*), reidside shiner (*Richardsonius balteatus*), chiselmouth (*Acrocheilus alutaceus*), and prickly sculpin (*Cottus asper*). Those species spawning at other times include burbot (*Lota lota*) in February, bull trout (*Salvelinus confluentus*), lake trout (*Salvelinus namaycush* - in Shuswap Lake only), white sturgeon (*Acipenser transmontanus*), and mountain whitefish (*Prosopium williamsonii*), which all spawned in mid-November (Carl, Clemens and Lindsey 1959; Alexander 1992b). Although the most intensive fresh water fishing would have occurred during the spawning runs, lake fishing occurred all year round (Teit 1930; Alexander 1992a). Many Interior Plateau peoples focussed their efforts on catching resident rainbow trout or anadromous steelhead (Teit 1900, 1909; Smith 1900; Lane 1981; Kennedy and Bouchard 1987a).

Spring fishing camps were commonly associated with mid-elevation lakes (see Section 3.5.2). This preference seems to reflect the fact that fish were more abundant and easier to catch in the small streams tributary to the smaller and colder lakes found in these settings. Hunting was also better at higher elevations during this time of year. However, some fish were certainly also caught in low-elevation tributary streams. Some of the smaller low-elevation lakes that might have been attractive for spring fishing include Garnet, Swan, Monte, Phillips, Hidden, and Humamilt Lakes. Prehistoric fishing stations and camps should be concentrated on streams leading in and out of the smaller lakes.

3.5.1.4 Hunting Locations and Basecamps

Most hunting was conducted at middle to high elevation in the late spring and fall, but some would also have taken place in lowland settings. For example, men hunted at lower elevation in November, while the houses were being prepared for winter. December, January, and February were largely spent indoors living on stored foods, but whenever the weather permitted, hunters made day trips from their villages to trap game and hunt deer (and other ungulates) in their winter ranges (Alexander 1992a; Post 1938). By March and April, game was generally poor and hard to catch, and hunting declined. Low-elevation hunting was conducted sporadically during June, July, and August, while most families were occupied catching salmon and gathering plant resources. By way of example, around one low-elevation lake, Okanagan-Colville men hunted deer on the hillsides, while the women gathered saskatoon berries (*Amelanchier alnifolia*) and choke cherries (Bouchard and Kennedy 1984b). Such hunts were probably poor since many ungulates summer at higher elevations.

At present, drier, low-elevation settings in the southern half of the TSA do not support significant numbers of deer and bighorn sheep, primarily due to arid conditions and sparse fodder, though there was some limited winter, spring, and early summer use of the area. However, deer and sheep may have been more seasonally abundant in these settings prior to heavy grazing pressure by cattle and horses after the late 1800s. Deer are currently found throughout the study area, but localized populations of bighorn sheep are found only in more arid localities, such as the mouth of Shuswap Lake, the head of Okanagan Lake, and the Okanagan and Similkameen River valleys. Riparian environments associated with lakes and rivers provide some of the best wintering grounds for sheep and deer, and low-elevation hunting sites may be more common in these locations.

Today, elk are found only in the Similkameen Valley, but they were probably more plentiful in the Okanagan TSA prior to Contact. In environments like the Nicola Valley, elk were numerous until the early 1800s (Kennedy and Bouchard 1985, 1987a; Teit 1930; James and Oliver 1991). Elk were also formerly present in the Silver Creek - Lookout Mountain locality (Kennedy and Bouchard 1987a).

Caribou, mountain goats, and moose were not available at low elevations in the TSA. Today, caribou are confined to the Northern Columbia Mountains Ecoregion along the northeast boundary of the study area. Mountain goats also occur here, as well as in the Okanagan Range Ecoregion. Both caribou and goats were probably more common in the past. Although moose are now present throughout the montane parts of the study area north of Kelowna, they were apparently absent from the Interior Plateau prior to 1920 (Spaulding 1990) and would not have been part of the traditional economy.

Individual bird species are rarely mentioned in the ethnographic record, but the Secwepemc and Okanagan-Colville are known to have hunted available species of ducks, geese, and swans, as well as sandhill cranes (*Grus canadensis*) and great blue herons (*Ardea herodias*) (Teit 1909, 1930). Conditions for waterfowl are quite favourable throughout the Okanagan Basin Ecoregion, especially around lakes and rivers near Osoyoos, Okanagan Falls, and Kelowna. Lakes and rivers north of the Okanagan Basin are generally poor habitat for waterfowl. Notable exceptions include: (1) some small lakes south of Enderby, (2) the head of Mabel Lake, (3) Salmon Arm on Shuswap Lake, (4) the South Thompson River, (4) the foot of White Lake, and (5) a few small lakes in the Eastern Thompson Upland east of Chase (Environment Canada n.d.). These locations would have been exploited most commonly during the spring and fall migrations, peaking in April and October (Campbell, *et al* 1990a). Basecamps may have been established in these locations primarily to hunt for waterfowl, since the migrations precede the main lake fisheries and follow the main salmon fishing season, when families were typically camped in those areas.

Trapping increased after the introduction of the fur trade, making it difficult to ascertain the importance of fur-bearing mammals in the traditional economy. However, all the ethnographic evidence seems to suggest that small mammals ranked far below the importance of salmon and

ungulates in the traditional diet. Small mammals and game birds like grouse (*Dendragapus obscurus*, *Canachites canadensis*, *Bonasa umbellus*, *Pedioecetes phasianellus*) (Campbell, et al 1990b) were available at low elevations all year and were probably hunted on a casual basis near the villages and basecamps (Post 1938) (Table 3). Snowshoe hares, rabbits, yellow-bellied marmots, porcupines, and squirrels are locally abundant in drier environments, while species preferring wetland habitats, such as beaver, mink, otters, and muskrats would be more common in the eastern half of the study area. The best hunting season for these animals would have been late fall and winter. Turtles were locally abundant, and would have been exploited where present (Bouchard 1993).

Large and small animals were commonly hunted with a bow and arrow, but spears, slings, and clubs were occasionally used. Traps and deadfalls were constructed for both large and small game, while fences and corrals were used to catch ungulates, often in conjunction with drives. Dogs were used extensively in the hunts (Teit 1930). The Okanagan-Colville also used to herd deer into large enclosures made from nets strung between thickets of trees. These appear to have been used most commonly near the main camps and in bushy locations (Teit 1930). Lone hunters would also ambush deer at mineral licks, at waterholes, or on rocky promontories where the animals went to escape flies and mosquitoes (Alexander 1992a). Animals were, however, killed wherever they were encountered, and consequently, kill sites could occur almost anywhere within the Okanagan TSA.

Since most of low-elevation hunting was conducted from the winter village or the salmon fishing camps, pre-Contact hunting basecamps should be relatively uncommon at low elevations. Kill and butchering sites should be common, but their location is difficult to predict because game distribution is scattered and largely unpredictable. However, they may be more common in settings favoured by wintering ungulates and migratory waterfowl. Good ungulate wintering range is generally found on hillsides above the main valleys at middle, rather than low elevations, except in the eastern part of the Shuswap region where low-elevation lands are more likely to be forested.

3.5.1.5 Plant Gathering Localities and Basecamps

Most low-elevation settings in the South Thompson and Okanagan Valleys are covered with grasses and sagebrush. This environment supports few food plants except for Mariposa lily (*Calochortus macrocarpus*), prickly-pear cactus (*Opuntia fragilis*, *O. polyacantha*), bitter-root (*Lewisia rediviva*), and desert-parsleys (*Lomatium* cf. *macrocarpum*). However, a variety of food plants is available in forest-edge settings and in riparian associations along streams that dissect the benchlands, with balsamroot (*Balsamorhiza sagittata*), and saskatoon berries being the most important (Turner, Bouchard and Kennedy 1980; Compton 1995). Many of the shoots, roots, and leaves collected from these habitats are available in the spring between March and May and were probably collected by people still residing at their winter villages. Berries were collected in large

quantities in June and July, prior to salmon fishing. First Nations in the study area also exploited a wide variety of tree species (see Section 3.6.1 and Appendix I).

Wetlands associated with low-elevation lakes and rivers offer a greater variety of plant foods. Some important wetland food species would be abundant in these localities, notably cottonwood mushrooms (*Tricholoma populinum*), water parsnip (*Sium suave*), silverweed (*Potentilla anserina* spp. *anserina*), and gooseberries (*Ribes inerme* and *R. lacustre*). Cattails (*Typha latifolia*), tule (*Scirpus acutus*, syn. *S. lacustris*), reed canary grass (*Phalaris arundinacea*), and willows (*Salix* spp.), all of which are useful in the construction of tools and shelters, were all abundant in these settings. The drier and more open slopes were important locations for collecting soapberry (*Shepherdia canadensis*), saskatoon, nodding onion (*Allium cernuum*), balsamroot, blackcap (*Rubus leucodermis*), dwarf blueberry (*Vaccinium caespitosum*), mountain huckleberry (*Vaccinium membranaceum*), thimbleberry (*Rubus parviflorus*), and oregon-grape (*Mahonia aquifolium*), with the berries being especially abundant in old burns. Descriptions of the many plants used by First Nations in the study area are available in Compton (1995), Palmer (1975) and Turner, Bouchard and Kennedy (1980). Again, many of the shoots and roots would have been available for harvest between March and May, the berries between June and July, cattails and tule in August, and mushrooms in October.

Important berry picking areas for highbush cranberries (*Viburnum edule*) and dwarf blueberries, among others, included: (1) the Eagle River valley (west of Griffin Lake), which attracted Secwepemc people from as far away as Kamloops (Bouchard and Kennedy 1986), (2) the Westwold locality, which is noted for its wild raspberries (*Rubus idaeus*), choke cherries (*Prunus virginiana*), and saskatoons (James and Oliver 1991), (3) Vernon, where red hawthorn berries were picked in August (Turner, Bouchard and Kennedy 1980), (4) Mount Hilliam, south of the western end of Shuswap Lake, where Secwepemc people from many bands went to pick huckleberries (Bouchard and Kennedy 1990), and (5) the White Lake basin near Penticton and Round Lake near Vernon, where saskatoons were abundant (Turner, Bouchard and Kennedy 1980). An important bitter-root digging area was located at the southern end of Okanagan Lake (Turner, Bouchard and Kennedy 1980).

Berry picking may have been conducted from winter villages or salmon fishing camps when these were located close by (e.g., Bouchard and Kennedy 1984a). However, the greatest concentrations of berries were often on valley slopes near springs, distant from the main waterways; at these locations, separate basecamps were created (Bouchard and Kennedy 1986).

3.5.1.6 Trails

Low-elevation trails and passes were frequently used. Three Valley Lake or Eagle Pass trail between Revelstoke on the Columbia River and Sicamous on Shuswap Lake, was an important trade route between the Secwepemc and Lakes peoples (Bouchard and Kennedy 1986; Teit 1930).

This route was probably favoured over the other trade routes that linked these two groups because it was a water-level route that did not involve a climb to high elevations. It was also a resource-rich corridor containing: (1) sockeye, coho, and spring salmon runs, (2) trout and charr, and (3) an abundance of berries, deer, and other game (Bouchard and Kennedy 1986). Traditional campsites were located along this route at the mouths of Yard Creek and the Perry River, and at Malakwa (Bouchard and Kennedy 1986).

Other important low-elevation trails included a route up the Okanagan Valley to the Shuswap River, and then down the latter to Shuswap Lake and the South Thompson River (Teit 1930), and a route from the Nicola Valley (Nicola-Similkameen and Nlaka'pamux) to Vernon (Secwepemc and Okanagan-Colville) via the Salmon River valley and the Westwold locality (James and Oliver 1991).

3.5.2 First Nations Use of Lands Near Mid-Elevation Lakes, Rivers, and Streams

This section of the report discusses examines traditional use of lands adjacent to mid-elevation (760 to 1500 m) lakes, rivers, and streams. In the northern third of the TSA, such lands are within the IDF and Engelmann Spruce Subalpine Fir (ESSF) biogeoclimatic zones, and to the southwest, they are within the IDF and ESSF zones. These lands include some of the more open portions of these zones.

No winter villages are reported to have occurred at these elevations, and salmon do not run into waterways in these settings (Manzon and Marshall 1980). However, they were important wintering range for ungulates, which were hunted in good weather from low-elevation winter villages. Fish were caught in the lakes by ice fishing in the winter, though probably less often than low-elevation lakes due to their relative distance from the winter villages. The game, fish, and plant resources present in these locations were very important in the spring.

From late February to early March was a critical period of the year, when stored food often become low or even exhausted. Game was poor and hard to catch, and no plants were ready to harvest. By late March, the weather had usually moderated the point where most families had moved out of their winter houses and into summer dwelling lodges. In late March and April, these families dispersed throughout their territory, many to gather plants and hunt at middle elevations. By May, trout, suckers, and other fishes began spawning in the mid-elevation lakes. In lean years, many families could not have survived without these resources. This is particularly true for the Lakes Division bands who lacked a stable salmon supply. Rather than travelling to subalpine parklands in the late spring and fall, some families opted to hunt around the mid-elevation lakes where they could also fish (Teit 1930; Alexander 1992a).

Fishing, hunting, and plant gathering basecamps found at middle elevations were situated in the same types of settings as described for low-elevation sites. However, since most of the lakes

in these locations were much smaller than at lower elevations, every lake large enough to support a resident fish population was probably exploited. Larger lakes attracted bigger groups of people. For example, in late April, Secwepemc, Nicola-Similkameen, Nlaka'pamux, and Okanagan-Colville families gathered in groups of up to 1000 at Chapperon Lake (west of the TSA boundary in the Southern Thompson Upland) for suckers, trout and peamouth. Soon after, many of the same people moved on to Pennask Lake where they caught rainbow trout, bull trout, and other fish at the inlets and outlets of the lake. One camp was located along the creek at the southwestern end of the lake. These gatherings were important social events which included games and races. The Chapperon Lake - Pennask Lake locality was also noted for pine mushrooms (*Tricholoma magnivelare*) and labrador tea (*Ledum groenlandicum*) (Kennedy and Bouchard 1987a; James and Oliver 1991).

Other lakes in the same area were used for as spring fishing, including Brenda, Marsh, Silver, and Hatheume Lakes. Trout were also caught in Trepanier Creek (Kennedy and Bouchard 1987a). Pinaus Lake was a fishery both for the Secwepemc and Okanagan-Colville (Arcas Associates 1985c). Some of these lakes were also fished kokanee in the fall (Kennedy and Bouchard 1987a).

These waterways generally have poor capacity for waterfowl (Environment Canada n.d.). Therefore, although they were undoubtedly used for some waterfowl hunting, they would have been used less frequently than more productive low-elevation lakes. Plant species are similar to those available at low elevations (see Section 3.5.1.5), but some species would be more abundant at middle elevations at low elevations in the more arid portions of the TSA.

The surrounding hills and mountains were used for hunting, presumably during the spring fishery and during the fall. For example, Nlaka'pamux and Okanagan-Colville peoples had a hunting camp at the northern end of Brenda Lake, from which they hunted deer in a 10 km radius. They built permanent meat-drying racks, and burned off underbrush to encourage deer forage (Kennedy and Bouchard 1987a). Okanagan-Colville people living at Westbank also hunted on Barton Hill, Mount Gottfriedson, Mount Miller, Lookout Mountain, and Mount Coldham, as well as along Trepanier Creek and many of the tributary creeks. Basecamps were reported to be located at the mouth of Clover Creek and at the McCall Lakes (Kennedy and Bouchard 1987a).

The species hunted in these settings would have been the same as those hunted at low elevations, though the conditions are often better here for wintering populations of elk, bighorn sheep, and deer (Table 3). Deer fences were probably more commonly used at middle elevations. These fences were typically built in small valleys or defiles where deer customarily crossed from one montane slope to another, or passed on their way to their wintering grounds. Constructed of poles, limbs, and trees, deer fences could exceed 800 m in length. The deer were caught in snares set at openings in the fence (Teit 1900; James and Oliver 1991). They were also used in conjunction with drives and dogs to herd elk over cliffs (James and Oliver 1991).

Mid-elevation grasslands would have been particularly attractive to First Nations populations, since mammal and plant resources were more abundant in and adjacent to these settings. Such grasslands are most widespread south of Vernon, on the western side of the Okanagan Valley. Grasslands may have been favoured destinations in spring when deer and roots were abundant, in June when women could have collected berries, and in the winter for hunting ungulates. One such locality is an important bitter-root digging area near Shingle Creek (Turner, Bouchard and Kennedy 1980).

Some of the most important trails through the mountains followed the waterways and passes. Examples include:

- The **Ratchford Creek trail** departed from the head of Seymour Arm on Shuswap Lake, ran up the Seymour River to Ratchford Creek, through Pettipiece Pass to Seymour Creek, and descended to the Columbia River about 4 km downstream from Downie Creek (Bouchard and Kennedy 1985). This trail may have been used by Secwepemc peoples travelling to hunting grounds on the upper Columbia River.
- The **Fosthall Creek trail** ran between the mouth of Fosthall Creek and Mabel and/or Sugar Lakes. It took one or two days to travel (Bouchard and Kennedy 1985).
- The **Monashee trail** went from Shuswap Lake up the Shuswap River, through Monashee Pass, and down Inonoaklin Creek to the Columbia River, along the route presently used by Highway 6. In 1862, it was an infrequently used trail (Bouchard and Kennedy 1985).

3.5.3 Archaeological Expectations for Low- and Mid-Elevation Watercourses

Winter villages are the largest and most conspicuous archaeological sites in these settings. These sites are predicted to be concentrated along low-elevation rivers and lake shores with significant salmon runs. They also occur on other streams and lakes, primarily in localities close to waterways supporting salmon runs. Sheltered locations on level ground, close to potable water and trees should be favoured. Depending on the defensive posture adopted, villages may be found either in secluded locations, or astride major trade routes. Dry, well-drained settings with sandy or gravelly soil were also preferred.

Salmon fishing basecamps should be the next largest sites present at low elevations. Pre-Contact salmon fishing camps and associated fishing stations should be concentrated at narrows and falls on rivers, at the mouths of streams, and at the inlets and outlets of larger lakes. In situations where suitable criteria for village location occur at the margin of a river or lake, sites may have functioned as both villages and salmon fishing basecamps.

As discussed in Section 3.2.2, much of the Okanagan Valley upstream from Okanagan Falls may only have been used as a hunting ground by groups with winter villages and salmon fishing

camp on the Okanagan River or in the Thompson - Shuswap drainage. Therefore, it is expected that fishing camps may be uncommon around Skaha and Okanagan Lakes.

Spring basecamps, where First Nations people fished for resident freshwater fish, hunted game animals, and gathered plants, could also have high visibility. These sites and their associated fishing stations would be configured to the banks of streams near the inlets and outlets of smaller lakes, though they may also occur along the lake shores themselves. They are predicted to be more abundant at middle elevations, rather than low elevations.

Clusters of cache pits for the temporary storage of fish and plants may be anticipated in or near villages, basecamps, and fishing stations.

At lower elevations, most hunting and plant gathering was staged from the winter village or fishing camps, so few specialized hunting - plant gathering basecamps are expected here. At middle elevations, many of these activities were based at the spring fishing sites, but separate basecamps may have been established for the fall hunts. Fall hunting camps may be anticipated near trails leading to higher elevations. Separate basecamps for berrying are reported to occur on open valley slopes near springs, while waterfowl hunting camps may be expected near riparian habitats favoured by migrating waterfowl.

The archaeological remains of plant gathering sites are normally very difficult to identify, since plant remains and the tools used to harvest them are highly perishable. However, plant processing activities, with associated cooking features and storage pits, usually occur at basecamps and villages. Culturally modified trees (CMTs) are often the only remaining evidence of traditional plant procurement sites. For example, on the southern Columbia Plateau, archaeologists identified a concentration of bark-stripped red cedar trees that provided evidence for the historic manufacture of traditional berry baskets (Bergland 1992). Concentrations of CMTs may be near villages and basecamps, or along trails. First Nations logging activities were commonly associated with the construction of shelters that were found at these locations, while cambium bark-stripping typically occurred around low- and mid-elevation winter villages and spring fishing camps.

Traditional hunting activities are likely to have produced a number of different archaeological sites in the TSA, including game lookouts, deer fences, and kill/butchering sites. Game lookouts may be expected on open promontories overlooking valleys or game corridors. Deer fences were usually constructed in narrow valleys where ungulates passed *en route* from high to low elevations. Kill and butchering sites should be common, but their location would be extremely difficult to predict, due to the unpredictable distribution of game. However, they may be more common in settings where wintering conditions are favourable for ungulates. Good winter range is generally found on hillsides at middle elevations above valleys. Kill sites may also be anticipated at mineral licks, drinking holes, and on rocky promontories. Hunting sites for small game and waterfowl will tend to concentrate near forest and wetland margins. Most hunting sites

will be small, with low densities of artifacts, but settings where ungulates were frequently encountered may contain higher artifact densities, due to visits to the site.

Higher site densities can also be predicted along trails and in mid-elevation grasslands. Grasslands would have been especially attractive to First Nations populations, since mammal and plant resources were more abundant in and adjacent to these settings. Frequently, trails to subalpine parkland and alpine meadows passed through these more open locations.

3.6 FORESTED MONTANE ENVIRONMENTS

3.6.1 First Nations Use of Forested Montane Environments

Forested environments include most of the continuous-canopy forests in the following biogeoclimatic zones: Engelmann Spruce Subalpine Fir (ESSF), Interior Cedar Hemlock (ICH), Interior Douglas-fir (IDF), and Ponderosa Pine (PP). As defined here, forested environments do not include open forests adjacent to lowland or mid-elevation watercourses, or alpine tundra. More than half of the Okanagan TSA is covered in forested environments, by this definition.

Ethnographic accounts of traditional use of forested environments are few and sketchy. People certainly hunted and gathered plants in forests, but the most commonly used settings appear to have been open woods near forest margins and open clearings (e.g., near wetlands, streams, and trails) where the variety and abundance of plant and animal species was greatest. Forested river and stream valleys are also described as travel corridors to high-biodiversity alpine - subalpine parkland environments (Alexander 1992a), but these settings are discussed in other parts of this section.

Although many mammals inhabit forests (see Table 3), their greatest populations are found at the forest margins. Game birds such as grouse also prefer forest margins and are rare in closed canopy forests (Campbell, et al 1990b). Given this characteristic distribution of mammals and birds, it is anticipated that First Nations of such environments may have focussed in locations with more open forests, small clearings, and wetlands. Waterways are excluded from the discussion of forested environments, so fishing, waterfowl hunting, shellfish gathering, and hunting of aquatic fur-bearing mammals are activities that would not have been undertaken here.

Some of the most important food plants found in the forests include black tree lichen (*Bryoria fremontii*), and the inner bark of lodgepole pine. The more open forests and forest margins contain a wider variety of plants, including several types of berries such soapberry, wild strawberry (*Fragaria vesca*, *F. virginiana*), blackcaps, and white-stemmed gooseberry (*Ribes inerme*). Higher elevation settings also have black mountain huckleberry, oval-leaved blueberry (*Vaccinium ovalifolium*), wild raspberry, and thimbleberry, with Oregon-grape, choke cherry, and saskatoon at lower elevations. Other important food plants found in forests include tiger lily

(*Lilium columbianum*), false Solomon's-seal (*Smilacina racemosa*), cow-parsnip (*Heracleum lanatum*), Indian celery (*Lomatium nudicaule*), and fireweed (*Epilobium angustifolium*) (Alexander 1992b: Tables 2 and 3; Turner, Bouchard and Kennedy 1980; Palmer 1975; Compton 1995).

First Nations in the study area made use of a wide variety of tree species. Appendix I provides a list of tree species known to occur in the study area and how they were used by the Secwepemc and/or Okanagan-Colville. It also describes the habitat where these species may be found. In addition to providing fuel and shelter, trees were used in residential construction and tool manufacture. Many trees were also used in medicinal preparations, or incorporated into ceremonial and religious activities. In the spring, the cambium (inner tree bark) of black cottonwood, lodgepole pine, ponderosa pine, whitebark pine, and subalpine fir were eaten. The seeds of whitebark pine were also commonly eaten in the fall. In total, seven deciduous and eight evergreen tree species are reported to have been bark stripped. Five deciduous and five evergreen species were also sometimes logged.

3.6.2 Archaeological Expectations for Forested Montane Environments

The majority of sites in forest environments are predicted to be hunting and plant gathering locations used by task groups based in other environments. It is probable that low-elevation forest resources were most commonly exploited from the winter villages and salmon fishing camps, mid-elevation forest settings from spring basecamps on lakes and streams, and high-elevation forests from subalpine parkland basecamps. A few small basecamps may also be anticipated near clearings with springs and wetlands in mid- to high-elevation forests, where people camped while hunting deer and other ungulates in the spring and fall. In general, forested lands used by Lakes Division bands may contain more sites than those used by River Division bands, because the former were more dependent on dispersed animal and plant resources.

Since most sites in forested environments were probably used by small task groups during day trips from a basecamp, features should be limited to hearths and the insubstantial remains of temporary shelters. Associated artifacts would reflect hunting and plant gathering activities, while food processing features and tools should be absent. Deer fences could have been located in some forested settings. Small kill/butchering sites, associated with few artifacts and having low archaeological visibility, may be expected throughout these lands. Game lookout sites would probably be rare, given the general absence of good overviews in this forested environment.

The greatest potential for culturally modified trees (CMTs) is in locations adjacent to the basecamps and villages mentioned above. As a general rule, CMT potential diminishes with distance from the open environments and waterways where these sites were located. Exceptions include locations with stands of trees which have a rare or patchy distribution in the study area, which occur near open clearings with springs. Although cultural modifications can be identified on old-growth tree stumps, CMTs are most likely to be found in areas not previously logged.

Evidence of traditional forest utilization is most likely to be found on western red cedar trees because of their remarkable resilience to the trauma of cultural modification.

3.7 SUBALPINE PARKLAND AND ALPINE TUNDRA ENVIRONMENTS

Until recently, little was known about traditional First Nations use of high montane environments. Inaccessibility has prevented most ethnographers from actually visiting these locations. In addition, many ethnographers working on the Interior Plateau have emphasized the salmon fisheries and have tended to overlook the significance of montane hunting and plant gathering. Most of the available information on the use of montane resources comes from recent studies (Alexander, et al 1985; Alexander 1992a; Tyhurst 1992; Turner 1992; Romanoff 1992). These studies have shown that high montane environments were an important element in the seasonal subsistence round for First Nations people on the Interior Plateau. Salmon may have represented the principal source of protein and calories, but when salmon runs were unproductive, First Nations became quite dependent upon alternate resources found in the mountains.

Much of the following discussion on the use of montane environments is based on ethnographic research among the Chilcotin, Lillooet, and Secwepemc peoples in the middle Fraser River drainage. However, land use patterns in montane environments are likely to have been similar throughout the Interior Plateau, and groups in the Okanagan TSA probably followed the same practices as the Fraser River groups. Specific references to groups in the TSA are provided where available.

3.7.1 First Nations Use of the Subalpine Parkland

The most important and heavily used montane environment was the subalpine parkland -- in this region, representing several subzones of the Engelmann Spruce Subalpine Fir zone (Coupé, Stewart and Wikeem 1991). These transitional subzones between the alpine meadows and closed-canopy subalpine forests are characterized by a mosaic of parkland meadows, *krummholz* tree clumps, and scattered stands of subalpine tree species. Elevations in the subalpine parkland range from about 1500 to 2100 m asl. Parkland settings are most common in the Monashee Mountains and in the Okanagan Range.

The climate of the subalpine parkland is distinguished by severe winters with heavy snowfalls, and First Nations groups were generally cut off from this environment until the winter snowpack melted, between May and June. At this time, small family groups would travel into the mountains and establish basecamps in parkland settings. Men made day trips from these basecamps to hunt ungulates, while the women gathered food plants, primarily roots (Alexander 1992a). In September, after the main salmon fishing season ended, most families returned to the mountains to hunt and gather additional plants (Post 1938; Bouchard and Kennedy 1984a). These gatherings

were important social events with games and gambling being common activities (Turner 1992; Tyhurst 1992). Similar gatherings in the Chilcotin attracted between 100 and 200 people (Alexander, et al 1985).

Later in the season, men continued to spend much of their time hunting, following the ungulates as they migrated to lower elevations. The intensity and duration of a fall hunt was probably determined by the number of salmon caught prior to the hunt; fewer salmon meant a greater need for game in order to meet winter subsistence requirements. Game animals began to move down to lower elevation by October, but hunting continued in the subalpine parkland until early November, after which the mountains were usually abandoned due to cold and stormy weather. Historically, these hunts were generally undertaken by individual men, or groups of up to ten men (Alexander 1992a; Romanoff n.d.) and could last anywhere from a few days to several months (Romanoff 1992; Teit 1930). Women were probably more common on these fall hunts in the past, when hide preparation and plant collection were more important to the economy.

At the southern end of the study area, where the winter was milder, the Okanagan-Colville sometimes conducted large hunts or drives for deer in mid winter, and for bighorn sheep in late winter (Teit 1930; Bouchard and Kennedy 1984b). From available descriptions, these hunts appear to have taken place in subalpine parklands. One example describes a hunt in the Ashnola River area, in which sheep were driven to the heads of two gulches at the top of the mountain, where hunters waited in ambush to kill them (Teit 1930). People did not appear to have camped in the mountains on these hunts, since trips to the mountains took place on the same day as the kill, and the sheep were simply cached in the snow for removal as needed (Teit 1930).

Basecamps from which hunting day trips were made were set up on level, dry land, close to water, and at the edge of the forest (Tyhurst 1992). Forest cover provided shelter from wind and rain, as well as firewood for cooking features and hearths. The trees also created a windbreak for meat-drying racks so that the smoke from smudge-fires would linger and keep flies away. The camps were on the leeward side of trees where feasible, with open meadows in front of the trees used for general camping activities (Alexander 1992a).

In general, subalpine parkland - alpine environments are complex environments, with topography, micro-climates, and vegetation associations varying significantly over short distances. Each mountain top is like an island, and the variety and abundance of plant and animal species can vary considerably from peak to peak. The range of variability can only be assessed by inspection of each locality, but general observations can be made about the possible location and potential for archaeological sites, based on traditional resource use and species distributions in these environments.

Fishing and waterfowl hunting would have been extremely infrequent uncommon activities in this environment, since lakes and streams in subalpine settings do not usually support fish or shellfish populations, or more than the occasional wetland bird (Environment Canada n.d.).

Given the rarity of aquatic resources and the need for sheltered camp locations, open lands immediately adjacent to lakes and streams in the montane parklands are expected to have a lower potential for archaeological sites than such locations at middle to low elevations.

All of the ungulate species, upland game birds, and all but a few of the other mammal species exploited by the Okanagan-Colville and Secwepemc were present in the subalpine parkland (see Table 3). This environment is particularly important as summer range for deer that typically use the fringes of open grassy areas, particularly those offering nearby escape terrain in the form of bluffs and broken slopes. As already discussed in Section 3.5.1.4, ungulates were killed wherever they were encountered, but kill/butchering sites can be anticipated at mineral licks, watering holes, and promontories. Rocky promontories were sometimes used as lookouts where game could be spotted, and rockshelters were sometimes used to provide temporary shelter while hunting (Alexander 1989).

Hunting drives were probably most common in subalpine parklands. During these drives, hunting parties of men and women worked co-operatively to drive ungulates (primarily deer, bighorn sheep, and elk) up or down a forested valley. The animals were killed by driving them either over a cliff or into a narrow passage where they could be easily shot. Hunters sometimes hid at the top of the passage, either in a natural depression or behind a man-made blind (commonly constructed of piled rocks). These blinds should be expected at high points overlooking game trails. Animals killed at these locations were probably butchered somewhere else since the scent of blood might scare away animals in future hunts (Alexander 1992a).

Deer fences were also constructed in the parkland. These fences were typically built in small valleys or in defiles where deer commonly crossed from one mountain to another or passed on their way down to their wintering grounds. Fences were also used to catch caribou (Teit 1930).

The most important plant foods found in the open meadows of this environment are spring beauty corms (*Claytonia* cf. *lanceolata*), avalanche lily bulbs (*Erythronium grandiflora*), dwarf mountain blueberries (*Vaccinium caespitosum*), tiger lily bulbs, nodding onion, balsamroot shoots and roots, cow-parsnip stems, and Indian celery leaves. Other important plant foods are found in the open forests at the edge of the meadows including whitebark pine nutlets, soapberries, huckleberries, and a variety of other plants with berries (Alexander 1992a; Turner, Bouchard and Kennedy 1980; Palmer 1975; Compton 1995). Plant gathering sites were concentrated in the moister open meadows and forest margins, while plant processing and storage, including the construction of cooking features and storage pits, was typically undertaken at basecamps.

Since this environment was typically visited in the spring when tree cambium was collected, bark stripping may be common on tree species such as whitebark pine, subalpine fir, and lodgepole pine. Lodgepole pine and Engelmann spruce bark may also have been stripped and used to cover shelters.

Subalpine parkland hunting grounds documented in the literature include: (1) Mount Mara, which was an important hunting location used after the fall salmon fishery at Sicamous Narrows (Bouchard and Kennedy 1986), (2) the headwaters of Scotch Creek (Bouchard and Kennedy 1990), and (3) mountainous settings north of Mount Copeland (northwest of Revelstoke), which were used to hunt caribou and hoary marmots (Bouchard and Kennedy 1986). Silver Star Mountain near Vernon is described as a good place to find mountain huckleberries (Turner, Bouchard and Kennedy 1980), and blackcaps were gathered 16 km up the Ashnola River from its mouth (Turner, Bouchard and Kennedy 1980).

3.7.2 First Nations Use of the Alpine Tundra

The Alpine Tundra biogeoclimatic zone, immediately above the subalpine parkland, was not as intensively used by local First Nations in the Okanagan TSA. Normally found at elevations above 2000 m, alpine settings are characterized by a predominance of low shrubs, grasses, and sedge species. Alpine meadows, with a rich and varied herbaceous flora, tend to occur in level or gently sloping landscapes where snow lasts longer and provides moister conditions. Although the unit is essentially treeless, *krummholz* (stunted) forms of a couple of subalpine species occasionally occur. Strong winds, especially at the highest elevations, make the effective temperatures even colder than those in the subalpine parkland. During the summer months the weather is generally sunny and warm during the day, but the evenings are usually cold, and frost, even snow, may occur any day of the year.

The absence of trees in alpine settings means that there is little or no shelter from wind, and no firewood for warmth and cooking food. In most locations, potable water is also scarce in the alpine, especially in drier and/or warmer years when snowpacks and associated runoff disappear early. Given the lack or scarcity of shelter, firewood, and water in alpine settings, even transitory campsites were probably rare in the prehistoric past. Ethnographic accounts do, however, describe daytime forays into the alpine from parkland basecamps. Subsistence activities during these day trips were primarily focussed on plant gathering by women and hunting by men (Alexander 1992a).

Kill/butchering sites may be anticipated in the same locations as described for the subalpine parkland, but should be less frequent since deer, bighorn sheep, and elk prefer the safety and shelter of the forest margins. Moreover, many of the smaller mammals are absent from alpine environments (see Table 3). White-tailed ptarmigan (*Lagopus leucurus*) is the only bird species known to occur in any abundance (Campbell, et al 1990b). Plant gathering activities were common in moister locations, with the most important resources being spring beauty corms, avalanche lily bulbs, and dwarf mountain blueberries. Fishing and waterfowl hunting would not have taken place in alpine settings, since lakes and streams in this environment are rarely large enough to support any fish or waterfowl populations.

3.7.3 Archaeological Expectations for Subalpine Parkland/Alpine Tundra Environments

The greatest potential for archaeological sites in high-elevation montane environments is within lands that could have been used as basecamps. These locations were typically situated in subalpine parkland on dry, relatively level land at the edge of the forest, with ready access to potable water. Locations sheltered by trees or topographic features would have a higher potential than more open lands. Level ground is usually rare and localized in such environments, and even the smallest areas meeting these specifications should have a high archaeological potential. In the alpine, on the other hand, camp sites are expected to be rare, and no large hearths, cooking features, shelters, or drying racks are to be expected in such settings.

Plant gathering was a common activity in these environments. However, most of the baskets, digging sticks, and other tools used to collect plants were made from perishable materials such as wood, bone, antler, and horn (Alexander 1992a), and as a consequence, plant gathering sites are nearly invisible in the archaeological record. However, evidence of plant processing and storage in the form of cooking features and storage pits may be anticipated at basecamp sites. A few isolated cache pits should also be expected outside the basecamps, near locations such as moist meadows with high densities of plant resources. CMTs in the form of bark-stripped whitebark pine, subalpine fir, lodgepole pine, and Engelmann spruce may also be present, especially close to good basecamp locations.

Isolated kill/butchering sites should be common; given the greater abundance and diversity of game species in subalpine parklands, such sites should be more numerous in these settings than the alpine tundra. Similar to other environments, these sites may be anticipated at mineral licks, drinking holes, and rocky promontories. Promontories may also be associated with game lookouts, while rockshelters may contain evidence of transitory camps.

Evidence of ungulate drives should also be expected in the mountains. Open mountain passes, through which ungulates and people travelled, have a high potential for hunting blinds and associated kill sites. Small valleys or defiles where deer commonly crossed from one mountain to another, or where they passed on their way down to wintering grounds, have a high potential for deer fences with associated kill sites and basecamps.

Each area of subalpine parkland in the TSA is unique in terms of the quantity and variety of plant and animal species present. Parkland settings with many potential camp sites and abundant food resources probably attracted many people and may be expected to contain large and numerous sites, with high artifact densities. Localities close to winter villages may also have seen more use (Alexander 1989). These conditions also created a greater demand for temporary storage and processing facilities, as well as more elaborate and numerous shelters. The circular depressions left by cache pits and cooking features would probably be the most easily recognized archaeological remains of any structures or features. Although alpine settings near important

expansive parkland settings will also have a higher potential for sites, fully alpine environments are predicted to contain fewer archaeological sites overall, than subalpine parklands.

3.8 NON-SUBSISTENCE PRACTICES PRODUCING ARCHAEOLOGICAL SITES

Many archaeological sites in the Okanagan TSA have been produced by cultural activities that were not an integral part of the seasonal round of subsistence activities. They include burials, rock art sites, lithic resource quarries, and sites of religious or ceremonial activities. Ethnographic information that could assist in predicting the location of such sites is discussed below.

3.8.1 Burial Places

The Secwepemc, Okanagan-Colville, and Nlaka'pamux typically buried their dead close to, but not adjoining the winter village, and some Nicola-Similkameen burials are also reported near winter villages. More than one burial ground may be associated with a village. The Okanagan-Colville and Secwepemc interred most of these burials in loose, sandy soil at the edge of a terrace, or in a natural mound. Burials at the base of a talus slope were common among the Nlaka'pamux, Nicola-Similkameen, and the Okanagan-Colville. Where talus slopes were not available, the Nicola-Similkameen buried their people on level ground and covered them with a round or conical pile of boulders. Caves are not reported to have been used as burial sites in this region. Among the Secwepemc and Nlaka'pamux, poor people and old people without powerful relatives were sometimes buried above ground on a scaffold, or on the ground and covered with sticks, mats, brush, bark, or stones (Teit 1900, 1909, 1930; Dawson 1892; Boas 1891; James and Oliver 1991; Smith 1900; Curtis 1911; Ray 1932).

People who died away from the village were usually returned to the village for burial. Secwepemc, Nicola-Similkameen, and Nlaka'pamux people who died in distant places were sometimes temporarily buried above ground or in shallow graves. Later the bones were bundled and reinterred near the village. Occasionally, Secwepemc and Nlaka'pamux people who died in very distant lands were cremated, then their ashes returned to the village (James and Oliver 1991; Teit 1900, 1909; Boas 1891; Dawson 1892). The Okanagan-Colville did not reinter people who died and had been buried at another village, but people who died in the mountains were always returned to the village for burial (Ray 1932).

Permanent burials did occasionally occur in other locations. The Nicola-Similkameen and Nlaka'pamux sometimes buried their dead near spring fishing camps. Deaths were reportedly common in the spring when food was in short supply, and some were also buried along trails to the spring fishing camps (James and Oliver 1991; Smith 1900). A Similkameen Okanagan chief also was reportedly buried near a trail (Teit 1930). Nlaka'pamux people who were poor, or who died in distant places, were also sometimes buried where they died (Teit 1900).

Based on this evidence, prehistoric burials should be most common near village sites, most commonly found at lower elevations on river and lake shores. Burials may be anticipated on prominent locations near terrace edges and on low sandhills. They may also be expected at the bases of talus slopes, especially outside the South Thompson River drainage. Similar landforms near fishing camps and trails may also be associated with burials. Although isolated burials could occur almost anywhere, they are likely to be rare.

3.8.2 Rock Art

Ethnographic and historic accounts of First Nations cultures in the study area provide few clues that could assist in predicting the location of pictographs (rock paintings) or petroglyphs (rock carvings). The function of petroglyphs in this region is poorly understood, but they are often found on large boulders at important fishing stations along the major rivers. Some pictographs (rock paintings) were assigned a mythological origin (Teit 1906, 1909), but most were made by boys and girls during puberty (vision questing) rituals, or by men to record their dreams or give thanks for a successful hunt (Teit 1900, 1906; 1909, 1930; Bouchard and Kennedy 1984b; Keyser 1992). These paintings are to be found...in lonely or secluded places near where Indians were in the habit of holding vigil and undergoing training during the period when they generally acquired their manitous [guardian spirits] (Teit 1918). These places were sometimes in canyons or near waterfalls (Teit 1900). The paintings were sometimes made in caves or on boulders, but are usually found on open rock faces with substantial protective overhangs (Corner 1968). It should be noted that the Okanagan-Colville sometimes also cut pictures into the bark of trees or burned images into the wood (arborglyphs) (Teit 1930).

In the study area, petroglyphs may be expected on large boulders near important fishing sites, such as those encountered at narrows, rapids and falls. Pictographs may also be anticipated within the TSA, but their location is more difficult to predict. They will probably occur anywhere that suitable rock outcrops or shelters exist, particularly along lake shores and important trails, but they may also be associated with remote settings near canyons and waterfalls.

3.8.3 Lithic Resource Quarries

Many of the tools traditionally used by the Secwepemc, Nicola, and Okanagan-Colville people were made from stone. Not all types of stone were suitable for the manufacture of tools, and good sources of suitable raw materials were few and sometimes even fought over (e.g., Morice 1894). Locations where lithic raw materials were collected and roughly processed for tool-making are called quarries.

Quarry sites are rarely mentioned in the ethnographic record. However, being one of the most sought-after rocks, obsidian (volcanic glass) is the material that was most frequently discussed.

Suitable volcanic environments in which obsidian would occur are not present within the Okanagan TSA, and it could only be obtained through trade, particularly with the Columbia Plateau. Fine-grained basalt was the stone most commonly used in the manufacture of tools by Canadian Plateau peoples. The largest known basalt quarries in Secwepemc territory are located far outside the TSA in the Arrowstone Range - Bonaparte River locality (Teit 1909; Dawson 1892; Smith 1900). Red ochre was also mined for use as a paint, and such quarries are reported on the Similkameen River and Adams Lake, but again, only in localities outside the study area (Dawson 1892). Local bands may have visited these distant sites to collect stone materials, or they may have received them in trade.

Basalt, and other lithic materials such as cherts and chalcedonies, do occur in bedrock formations within the Okanagan TSA, or as cobbles in fluvial deposits along creeks and in glacial drift sediments. However, it would be difficult to predict their location. Archaeological site densities are predicted to be much higher near quarry locations.

3.8.4 Religious and Ceremonial Activities

Many of the religious and ceremonial activities practiced by local First Nations peoples took place at the winter village and not at sites set aside for such activities. Moreover, many of these activities would not have resulted in the formation of physical evidence that would be identified as archaeological remains. Nevertheless, exceptions may exist. Certain places were commonly used for bathing or spiritual renewal, and the ongoing affirmation of assistance from spiritual partners (Teit 1900, 1909, 1930; Dawson 1892; Boas 1891; Bouchard and Kennedy 1984b; James and Oliver 1991; Curtis 1911). These places had to be near water and trees, in isolated areas, often in montane settings. They commonly featured bathing pools and sweat lodges, and are sometimes associated with pictograph sites. At some sites, cairns or stone rings were constructed. Secwepemc boys also sometimes slept in caves during these rites (Ray 1942). In the study area, Kay Falls (tributary of the Eagle River) has been identified as a site where young Secwepemc people went to obtain guardian spirit power (Bouchard and Kennedy 1986).

It is difficult to predict where sites pertaining to these activities would be located, but some can be expected to be associated with prominent landscape features such as caves, waterfalls, canyons, and rapids.

Table 3. A list of mammals used by First Nations people in the Okanagan TSA.

Common Name	Scientific Name	Hunted by Secwepemc	Hunted by Okanagan- Colville	Absent From Environmental Settings				
				1	2	3	4	5
Badger, yellow	<i>Taxidea taxus taxus</i>	N	Y					
Bear, black	<i>Ursus americanus</i>	Y	Y					
Bear, grizzly	<i>Ursus arctos horribilis</i>	Y	Y					
Beaver	<i>Castor canadensis</i>	Y	Y			X		X
Bobcat	<i>Lynx rufus fasciatus</i>	N	Y					X
Caribou	<i>Rangifer tarandus montanus*</i>	Y	Y	X	X			
Cougar	<i>Felis concolor</i>	N	Y					
Coyote	<i>Canis latrans lestes</i>	Y	Y					
Deer, mule	<i>Odocoileus hemionus hemionus</i>	Y	Y					
Deer, whitetail	<i>Odocoileus virginianus*</i>	Y	Y					
Elk	<i>Cervus canadensis nelsoni*</i>	Y	Y					
Fisher	<i>Martes pennanti columbiana*</i>	Y	Y					X
Fox, red	<i>Vulpes fulva</i>	Y	Y					
Groundsquirrels		N	Y					
Groundsquirrel, Columbian	<i>Spermophilus columbianus</i>	N	?					
Groundsquirrel, mantled	<i>Spermophilus lateralis*</i>	N	?					
Hare, snowshoe	<i>Lepus americanus pallidus</i>	Y	Y					X
Lynx	<i>Lynx canadensis canadensis</i>	Y	Y					X
Marten	<i>Martes americana</i>	Y	Y					X
Marmots		Y	Y					
Marmot, hoary	<i>Marmota caligata*</i>	?	?	X	X			
Marmot, yellow-bellied	<i>Marmota flaviventris avara*</i>	?	?					
Mink	<i>Mustela vison energumenos</i>	Y	Y			X	X	X
Moose	<i>Alces alces andersoni*</i>	Y	Y					X
Mountain goat	<i>Oreamnos americanus*</i>	Y	Y	X				

Table 3. A list of mammals used by First Nations people in the Okanagan TSA.

Common Name	Scientific Name	Hunted by Secwepemc	Hunted by Okanagan- Colville	Absent From Environmental Settings				
				1	2	3	4	5
Muskrat	<i>Ondatra zibethica</i>	Y	Y			X		X
Otter	<i>Lutra canadensis evexa</i>	Y	Y			X	X	X
Porcupine	<i>Erethizon dorsatum nigrescens</i>	Y	Y					X
Rabbits		N	Y					
Jackrabbit, white-tailed	<i>Lepus townsendii townsendii*</i>	N	N					
Cottontail, mountain	<i>Sylvilagus nuttallii nuttallii*</i>	N	N					
Sheep, bighorn	<i>Ovis canadensis*</i>	Y	Y					
Skunk	<i>Mephitis mephitis</i>	N	Y					X
Squirrels		Y	Y					
Squirrel, northern flying	<i>Glaucomys sabrinus</i>	?	?					X
Squirrel, red	<i>Tamiasciurus hudsonicus</i>	?	?					X
Weasels		N	Y					
Weasel, long-tailed	<i>Mustela frenata</i>	N	?					
Weasel, short-tailed	<i>Mustela erminea richardsonii</i>	N	?					
Wolf	<i>Canis lupus</i>	Y	Y					
Wolverine	<i>Gulo luscus luscus</i>	Y	Y					

Information derived from Teit (1909, 1930); Bouchard and Kennedy (1990); Ray (1933). Nomenclature after Cowan and Guiget (1965).

1. Low-elevation lakes, rivers, and streams.
2. Mid-elevation lakes, rivers, and streams.
3. Forested montane environments.
4. Subalpine parklands.
5. Alpine tundra.

* Species with restricted distribution in the Okanagan TSA.

4.0 ARCHAEOLOGICAL OVERVIEW

This section describes and discusses previous archaeological research conducted in the Okanagan TSA. In particular, it focuses upon research which has generated information of particular relevance to this study. This primarily includes regional site inventory studies, though studies of limited scope and extent which have provided unique information about prehistoric land use, are also included.

Archaeological sites throughout Canada are numbered according to the Borden Site Designation Scheme (Borden 1952). This scheme is based on the maps of the National Topographic System and uses latitude and longitude to pinpoint the location of a site. The four alternating upper and lower case letters (e.g., **DgQv**) designate a unique block measuring 10 minutes of latitude by 10 minutes of longitude. Archaeological sites are numbered sequentially within a block based (usually) on their date of discovery; thus, DgQv 2 would be the second site recorded in block DgQv.

4.1 REGIONAL PREHISTORY OF THE OKANAGAN - SHUSWAP

The history of archaeological research in the Interior Plateau of British Columbia has been recently summarized in Richards and Rousseau (1987), Pokotylo and Mitchell (1993), and Stryd and Rousseau (1996), and need not be repeated here.

The Okanagan TSA is situated within the Canadian Plateau Cultural Area (as defined by Richards and Rousseau 1987). Excavations of numerous prehistoric sites throughout the Plateau have provided a reliable model of regional prehistory. Figure 2 represents a cultural (and palaeo-environmental) sequence for the Southern Interior of British Columbia.

4.1.1 Early Prehistoric Period (11,000 - 7000 BP)

The initial peopling of the Southern Interior of B.C. probably commenced between about 11,000 and 10,000 BP (Rousseau 1993), by ancient First Nations people moving into the region from the Columbia Plateau and Great Basin to the south. These migrations appear to have involved peoples belonging to five different archaeological traditions: (1) the Western Fluted Point Tradition, (2) the Intermontane Stemmed Point Tradition, (3) the Plano Tradition, (4) the Early Coast Microblade Complex and (5) the Old Cordilleran Tradition (Stryd and Rousseau 1996; Rousseau 1993).

During the Early Prehistoric Period, initial cool and wet postglacial conditions were quickly replaced by hot and dry conditions (the so-called Hypsithermal or Climatic Optimum). During

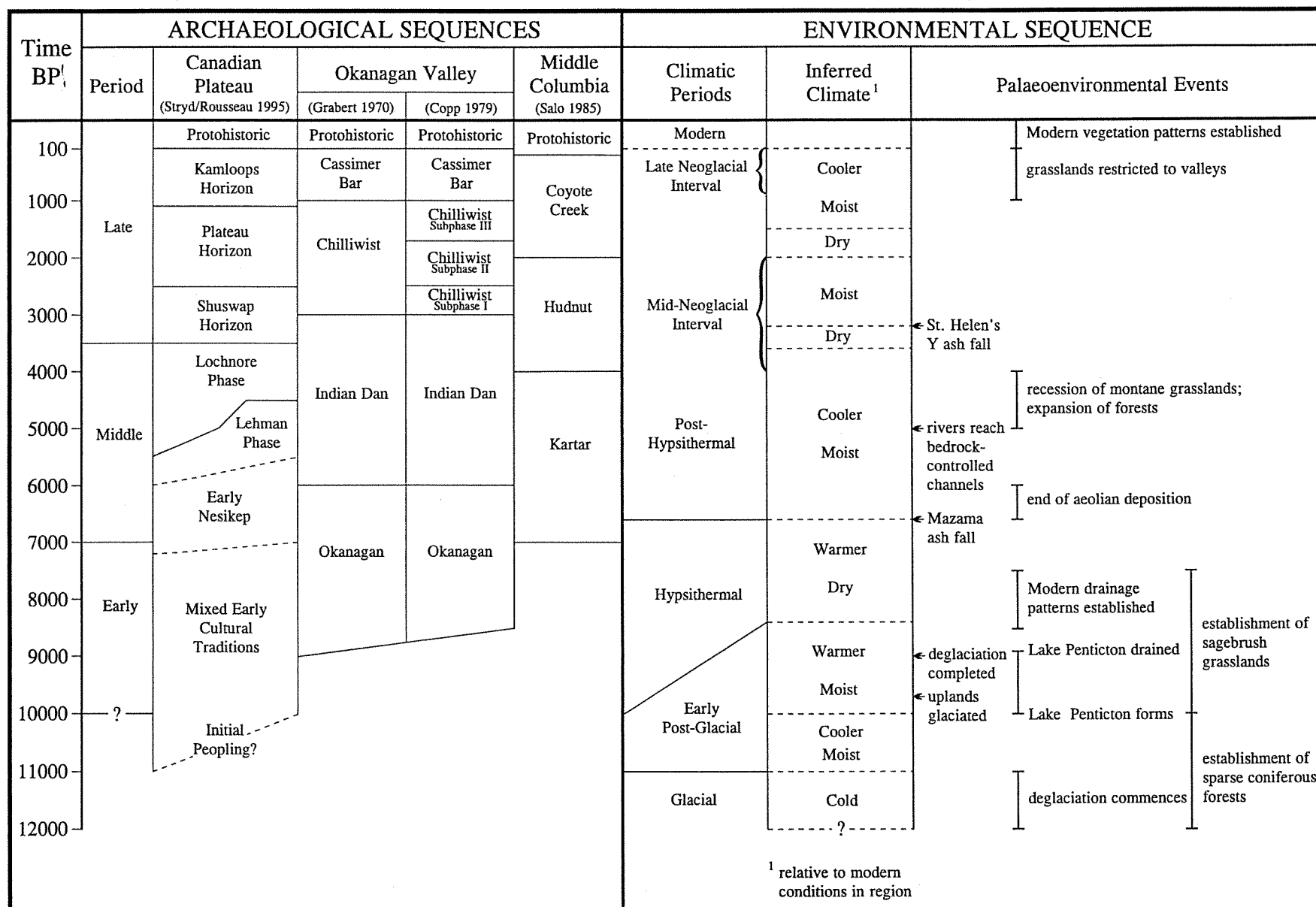


Figure 2. Cultural and palaeoenvironmental sequence for the Southern Interior of British Columbia.

this period, a reliance on hunting and a subsistence pattern characterized by an ever-broadening foraging spectrum is inferred, involving more intensive and more efficient exploitation of small animals and plants (Stryd and Rousseau 1996), though the earliest inhabitants of the region may have been able to exploit relict Pleistocene mega-fauna, including extinct forms of bison. The earliest manifestations of this occupation may have been associated with mid-elevation grasslands, away from inhospitable glacial lakes that filled the valley bottoms. As glacial lakes drained between 9000 and 8000 BP, valleys would have become more attractive as sources of potable water during the xeric climatic regime of the Hypsithermal. However, settings away from rivers and lakes would have been extremely arid and probably devoid of most game species. Sites of this age will almost always be found in deeply-buried contexts, often associated with thick deposits of aeolian sediments (e.g., Rousseau, et al 1991).

Dated sites earlier than about 7000 BP are very rare in the Southern Interior of B.C., but examples are known from: (1) a campsite (dated 7530 BP) buried by the Drynoch Slide south of Spences Bridge (Rousseau 1993), (2) a human skeleton (dated 8240 BP) from Gore Creek west of Chase (Cybulski, et al 1981), (4) another encampment (dated 8400 BP) at the Landels Site on Oregon Jack Creek near Ashcroft (Rousseau, et al 1991), and (5) a third campsite, at Stirling Creek (dated 7400 BP) in the Similkameen River valley southeast of Hedley (Copp 1996, 1997).

A small number of distinctive Early Prehistoric artifacts, primarily projectile points (which would have been used to arm spears or atlatl darts), have been discovered in various parts of the Okanagan TSA. Generally speaking, artifacts which appear to be attributable to the Western Fluted Point and Plano traditions have only been found in the Shuswap region and beyond the TSA to the west. Early Stemmed Point Tradition and Old Cordilleran tradition artifacts are most common to the south, but have been found throughout the Southern Interior. Early Coast Microblade Complex artifacts are characteristic of sites in the Cascade Mountains, and have recently been identified in the Similkameen River valley just beyond the TSA boundary (Copp 1996). Early-looking artifacts associated with still-undocumented sites have also been reported in the Salmon River valley around Falkland and Westwold (W.Choquette, archaeological consultant, pers. comm., 1988), and in the reservoir drawdown zone of Sugar Lake (A.Mackie, Archaeology Branch, pers. comm., 1996).

4.1.2 Middle Prehistoric Period (7000 - 3500 BP)

The Middle Prehistoric Period in the Southern Interior generally coincides with the end of the Hypsithermal and onset of cooler, moister conditions. Subsistence was based primarily on hunting game animals and gathering plant foods, although there could have been robust salmonid populations in some watersheds available to First Nations fishers.

At the beginning of this period, the distinctive ungulate-hunting Nesikep Tradition culture emerged (Stryd and Rousseau 1996), apparently unique to the Fraser - Thompson drainage. Its

origins doubtless lie in the mix of early regional traditions, but appears to have affinities to archaeological remains from the Columbia Plateau of Washington and Idaho (Matson 1988). Where sites of this age have been identified, they are usually configured to the higher terraces of existing rivers, but sites have also been found in mid-elevation settings beyond the study area (e.g., Arcas Consulting Archeologists 1995a). The latter part of the Nesikep Tradition is called the Lehman Phase (Arcas Associates 1985a), dated ca. 6000/5000 to 4400 BP; Lehman Phase sites are normally associated with existing rivers in valley bottoms, and existing watercourses and lakes in mid-elevation and upland settings (Stryd and Rousseau 1996).

A new archaeological culture, called the Lochnore Phase, appears in the Fraser - Thompson drainage about 5500 BP and persists until 4000/3500 BP (Stryd and Rousseau 1996). The appearance of this tradition signals the arrival of riverine-adapted, Salishan-speaking peoples from the Northwest Coast, presumably to exploit the salmon which became more abundant in the main rivers of the region with the onset of post-Hypsithermal climatic and hydrological conditions. The Lehman Phase people of the Nesikep Tradition and the Lochnore Phase people seem to have co-existed and maintained separate cultural identities for at least several hundred years. By ca. 4400 BP, the fishing-oriented, Salish-speaking, Lochnore Phase people had absorbed (perhaps both culturally and genetically) the indigenous, hunting-oriented, Lehman Phase people, thereby bringing to an end the Nesikep Tradition (Stryd and Rousseau 1996).

The Middle Prehistoric occupation of the Okanagan and Similkameen River valleys is cloudier than the Shuswap region, because fewer sites of this age are known from the region. However, its proximity to the adjacent Columbia Plateau of Washington suggests potential similarities with the cultural sequence developed for that region (Grabert 1968a, 1974). In the Okanagan Valley, Grabert proposed the Okanagan (10,000 - 6000 BP) and Indian Dan (ca. 6000 - 3000 BP) Phases, which he believed evolved as local expressions of the Old Cordilleran Tradition (Grabert 1974; Stryd and Rousseau 1996). Recent work in the Similkameen River valley has so far failed to shed any light on Grabert's sequence, except that cultural materials of Middle Prehistoric age were identified (Copp 1996).

Dated Lehman or Lochnore Phase sites are known from Monte Creek (I. Wilson 1991; I.R. Wilson Consultants 1992) and Adams Lake (Bailey, et al 1993) west of the TSA, and on Shuswap Lake (Rousseau, Muir and Alexander 1991). However, most radiocarbon-dated Lochnore and Lehman Phase components and/or sites are located well west of the Okanagan TSA, including the Highland Valley (Arcas Associates 1986a), the Ashcroft locality (Arcas Associates 1985a; Rousseau, et al 1991), and the Lillooet - Pavilion area (Richards 1978; Hayden, et al 1987).

Neither Lehman nor Lochnore Phase cultural materials are presently known from the Okanagan Valley or the Similkameen River valley areas (*cf.*, Stryd and Rousseau 1996). Large numbers of leaf-shaped projectile points (or bifacial knives) have been collected at many places within the Okanagan, some of them in environmental contexts that could suggest attribution to Middle Prehistoric sites. This interval is well-expressed along the middle Columbia River near

its confluence with the Okanogan River in Washington (Grabert 1968a; Salo 1985), but is known in the study area from some undated components in sites excavated by Garland Grabert (Stryd and Rousseau 1996).

4.1.3 Late Prehistoric Period (3500 - 200 BP)

The end of the Lochnore Phase (and Middle Prehistoric Period) and the establishment of the succeeding Plateau Pithouse Tradition (Late Prehistoric Period) is presently clouded by some recent discoveries, but occurred about 3500 BP (Richards and Rousseau 1987). The Plateau Pithouse Tradition represents a more sedentary way of life focused on intense salmon exploitation and storage, supplemented as required by other resources, and on use of the semi-subterranean pithouse as a winter residence (Stryd and Rousseau 1996).

The Late Prehistoric Period on the Canadian Plateau has been divided into three successive cultural horizons, each with its own artifact styles, technological attributes, and settlement characteristics (Richards and Rousseau 1987; *cf.*, Pokotylo and Mitchell 1993). The three horizons are the Shuswap Horizon (ca. 3500 to 2400 BP), Plateau Horizon (ca. 2400 to 1200 BP), and Kamloops Horizon (ca. 1200 to 200 BP).

All three horizons of the Late Prehistoric Period, as well as early historic remains, are commonly represented in cultural materials recovered from archaeological excavations in the Shuswap region of the Okanagan TSA and elsewhere in the Southern Interior (Richards and Rousseau 1987). Regional expressions of the Plateau Pithouse Tradition horizons in the Thompson - Shuswap drainage are the Shuswap, Thompson (= Plateau horizon), and Kamloops Phases (Richards and Rousseau 1987; Pokotylo and Mitchell 1993). Richards and Rousseau (1987) assert that their cultural sequence is applicable to the Okanagan and Similkameen River valleys as well, but archaeological assemblages in this region also bear marked resemblances to the Columbia Plateau sequence of central Washington (Grabert 1974; Pokotylo and Mitchell 1993). Grabert's research in the Okanagan Valley (1968a, 1974), on both sides of the International Boundary, resulted in development of a cultural sequence beginning with the Okanagan and Indian Dan Phases as previously mentioned, and in the Late Prehistoric Period including the Chiliwist (3000 - 850 BP) and the Cassimer Bar (850 - Contact) Phases. Subsequent excavations near Vaseaux Lake led Copp (1979) to refine the Chiliwist Phase into three subphases (I: 3000 - 2350 BP; II: 2350 - 950 BP; III: 950 - Contact), of which the last subphase appears to represent an occupational hiatus in the southern Okanagan Valley (Copp 1979; Pokotylo and Mitchell 1993).

4.2 ARCHAEOLOGICAL SITE INVENTORY STUDIES

Despite being the most densely-populated region of Interior B.C., landscapes within the Okanagan TSA study area have not been as intensively inventoried for archaeological sites as

many other parts of the province. Nevertheless, a substantial number of site surveys have been conducted throughout the TSA, resulting in the recording of 955 archaeological sites and creating the database upon which the potential model was based. This section summarizes the results of archaeological investigations that resulted in the identification and recording (or re-recording) of sites within the TSA. For convenience, the study area has been differentiated into Okanagan/Similkameen and Shuswap regions, reflecting the natural division between Thompson - Shuswap and Columbia - Okanagan drainage basins.

4.2.1 Site Inventories of the Okanagan - Columbia Basin

The earliest documented archaeological investigation conducted in this part of the study area was carried out by Warren Caldwell (University of Washington), who sketchily recorded 89 sites between the head of Okanagan Lake and the International Boundary, including the lower Similkameen River valley (Caldwell 1954). Additional sites were recorded by Garland Grabert (Western Washington University) in the late 1960s, particularly in the northern Okanagan (Grabert 1968b, 1974). During the 1960s, avocational archaeologist John Corner conducted an inventory of pictographs of the Southern Interior (Corner 1968). Small numbers of additional sites were also recorded during this period, as a result of reports to university or provincial museum authorities by amateur enthusiasts and local residents. More systematic inventories of archaeological sites were undertaken in the Okanagan by Stan Copp (Simon Fraser University) in 1974 and under the direction of James Baker (Okanagan College) in 1975 (Copp 1974; Baker 1975). Smaller-scale site surveys in the Okanagan were carried out by numerous archaeologists employed by the Archaeological Sites Advisory Board (ASAB) and Heritage Conservation Branch (HCB) between 1976 and 1983. Since 1980, nearly all of the site surveys in the Okanagan and Similkameen Valleys have been undertaken in the context of development-specific archaeological impact assessments. Two exceptions are an inventory of sites within the traditional territory of the Upper Nicola Indian Band in the Pennask Lake locality (James and Oliver 1993), and a systematic site survey of sites in the Similkameen River valley upstream from Hedley (Vivian 1989a). The latter study took place beyond the boundaries of the TSA, but its findings were of considerable importance for developing the Okanagan TSA site potential model.

Most of the sites recorded in the Okanagan were identified since 1970. A total of 13 inventory-level archaeological studies have accounted for a total of 507 sites identified and recorded (including previously-recorded sites relocated and re-recorded). By contrast, about 53 small-scale archaeological impact assessments or limited-area surveys between 1963 and 1995 have resulted in the identification or relocation of 215 additional sites. Table 4 summarizes the results of archaeological site surveys in the Okanagan - Similkameen region, while Table 5 is a summary of small-scale archaeological surveys and research in this part of the TSA.

Table 4. Summary of Archaeological Inventories in the Okanagan - Similkameen Region.

Year	Director	Affiliation	Title	Sites Recorded	Comments	Reference
1952	Warren Caldwell	University of Washington	Survey of Okanagan and Similkameen Valleys	89	Cursory site recce., primarily of valley bottom settings	Caldwell 1954
1967	Garland Grabert	Western Washington University	Survey of Upper Okanagan Valley	29	Established that recent landforms contain only recent sites; burials associated with dunes or low eminences near lakes; high frequency of sites in tributary valleys	Grabert 1968b
1972	Gerry Roberts	Osoyoos Indian Band	Inkameep Archaeological Project	13	Judgemental survey on the Osoyoos Indian Reserve	Roberts 1974
1974	Stan Copp	Simon Fraser University	Okanagan - Similkameen Survey	63	Judgemental survey of valley bottom and valley-side settings	Copp 1974
1975	James Baker	Okanagan College	Okanagan College Archaeological Research Project	74	Utilized only random-sample quadrat survey methods in the TSA; 27 sites identified in 72 1000 m ² quadrats; 47 sites outside quadrats	Baker, ed. 1975
1976	Stan Copp	Simon Fraser University	Okanagan - Similkameen Survey	7	Judgemental survey of valley bottom and valley-side settings	Copp 1979
1976	Steve Lawhead	ASAB	Interior Lakes Survey	79	Systematic survey of Okanagan Lake shoreline	Lawhead and McLeese 1976
1977	Mike Rousseau	ASAB	Interior Lakes Inventory	73	Systematic survey of Okanagan Lake shoreline, continued	Rousseau and Wales 1977
1983	Mike Rousseau	Westbank Indian Band	Investigations on Tsinstikeptum IR#10	35	Systematic survey, restricted to main Westbank Band IR	Rousseau 1984
1985	Ian Wilson	I.R. Wilson Consultants	Penticton - Peachland Highway 4-Laning	16	Impact assessment along Hwy 97 corridor	Wilson and Thompson 1985
1987*	Brian Vivian	University of Calgary	Cultural Resources of the Princeton Basin	126	Systematic site survey in Similkameen River valley NW of Hedley	Vivian 1989a
1988	Brian Vivian	University of Calgary	Cathedral Provincial Park Survey	26	Survey along Ashnola River and alpine settings within park	Vivian 1989b
1991	Malcolm James / Lindsay Oliver	Upper Nicola Indian Band	Spahomin Archaeological Inventory	?	Survey of mid-elevation lakes near western edge of TSA; this part of work never formally reported	James and Oliver 1993
1993	Jean Bussey	Points West Consultants	Investigations for SONG Pipeline Project	10	Impact assessment within natural gas pipeline corridor	Bussey 1993

* Study conducted beyond Okanagan TSA but useful for model development; not included in site counts

Table 5. Summary of Limited Archaeological Surveys in the Okanagan - Similkameen.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1963	Don Abbott	BCPM	Provincial Parks Survey	5	16?	Abbott 1963
1971	Mike Blake	ASAB	Archaeological Survey of Parks and Park Reserves	20	53?	Condrashoff 1971
1973	Mike Robinson	ASAB	Dept. of Highways Archaeological Survey	4	3 Linear Corridors?	Robinson and St. Pierre 1973
1975	Jerry Roberts	ASAB	Nicola - Cranbrook Transmission Line Impact Assessment	6	Linear Corridor	Roberts and Brolly 1976
1975	Margaret Burnip	ASAB	Dept. of Highways Archaeological Survey: Southern District	0	? Linear Corridors	Burnip and Hardern 1975
1976	Abbey Bates	ASAB	Dept. of Highways Archaeological Site Survey	10	23 Linear Corridors	Bates and McMath 1976
1976	Jerry Roberts	ASAB	Nicola - Cranbrook Transmission Line	10	Linear Corridor	Roberts 1976
1977	Linda Haugen	ASAB	Ministry of Highways Archaeological Survey: Southern Interior	23	Linear Corridors	Haugen and Galvin 1977
1978	Mike Rousseau	ASAB	Thompson - Okanagan Regional Inventory	28	38	Howe and Rousseau 1978
1978	Mike Rousseau	ASAB	Inventory and Assessment of Provincial Parks	28	4	Duff and Rousseau 1978a
1979	Mike Rousseau	HCB	Thompson - Okanagan Impact Assessment	8	14	Rousseau 1979
1980	Mike Rousseau	HCB	Thompson - Okanagan - Kootenay Impact Assessment	10	40	Rousseau and Richards 1980
1981	Richard Brolly	HCB	Southern Interior Survey	9	14	Brolly 1981
1982	Richard Brolly	HCB	HCB Highways Survey	9	2 Linear Corridors	Brolly and Calancie 1982

Table 5. Summary of Limited Archaeological Surveys in the Okanagan - Similkameen.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1982	Steve Lawhead	Arcas Associates	Heritage Resource Assessment of Ewings Landing, Okanagan Lake	5	1	Lawhead 1982
1983	Richard Brolly	HCB	HCB Highways Survey	0	Linear Corridor	Brolly 1984
1983	Mike Rousseau	Archer Consultants	Impact Assessment of Subdivision near Fintry, Okanagan Lake	5	1	Rousseau and Sumpter 1983
1985	Jean Bussey	Points West Consultants	Impact Assessment of Highway Revisions Between Kelowna and Vernon	6	Linear Corridor	Bussey 1986
1986	Steve Lawhead	Arcas Associates	Coquihalla Highway: Merritt - Peachland	0	Linear Corridor	Arcas Associates 1987
1988	Mike Rousseau	Points West Consultants	Impact Assessment of C.O.R.D. Wastewater Plant and Hospital, Westbank	0	1	Bussey 1988
1989	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Lakeview Estates Subdivision, Vernon	0	1	Arcas Consulting Archeologists 1989a
1989	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Appel Estates Subdivision, Skaha Lake	2	1	Arcas Consulting Archeologists 1989b
1989	Sandra Zacharias	Deva Heritage Consultants	Impact Assessments of Highways Projects in the Kamloops and Kelowna Area		? Linear Corridors	Zacharias 1989a
1990	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment at Fintry Delta, Okanagan Lake	6	1	Arcas Consulting Archeologists 1990a
1990	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment at Caesars, Okanagan Lake	3	1	Arcas Consulting Archeologists 1990b
1990	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Mission Ridge Subdivision, Westbank	0	1	Arcas Consulting Archeologists 1990c
1990	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Trailer Park, Westbank	0	1	Arcas Consulting Archeologists 1991a

Table 5. Summary of Limited Archaeological Surveys in the Okanagan - Similkameen.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1990	Wayne Choquette	Consultant	Heritage Resources Assessments of Two Parks in the Okanagan	1	2	Choquette 1990
1990	Wayne Choquette	Consultant	Heritage Resource Assessment of Blocks 2 & 16, Okanagan Falls	1	1	Choquette 1991
1990	Sandra Zacharias	Deva Heritage Consultants	Impact Assessment of Highways Projects in the Thompson - Okanagan - Kootenay Regions	1	4 Linear Corridors	Zacharias 1990a
1990	Sandra Zacharias	Deva Heritage Consultants	Impact Assessment of Okanagan College North Campus, Kelowna	0	1	Zacharias 1990b
1991	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of CLD Condo Development, Vernon	3	1	Arcas Consulting Archeologists 1991b
1991	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Subdivision at Gellatly, Westbank	0	1	Arcas Consulting Archeologists 1991c
1991	Diana French	Consultant	Impact Assessment of Property in Winfield	0	1	French 1991a
1991	Diana French	Consultant	Impact Assessment of Subdivision in Summerland	0	1	French 1991b
1992	Rebecca Balcom	EMA Consultants	Impact Assessment of Subdivision in Winfield	0	1	Balcom 1992a
1992	Richard Brolly	Arcas Consulting Archeologists	Overview of C.O.R.D. Linear Parks, West Side of Okanagan Lake	2	Linear Corridor	Arcas Consulting Archeologists 1992a
1992	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Fairway Hills Subdivision, Oliver	1	1	Arcas Consulting Archeologists 1992b
1992	Diana French	Consultant	Impact Assessment of Campbell Road Subdivision, Kelowna	1	1	French 1992
1992	Mike Rousseau	Antiquus Archaeological Consultants	Impact Assessment of Residential Subdivision in Olalla	0	1	Rousseau 1992

Table 5. Summary of Limited Archaeological Surveys in the Okanagan - Similkameen.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1993	Jeff Bailey	Antiquus Archaeological Consultants	Impact Assessment of Fish Lake Road Project near Summerland	0	Linear Corridor	Bailey and Rousseau 1993
1993	Jeff Bailey	Antiquus Archaeological Consultants	Impact Assessment of Clifton Gravel Pit in Keremeos	2	1	Bailey and Will 1993
1993	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of South Okanagan Substation, near Oliver	1	1	Arcas Consulting Archeologists 1993a
1993	Geordie Howe	Arcas Consulting Archeologists	Impact Assessment of Tavistock Property, Okanagan Lake	2	1	Arcas Consulting Archeologists 1993b
1993	Bjorn Simonsen	Bastion Group Consultants	Assessment of Bearcub Feldspar Project, Reisdig, near Lumby	0	1	Simonsen 1993a
1993	Bjorn Simonsen	Bastion Group Consultants	Impact Assessments of MoTH Projects in the South Okanagan	0	7 Linear Corridors	Simonsen 1993b
1993	Kathleen Sykes	Consultant	Impact Assessment of Addition to Trailer Park, near Keremeos	0	1	Sykes 1993
1994	Mike Rousseau	Antiquus Archaeological Consultants	Assessment of DkQw 36 in Okanagan Mountain Park	1	1	Bailey and Rousseau 1994
1994	Sandra Zacharias	Deva Heritage Consulting	Impact Assessment of MoTH Projects	0	Linear Corridor	Zacharias 1994
1995	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Okanagan Correctional Centre Site, Winfield	0	1	Arcas Consulting Archeologists 1995b
1995	Diana French	Consultant	Archaeological Resource Inventory of High Ridge Estates, Kalamalka Lake	0	1	French 1995
1996	Gabriella Prager	Points West Consultants	Impact Assessments of SBFEP Developments in Penticton Forest District	0	5	Prager 1997a
1996	Gabriella Prager	Points West Consultants	Impact Assessments of Woodlots in Penticton Forest District	2	10	Prager 1997b

4.2.2 Site Inventories of the Shuswap - Thompson Basin

The earliest archaeological work done in the Shuswap region was an avocational survey of the South Thompson River valley and Shuswap drainage basin by SFU Professor Knut Fladmark as a school boy between 1958 and 1964 (Fladmark 1969). Some years later, University of Calgary students under the direction of Sharon Johnson Fladmark recorded a few sites in the western Shuswap, as part of a two-year survey and excavation project in the Thompson River - western Shuswap area (Johnson Fladmark and Stewart 1972). In 1977, Bill Brown and Greta Lundborg (ASAB) identified several sites during a survey of the Adams River Recreational Reserve (Brown and Lundborg 1977), of which only three sites are actually within the Okanagan TSA. Like the Okanagan, additional sites would also have been recorded between 1970 and 1980, as a result of reports from local residents and small-scale impact assessments to provincial government archaeologists.

The most important work in the western part of the region resulted from two seasons of site inventory within the Thompson - Shuswap drainage, under the direction of Gordon Mohs (HCB) in 1978 and 1979. The 1978 project was focused on the valley of the South Thompson River (Mohs 1981a), but took place beyond the TSA study area. Most of Mohs' 1979 survey area lay just west of the TSA boundary, but 41% of the identified sites are within the present study area (Mohs 1980). Although much of the focus of Mohs' surveys took place outside of the Okanagan TSA, the results of these surveys have provided extremely important insights about the distribution and setting of archaeological sites throughout this region. A similar site inventory along the Shuswap River between Mabel Lake and Shuswap Lake in the southeastern part of the region was carried out by Stephen Lawhead and Geordie Howe on behalf of the Spallumcheen Band in 1984 (Arcas Associates 1985b). Lastly, a 1985 impact assessment of a long section of the Trans-Canada Highway east of Sicamous (Arcas Associates 1986b) covered enough ground in a poorly-known part of the Shuswap region to justify inclusion as an inventory-level survey.

Most of the sites recorded in the Shuswap were probably identified between 1970 and 1980. A total of seven inventory-level archaeological studies have accounted for a total of 180 sites identified and recorded (including previously-recorded sites relocated and re-recorded, but also including some sites beyond the TSA boundary). Moreover, 32 small-scale impact assessments or limited surveys between 1971 and 1996 have resulted in the identification or relocation of 56 additional sites. The numbers of sites from all these projects do not necessarily tally with the actual number of recorded sites within the region, because many sites have been recorded outside of the context of a site survey, numbers of municipally- or regionally-designated built-heritage sites are included, and numerous sites have been investigated on two or more occasions. Table 6 summarizes the results of inventory-level archaeological site surveys in the Shuswap region, while Table 7 represents a summary of small-scale archaeological surveys and research in this part of the TSA.

Table 6. Summary of Archaeological Inventories in the Shuswap Region.

Year	Director	Affiliation	Title	Sites Recorded	Comments	Reference
1958-1964	Knut Fladmark	University of Calgary	Archaeological Sites in the Shuswap - Thompson River Area	46	Avocational site survey; 32 sites within of TSA	Fladmark 1969
1972	Sharon Johnson Fladmark	University of Calgary	Shuswap Lakes Archaeological Project	4	Project primarily oriented toward site excavation	Johnson Fladmark and Stewart 1972
1977	Bill Brown & Greta Lundborg	ASAB	Archaeological Resources of the Lower Adams River	66	Survey of Adams River Recreational Reserve; only 3 sites within the TSA	Brown and Lundborg 1977
1978*	Gordon Mohs	ASAB	Heritage Resources of the South Thompson River Valley	192	Systematic site survey beyond boundaries of the TSA	Mohs 1981a
1979	Gordon Mohs	HCB	Heritage Resources of the Western Shuswap Basin	113	Most of study area outside of TSA; 49 sites within the TSA	Mohs 1980
1984	Steve Lawhead	Arcas Associates	Spallumcheen Heritage Inventory	83	Systematic survey of Shuswap River and Spallumcheen Valley	Arcas Associates 1985b
1985	Mike Rousseau	Arcas Associates	Hwy 1 Four-laning: Cambie - Revelstoke	9	Impact assessment of highway corridor	Arcas Associates 1986b
* Study conducted outside Okanagan TSA but useful for model development; not included in site counts.						

Table 7. Summary of Limited Archaeological Surveys in the Shuswap Region.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1971	Mike Blake	BCPM	Archaeological Survey of Parks and Park Reserves	5	44	Condrashoff 1971
1976	Abbey Bates	ASAB	Dept. of Highways Archaeological Site Survey	2	4 Linear Corridors	Bates and McMath 1976
1977	Linda Haugen	ASAB	Ministry of Highways Archaeological Survey: Southern Interior	0	10 Linear Corridors	Haugen and Galvin 1977
1978	Mike Rousseau	ASAB	Thompson - Okanagan Regional Inventory	0	5	Howe and Rousseau 1978

Table 7. Summary of Limited Archaeological Surveys in the Shuswap Region.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1978	Mike Rousseau	ASAB	Inventory and Assessment of Provincial Parks	14	11	Duff and Rousseau 1978a
1979	Brian Apland	ARESCO Heritage Consultants	Impact Assessment of the Ashton - Salmon Arm Transmission Line	6	Linear Corridor	ARESCO 1979
1979	Mike Rousseau	HCBC	Thompson - Okanagan Impact Assessment	3	12	Rousseau 1979
1980	Mike Rousseau	HCBC	Thompson - Okanagan - Kootenay Impact Assessment	2	35	Rousseau and Richards 1980
1981	Richard Brolly	HCBC	Southern Interior Survey	1	6	Brolly 1981
1981	Deanna Ludowicz	ARESCO Heritage Consultants	Impact Assessment of the Ashton - Nicola Transmission Line	8	Linear Corridor	ARESCO 1981a
1982	Richard Brolly	HCBC	HCBC Highways Survey	0	12 Linear Corridors	Brolly and Calancie 1982
1983	Richard Brolly	HCBC	HCBC Highways Survey	1	10 Linear Corridors	Brolly 1984
1983	Mike Rousseau	Archer Consultants	Impact Assessment of Subdivision on Anstey Arm, Shuswap Lake	1	1	Rousseau and Rousseau 1983
1986	Steve Lawhead	Arcas Associates	Impact Assessment of Site Efq6	1	1	Arcas Associates 1986c
1988	Richard Brolly	Arcas Associates	Impact Assessment of Property on Shuswap Lake	1	1	Arcas Associates 1989b
1988	Tom Richards	Arcas Associates	Impact Assessment of Subdivision, Mara Lake	0	1	Arcas Associates 1989c
1989	Tom Richards	Arcas Associates	Impact Assessment of Squilax Bridge Project	7	Linear Corridor	Arcas Associates 1989d
1989	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Subdivision at Sorrento	0	1	Arcas Consulting Archeologists 1989b
1989	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Subdivision at Lee Creek, Shuswap Lake	1	1	Arcas Consulting Archeologists 1989c
1989	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Mabel Lake Road Subdivision, Enderby	1	1	Arcas Consulting Archeologists 1989d

Table 7. Summary of Limited Archaeological Surveys in the Shuswap Region.

Year	Director	Affiliation	Title	Sites Investigated	Number of Referrals	Reference
1989	Wayne Choquette	Consultant	Reconnaissance of Subdivision on the Scotch Creek Fan	0	1	Choquette 1989
1989	Sandra Zacharias	Consultant	Impact Assessment Subdivision at Corning Creek, Shuswap Lake	1	1	Zacharias 1989b
1990	Richard Brolly	Arcas Consulting Archeologists	Impact Assessment of Highways in the Kamloops Region	0	Linear Corridor	Arcas Consulting Archeologists 1990d
1990	Mike Rousseau	Rousseau/Muir Heritage Resource Consulting	Impact Assessment of Subdivisions at Eagle Bay and Fraser Bay on Shuswap Lake	2	2	Rousseau 1990
1991	Mike Rousseau	Rousseau/Muir Heritage Resource Consulting	Impact Assessment of Subdivision between Anglemont and St. Ives on Shuswap Lake	0	1	Muir and Rousseau 1991
1992	Rebecca Balcom	EMA Consultants	Impact Assessment of Spallumcheen Pipeline	0	Linear Corridor	Balcom 1992b
1992	Mike Rousseau	Antiquus Archaeological Consultants	Impact Assessment of Subdivision at Falls Creek near Enderby	1	1	Rousseau and Muir 1992a
1993	Peter Merchant	Antiquus Archaeological Consultants	Impact Assessment of Subdivision at Balmoral on Shuswap Lake	0	1	Merchant and Bailey 1993
1994	Morley Eldridge	Millennia Research	Overview of the Mt. Ida Foothills	0	1	Eldridge 1994
1995	Ian Franck	Antiquus Archaeological Consultants	Assessment of Property on Old Town Bay near Sicamous	4	1	Franck 1995
1995	Andrew Mason	I.R. Wilson & Associates	Impact Assessment of Subdivision on Shuswap River	1	1	Mason 1995
1996	Sue Woods	Arcas Consulting Archeologists	Impact Assessments of Forestry Developments in Salmon Arm Forest District	0	4	Arcas Consulting Archeologists 1997
1996	Jeff Bailey	Golder Associates	Impact Assessment of Subdivision at Scotch Creek, Shuswap Lake	1	1	Golder Associates 1996
1996	Vicki Feddema	Arcas Consulting Archeologists	Impact Assessment of Subdivision on Adams Pit Road	0	1	Arcas Consulting Archeologists 1996a

4.2.3 Site Inventory Coverage by Ecoregions and Ecosections

Table summarizes the locations of archaeological sites within the Okanagan TSA according to Ecoregions and Ecosections (see Section 2.1.6), and also by gross environmental settings within those units. When site inventory coverage is compared to the different environmental units, some predictable patterns emerge. The highest frequency of sites is within the Okanagan Basin Ecosection (62%), representing valley bottom and lakeshore settings which have been the focus of the most intensive surveys in the TSA. The Shuswap Highlands (11%) and Eastern Thompson Upland (12%) Ecosections have the next highest site frequencies, primarily reflecting the existence of well-surveyed waterways within the Shuswap region. However, upland settings in this region are essentially unknown. The Okanagan Range Ecoregion (10%) appears to have a moderate frequency of sites, nearly all of which are restricted to the Similkameen and Ashnola River valley, though all of the alpine/subalpine sites known from the TSA are within this Ecoregion. The Southern Thompson Upland (3%) has a surprisingly low frequency of sites, predominantly in the Salmon River valley and around Pennask Lake. Lastly, montane Ecosections of the Okanagan Highlands, Southern and Northern Columbia Mountains are practically devoid of sites (all < 1%), exemplifying the few site surveys which have taken place in this part of the TSA. Most of the sites which have been recorded are associated with the major rivers which are present within these units, with the conspicuous exception of a number of sites associated with small lakes in the Okanagan Highlands.

When site distributions are considered according to their environmental settings, it is seen that 43% of the sites are associated with major lakes or rivers. Another 27% are near small and medium lakes or secondary/tertiary streams. In total, 70% of the site inventory is directly associated with significant watercourses, primarily in valley bottom settings. About 28% of the sites are found in mid-elevation benchlands, usually at the edges of valleys. Slightly less than 1% of known sites are recorded from alpine or subalpine settings, and less than 1% are found in montane plateaus (here, defined as montane settings higher in elevation than benchlands). Lastly, about 1% of sites are associated with pond and wetland settings throughout the Okanagan TSA.

4.3 ARCHAEOLOGICAL SITE EXCAVATIONS

A number of archaeological excavations conducted within the Okanagan TSA study area have significantly contributed to the present understanding of southern Interior Plateau prehistory. Generally speaking, many of the excavations in the TSA have been small-scale or short-duration projects, and in recent years restricted to resource management-oriented salvage operations at threatened sites. A few substantial research excavations have taken place within the study area, primarily within the northern Okanagan and western Shuswap regions. Table 9 summarizes all archaeological site investigations which are known to have taken place within the TSA.

Table 8. Summary of Archaeological Sites by Environmental Setting.										
Ecoprovince	Ecoregion	Ecosection	Environmental Setting							Total
			Major Lakes & Rivers	Medium & Small Lakes	Ponds & Wetlands	Secondary & Tertiary Streams	Benchlands	Montane Plateaus	Subalpine & Alpine	
Southern Interior	Okanagan Range	None	40	0	0	18	30	0	9	97
	Thompson - Okanagan Plateau	Eastern Thompson Upland	65	17	1	10	19	0	0	112
		Southern Thompson Upland	2	7	3	10	1	4	0	27
		Okanagan Basin	209	78	5	99	208	0	0	599
	Okanagan Highland	1	4	0	1	0	0	0	6	
Southern Interior Mountains	Columbia Mountains & Highlands	Northern Columbia Mountains	1	2	0	3	0	0	0	6
		Southern Columbia Mountains	0	4	0	1	0	0	0	1
		Shuswap Highlands	90	6	0	3	8	0	0	107
		Total	408	114	9	145	266	4	9	955

Table 9. Archaeological Site Investigations in the Okanagan TSA.

Region	Year	Project Name	Site(s)	Project Type	Director	Affiliation	Comments	Reference
Okanagan	1966 1967	Okanagan Archaeological Project	DiQw 2 EbQu 12	Research	Garland Grabert	WWU	Test excavations at sites in Kelowna and Marron Valley	Grabert 1974
Shuswap	1966 1967	Okanagan Archaeological Project	EbQr 1,2 EcQt 2,3,4 EcQv 4,5	Research	Garland Grabert	WWU	Test excavations at 7 sites in the Shuswap - Salmon River valley area	Grabert 1974
Shuswap	1968	Squilax Indian Reserve Burial	EfQv ?	CRM	Chris Turnbull	University of Calgary	Recovery of burial on Little River beyond TSA boundary	Turnbull 1968
Okanagan	1969	Vernon Burial Site	EcQt ?	CRM	H. Campbell-Brown	Medical Practitioner, Vernon	Recovery of burial at Otter Lake	Campbell-Brown 1970
Shuswap	1970	Lee Creek Archaeological Project	EfQv 1	Fieldschool	Dean Fredlund Clyde Tucker	Okanagan College; Salmon Arm Secondary School	Student excavation of housepit depression on N shore of Shuswap Lake	Fredlund and Tucker 1970
Shuswap	1971	Scotch Creek Provincial Park Excavation	EfQu 3	Research	John Sendey	BCPM	Excavation of pithouse village on N shore of Shuswap Lake	Sendey 1972
Shuswap	1972	Shuswap Lakes Archaeological Project	EfQv 4,5, 19	Research	Sharon Johnson Fladmark	University of Calgary	Excavation of pithouse village on S shore of Shuswap Lake; other sites investigated beyond TSA boundary	Johnson Fladmark 1973
Shuswap	1972	Blind Bay Rockshelter Project	EfQu 10	Research	Joe Stewart	University of Calgary	Excavation of a rock shelter site on the S shore of Shuswap Lake	Stewart 1972
Okanagan	1973 1974	Inkameep Archaeological Project	DgQu 2, 12,14,15, 16,17	Research	Gerry Roberts	Osoyoos Indian Band	Test excavations of 6 sites on the E side of Osoyoos Lake	Roberts 1974
Okanagan	1975 1976	McCall Site Archaeological Excavations	DhQv 48	Research	Stan Copp	SFU	Excavations at a stratified site on the Okanagan River N of Vaseaux Lake	Copp 1979
Okanagan	1978	Cameron's Point Test Excavations	EbQu 39	CRM	Mike Rousseau	ASAB	Test excavation at a site on the E side of Okanagan Lake S of Vernon	Duff and Rousseau 1978b
Okanagan	1979	Tuc-el-nuit Lake Test Excavations	DhQv 6	CRM	Mike Rousseau	ASAB	Test excavation at a site on the Osoyoos Indian Reserve near Oliver	Rousseau 1983c
Shuswap	1980	Excavation of a Rectangular Housepit near Enderby	EdQs 14	CRM	Gordon Mohs	HCB	Excavation of part of site in conflict with development	Mohs 1981b
Shuswap	1981	Ashton - Salmon Arm Transmission Line Mitigation	EdQs 3 EdQs 12	CRM	Ian Wilson	ARESCO Heritage Consultants	Excavations at 2 sites including pithouse village EdQs 3	ARESCO 1981b

Table 9. Archaeological Site Investigations in the Okanagan TSA.

Region	Year	Project Name	Site(s)	Project Type	Director	Affiliation	Comments	Reference
Okanagan	1983	Tsinstikeptum IR Archaeological Project	DIQv 1,3, 36,37,38, 39	Research	Mike Rousseau	Westbank Indian Band	Test excavations at 6 sites on the Tsinstikeptum Indian Reserve in Westbank	Rousseau 1984
Okanagan	1983	Pandosy Grave Project	n/a	Research	Linda Gullason Chris Justice	BC Heritage Trust; Okanagan College	Search for grave of historic Okanagan missionary in Kelowna	Gullason and Justice 1983
Okanagan	1983	Archaeological Investigations at the Keremeos Grist Mill	DhQw 30	CRM	Heinz Pyszczyk	Points West Consultants	Test excavations at historic grist mill in Keremeos	Pyszczyk 1983
Okanagan	1984	Keremeos Grist Mill Monitoring	DhQw 30	CRM	Jean Bussey	Points West Consultants	Monitoring of developments around the historic grist mill	Bussey 1984
Okanagan	1984	Pinaus Lake Burial Salvage	EcQv 2	CRM	Steve Lawhead	Arcas Associates	Recovery of a burial at Pinaus Lake	Arcas Associates 1985c
Shuswap	1985	Boyes Site Excavation	EfQq 3	CRM	Joanne Curtin	Arcas Associates	Excavation of an open camp site near the Trans-Canada Highway	Arcas Associates 1986d
Shuswap	1986	Otter Lake Burial Recovery	EcQt 12	CRM	Joanne Curtin	Arcas Associates	Recovery of a burial from a site on Otter Lake	Arcas Associates 1987b
Okanagan	1986	Burial Recovery on the Osoyoos Indian Reserve	DgQu 4	CRM	Stan Copp	Vancouver City College	Recovery of a burial on the Osoyoos Indian Reserve	Copp 1986
Shuswap	1989	Squilax Bridge Archaeological Project	EfQv 121, 123, 133	CRM	Tom Richards	Arcas Consulting Archeologists	Excavation of pithouse village and 2 clusters of storage pits near Squilax Bridge	Arcas Consulting Archeologists 1990e
Shuswap	1990	Fraser Bay Archaeological Project	EfQt 1	CRM	Mike Rousseau	Rousseau/Muir Heritage Resource Consulting	Excavation at stratified on the N shore of Shuswap Lake	Rousseau, Muir and Alexander 1991
Okanagan	1990	Camp Hatikvah Burial Distribution Assessment	EaQu 5	CRM	Lindsay Oliver	Consultant	Test excavations at reported burial site at Oyama	Oliver 1990
Okanagan	1991	Monitoring of Development at Oyama	EaQu 5	CRM	Rick Schulting	Consultant	Monitoring of reported burial site at Oyama	Schulting 1991
Okanagan	1993	South Okanagan Natural Gas Pipeline Mitigation	DiQv 17	CRM	Jean Bussey	Points West Consultants	Emergency salvage of buried site at Okanagan Falls	Bussey 1995
Shuswap	1995	Monitoring of Development at Fraser Bay	EfQt 1	CRM	Mike Rousseau	Antiquus Archaeological Consultants	Monitoring of residential construction at previously-excavated site on N shore of Shuswap Lake	Rousseau 1996

Besides the site investigations listed in Table 9, a number of significant excavation projects which took place at sites just beyond the boundaries of the study area are of considerable importance for understanding the prehistory of the Okanagan TSA. Most of these projects, particularly in the Shuswap - Thompson drainage, have focused upon pithouse villages (e.g., Johnson Fladmark 1973; R. Wilson 1980; Blake 1976; Eldridge 1974; C. Carlson 1980; Stryd 1981; Arcas Associates 1988; Merchant, et al 1994; Bailey, et al 1994). However, an Early Prehistoric burial was recovered from Gore Creek near Pritchard (Cybulski, et al 1981), and a Late Prehistoric talus burial was salvaged from Skwaam Bay on Adams Lake (Hills 1971). Excavations at three Middle Prehistoric sites near Monte Creek resulted in the identification of buried habitation features that are the oldest house remains yet reported from the Interior Plateau (I. Wilson 1991a; I.R. Wilson Consultants 1992). Lastly, an excavation at the Ducks Meadow Quarry on Monte Creek (Rousseau and Muir 1992b) represents the only detailed investigation of a major lithic resource quarry on the Interior Plateau.

Fewer site investigations have taken place peripheral to the Okanagan and Similkameen region of the TSA. Most important are several seasons of site excavations along the Okanogan River in Washington (Grabert 1968a, 1974), and a multi-year research project in the Chief Joseph Dam reservoir along the Columbia River upriver from its confluence with the Okanagan (Chatters 1984; Campbell 1985). More recently, excavations at two sites in the Similkameen River valley just southeast of Hedley have returned Early Prehistoric and Middle Prehistoric dates in a context immediately adjacent to the TSA (S. Copp, Itkus Consultants, pers. comm., 1997; Copp 1996).

4.4 ARCHAEOLOGICAL SITES IN THE OKANAGAN - SHUSWAP REGIONS

A total of 955 archaeological sites were recorded within the study area when this project was initiated. These include 836 sites documented as Prehistoric, 96 sites documented as containing historic remains, and 23 sites which are reported to have both historic and prehistoric components. Of the documented prehistoric sites, 30 are isolated finds. These are treated as surface scatter sites where they appear in the site database, although for many years there has been an unofficial policy in British Columbia not to record isolated archaeological remains as discrete sites. Thus, the actual number of *known* isolated finds is considerably under-represented in the following discussions. For comparative purposes, sites within the smaller Vernon and Salmon Arm Districts have been combined and counted separately from the large Penticton District, because it is suspected that the northern Okanagan may have more cultural relationships with the Thompson - Shuswap region, while the south is more closely related to the Columbia Plateau. Table 10 summarizes the types of archaeological remains at sites within the Okanagan TSA. It is important to note that the totals do not necessarily match the actual numbers of site records in the Archaeological Site Registry, because two or more types of archaeological remain can occur at a single site.

Table 10. Tabulated Archaeological Sites in the Okanagan TSA by Site Type.

Forest District	Cultural Material (Subsurface) ¹	Cultural Material (Surface) ²	Habitation				Subsistence Feature ⁵	Petro-form ⁶	Rock Art	Human Remains	Earthwork ⁷	Trail ⁸	Historic ⁹	Total
			Rectangular Depression ³	Circular Depression ³	Cave or Rockshelter	Platform or Sweatlodge ⁴								
Penticton	54	250	9	80	66	8	92	22	80	31	5	17	96	810
Vernon and Salmon Arm	22	173	65	101	7	2	83	4	29	22	1	1	43	553
Total	76	423	74	181	73	10	175	26	109	53	6	18	139	1363

¹ Sites with buried artifacts and other archaeological materials; could include villages without pithouses.

² Sites usually with stone artifacts on the surface; normally represent transitory camps or lithic workshops; includes recorded isolated finds and lithic resource quarries.

³ Rectangular depressions are housepits, restricted to the later part of the Kamloops horizon and possibly an ethnic marker of Secwepemc habitation; Circular depressions represent the most common type of housepits in the Okanagan TSA; housepits are assumed to be circular unless specified otherwise.

⁴ A miscellaneous category of habitation features which normally must be confirmed by ethnographic analogy or informant interviews; some sweatlodges may actually represent subsistence features.

⁵ Include storage/cache pits, roasting/cooking features, fish- and berry-drying racks, and fishing stations.

⁶ Includes boulder cairns, some rock features associated with burials, and stone rings on flat boulders that may be subsistence features.

⁷ Earthworks are sediment mounds presumed to have been constructed by First Nations people.

⁸ Includes recorded sections of historical trails, most of which were originally used by First Nations people.

⁹ Includes all classes of historic sites, including municipally- or provincially-designated built heritage sites, and historical remains recorded as sites by archaeologists.

4.4.1 Prehistoric Sites

The nature, frequency, and distribution of all types of prehistoric archaeological remains are discussed below. It must be reiterated that archaeological remains of more than one type may be present at a single site (e.g., a habitation site where burials are also present). Because the association between different types of archaeological remains cannot normally be established without extensive excavation, each type is treated as if it alone were present at a site. Consequently, the total number of archaeological remains considerably exceeds the total number of sites cited above. Table 11 lists prehistoric archaeological remains by type and frequency within the TSA.

Table 11. Absolute and Relative Frequencies for Archaeological Site Types in the TSA.						
Site Type	Complete Okanagan TSA		Penticton District		Vernon/Salmon Arm District	
	n	f ¹	n	f ²	n	f ²
Cultural Materials - Subsurface	76	6.2	54	7.5	22	4.3
Cultural Materials - Surface	423	34.5	250	35.0	173	33.9
Habitation Features	338	27.6	163	22.8	175	34.3
Subsistence Features	175	14.3	92	12.9	83	16.3
Petroforms	26	2.1	22	3.1	4	0.8
Rock Art	109	8.9	80	11.2	29	5.7
Human Remains	53	4.3	31	4.3	22	4.3
Earthworks	6	0.5	5	0.7	1	0.2
Trails	18	1.5	17	2.4	1	0.2
¹ Represents relative frequency from total site inventory ² Represents relative frequencies of sites within Districts						

4.4.1.1 Cultural Materials - Subsurface

These sites are defined as deposits of archaeological remains below the surface, representing gradual build-up of anthropogenic (i.e., created by cultural activities, not natural pedogenic processes) sediments, *or* burial of archaeological materials by natural processes (such as aeolian deposition). Such sites may contain lithic (=stone) and bone/antler artifacts, fire-altered rocks, and charcoal, and will include faunal remains such as animal bones and freshwater mussel shell where soil conditions permit. Subsurface sites are assumed to represent relatively intensive occupation of a location, either by a large number of people or by a smaller number over a very long period of time. Functionally, such sites could have been transitory resource-harvesting or -processing camps, but could also represent villages where pithouses were not used, such as summer villages. Most such sites will usually have some stone artifacts scattered about the surface to mark their location, but nearly all older sites (i.e., Early or Middle Prehistoric) will be more or less completely buried. Other classes of archaeological remains may be found at the location of subsurface cultural materials, without necessarily being associated with them. For example, a buried Middle Prehistoric campsite on a river terrace may have been used as the site for Late Prehistoric storage pits.

Subsurface cultural materials are not very abundant in the TSA, where they represent only 6.2% of all prehistoric sites (Penticton = 4.4%; Vernon/Salmon Arm = 1.8%). Within the districts, 7.5% of the sites in Penticton District and 4.3% of the sites in the Vernon/Salmon Arm Districts contain subsurface cultural materials. They have primarily been identified in valley bottom settings in association with major rivers or large and medium lakes, though small numbers will also be found in other environmental settings. Nearly all Early or Middle Prehistoric-aged sites will be represented by subsurface cultural deposits, though Late Prehistoric examples will also occur, notably in the Shuswap region.

4.4.1.2 Cultural Materials - Surface

This category includes sites which are normally recognized by scatters of lithic artifacts, frequently incorporating fire-altered rocks and charcoal, and more rarely including faunal remains. Such sites were primarily used as transitory camps for resource-harvesting or -processing tasks, but could also result from specialized, non-subsistence activities like tool sharpening and maintenance, or rearming of projectiles like arrows and spears. Another class of site which would result in surface scatters of artifacts would be the lithic reduction workshops which are normally present around lithic resource quarries, where First Nations people obtained the raw materials for stone tool manufacture. Although transitory use of a site is assumed by this classification, it could have been re-used on many occasions over an interval of many centuries. This class of site is very often associated with other types of archaeological remains, particularly habitation sites of various kinds, subsistence features, and subsurface cultural materials.

Surface scatters are the most common archaeological site type in the TSA, representing 34.5% of all prehistoric sites (Penticton = 20.4%; Vernon/Salmon Arm = 14.1%). Within the districts, 35.0% of the sites in Penticton District and 33.9% of the sites in the Vernon/Salmon Arm Districts are surface scatters. Surface scatters are probably the most variable site type in terms of distribution, size, function, age, and duration of occupation. They have been identified in all of the environmental units in the TSA where sites have been recorded, and are associated with all prehistoric time-periods, though Late Prehistoric sites are most abundantly represented.

4.4.1.3 Habitation Sites

This category includes five or six subclasses of archaeological features which are assumed to represent evidence of permanent or semi-permanent habitation by First Nations people. Functionally, most such sites probably represent winter village sites, though some other habitation features not associated with villages have also been identified. In the Okanagan and Shuswap regions, villages are easily identified by the presence of rectangular (or sub-rectangular) and circular cultural depressions greater than 4 m in diameter, usually referred to as housepits. Rock shelters (and rare cave sites) include habitations which are located beneath overhangs of rock or at the base of steep cliffs. In most instances, sites in such settings would have represented transitory campsites, but they often contain subsurface cultural materials. Only small numbers of two other types of habitation features have been recorded from the Okanagan TSA; platforms are usually considered to represent the remains of spring/summer matlodge structures, and sweatlodge depressions are small depressions associated with more or less greater amounts of fire-altered rocks. Unless verified by First Nations informants, most sweatlodge depressions would be virtually indistinguishable from cooking features (see Section 4.4.1.4).

Considered together, habitation sites represent the second most abundant site type in the Okanagan TSA. A total of 338 sites containing habitation features are recorded in the Okanagan and Shuswap regions, equivalent to 27.6% of all sites. Table 12 tabulates absolute and relative frequencies of habitation sites for the entire TSA, as well as Penticton and Vernon/Salmon Arm Forest Districts.

Habitation sites which are villages usually contain a more complex array of cultural features and greater density of cultural materials than the other types of sites, reflecting the variety and intensity of activities that occurred at these sites. In addition to remains of residential structures, most village sites also contain features such as hearths, storage pits, sweat lodges and puberty lodges (possibly), and smoke houses. Scattered stone tools and lithic debris, as well as bone fragments and fire-altered rocks are commonly found at these sites. Habitation sites are most commonly associated with major rivers (in the Shuswap region and Similkameen River valley) or lakes (especially in the Okanagan Valley and on Shuswap Lake), but there also appears to have been a distinct preference for First Nations people in the Okanagan Valley to establish villages on or near secondary and tertiary streams.

Table 12. Absolute and Relative Frequencies of Habitation Sites Within the TSA.

Site Type	Complete Okanagan TSA		Penticton District		Vernon/Salmon Arm District	
	n	f*	n	f*	n	f*
Rectangular depressions	74	21.9	9	2.7	65	19.2
Circular depressions	181	53.5	80	23.6	101	29.9
Rockshelters and Caves	73	21.6	66	19.5	7	2.0
Platforms and Sweatlodges	10	2.9	8	2.4	2	0.6
Total	338	99.9	163	48.2	175	51.8

* All frequencies based on total number of habitation sites in the TSA.

Most habitation sites will date to the last 4400 years in the Interior Plateau, but are most common between 3500 and 200 years BP (Stryd and Rousseau 1996; Richards and Rousseau 1987). However, there is abundant archaeological evidence from the middle Columbia River in Washington (e.g., Chatters 1986b, 1989; Salo 1987; Campbell 1985) that semi-permanent villages had become established in the southern extremity of the Okanagan River drainage by about 5000 BP.

4.4.1.4 Subsistence Features

This category is represented by clusters of one or more cultural features which were used for food processing and storage. In this region, such sites are most frequently recognized by the presence of small (normally, less than 4 m in diameter) circular to sub-rectangular cultural depressions. Lower frequencies of other types of subsistence features have also been documented, including fish weirs and a class of distinctive, stone-lined pit features that are exclusive to the Okanagan Valley. Another enigmatic class of potential subsistence features is exclusive to the southern Okanagan Valley and Similkameen River valley; these are variously described in the Archaeological Sites Register as berry drying racks or stone ring petroforms. Pioneer ethnographer James Teit (1930) describes identical features from the American reaches of the Similkameen River, which Bouchard and Kennedy (1984b) assert were constructed by young women during vision quests. Due to the fragmentary nature of the archaeological record, it was not feasible to segregate such features, but it was suspected that they have been split among at least two classes of remains by various archaeologists. Lastly, there is another type of *potential*

subsistence feature that should occur in the Okanagan Range Ecoregion and Okanagan Highland Ecoregion, and less certainly in other Ecoregions; these are berry-processing trenches, or long, shallow trenches in which fires were set to dry berries (usually huckleberries). Such sites have not yet been documented in British Columbia, but they have been reported in the North Cascade Mountains of Washington.

In many parts of the Interior Plateau, storage pits are often associated with pithouse villages. In contrast, cooking features are more commonly found near locations where food resources -- particularly root crops -- were harvested, but will usually be associated with a nearby water source.

The distinctive southern Okanagan stone-lined pits are often found within rockshelters, or in settings like talus slopes where there is a great deal of loose, rubbly stone present. They do not usually occur near watercourses, but a putative association with trails (e.g., French 1992) was rejected on the evidence of survey results from the Tsinstikeptum IR (Rousseau 1984). The berry-drying racks or stone circle petroforms, whatever function they may have served, are nearly all associated with very large, flat-topped boulders at the toes of steep, rocky montane slopes. On the eastern side of Osoyoos Lake such features are a considerable distance from the nearest watercourse, and in the Similkameen River valley west of Keremeos tend to be found along the break in slope at the edge of the valley bottom. In other parts of the Similkameen, such features may be closer to the river, but it is suspected that their association with aboriginal trails may be more significant.

Fish weirs are one of the rarest site types in the TSA, with one each recorded from the Okanagan and lower Shuswap Rivers, some reported features from the middle Shuswap River just downstream from the outlet of Mabel Lake and the Okanagan River above Oliver, and one unrecorded site from a gravel bar in the South Thompson River (not within the TSA). Similar features in Sicamous Narrows, connecting Mara and Shuswap Lakes, were reported to have been destroyed when the Narrows was dredged for navigational purposes. The physical remnants of fish weirs may either be low stone walls across stream channels, or remnants of wooden-pole structures in streams and rivers. One such structure, observed on the South Thompson River near Monte Creek, was comprised of multiple rows of wooden stake stubs in a broad river bar exposed at low water (J.Jules, Kamloops Indian Band, pers. comm., 1995).

4.4.1.5 Petroforms

This class of archaeological remains consists of cultural features which are artificial stone structures or alignments. There are a small number of documented sites under this classification which appear to be natural geological formations of spiritual or legendary significance to First Nations people. A total of 26 sites containing petroforms are recorded in the Okanagan TSA,

representing 2.1% of the site inventory. They are considerably more abundant in the Penticton District (n=22; f=3.1%) than in the Vernon/Salmon Arm Districts (n=4; f=0.8%).

In the Okanagan TSA, petroform sites consist of stone cairns (n=8), berry-drying racks (n=2, but also see Subsistence Features), circular structures (n=7 -- some are also documented as burial features), rectangular structures (n=2), and there are single examples of U-shaped structures, petroforms associated with burials, and a natural spire. There are also two historical petroforms and two petroforms of unreported configuration. The Archaeological Sites Register illustrates a degree of confusion about the functional attribution of petroforms, with identical features being recorded as subsistence features/berry-drying racks and petroforms/berry-drying racks by different authorities. Moreover, there are a number of features recorded as petroforms which appear to be identical to stone ring features recorded as burial features. Lastly, it is likely that many of the circular petroforms are the same as features recorded by earlier authorities as berry-drying racks.

Except for the petroforms reported to be historic features, sites of this type are considered to be of pre-Contact age, occasionally on the basis of associated lithic artifacts, though it is normally impossible to ascertain the age of unaccompanied cultural features. Most petroforms are configured to major rivers and large to medium lakes, or benchlands at the edges of large valleys. Stone cairns are a conspicuous feature of alpine settings in the Southern Continental Ranges of the Southern Rocky Mountains Ecoregion, and may yet be identified in similar environments in the Monashee Mountains and Okanagan Range.

4.4.1.6 Rock Art

This category includes sites with pictographs (rock paintings) or petroglyphs (rock carvings/etchings), which are typically found on bedrock outcrops and large boulders. Rock art is documented at 109 sites in the Okanagan TSA, of which one is a unique petroglyph near the eastern end of Shuswap Lake. A total of 79 of these sites consist exclusively of rock art, while additional cultural remains are present at the remaining 30 sites. Sites with rock art sites are nearly three times more frequent in the Penticton Forest District as they are in the Vernon/Salmon Arm Districts, and are particularly common in the Similkameen River and southern Okanagan Valleys.

The age of rock art sites in the TSA is undetermined, though it is likely that most of them are less than 1000 years old. Older rock art would likely have been obscured or destroyed through natural weathering. Rock art tends to be concentrated in valley bottom settings, particularly along lakes and rivers or secondary streams, but in the Okanagan Valley numerous pictographs are found in rocky benchland settings.

4.4.1.7 Human Remains

This category includes sites which contain material remains and features typically associated with prehistoric mortuary practices. These include human skeletal remains, burial pits, stone petroforms, and grave goods. A total of 53 sites in the Okanagan TSA have been reported to contain one or more human burials, equivalent to 4.3% of the total site inventory. Ten of the burial sites (0.8%) are documented as being of historical age. Evidence of additional cultural activities is reported at 17 of the sites, including archaeological features potentially associated with mortuary practices. Remarkably, the relative frequencies of sites with human remains within the Vernon/Salmon Arm and Penticton Forest Districts (4.3% in each) are identical with that of the entire TSA.

Burials in the Interior Plateau traditionally tend to be located near known or potential habitation areas (e.g., Arcas Associates 1985c), but the documented information from the Okanagan/Similkameen and Shuswap regions does not strongly support such a contention for the TSA. Although burials are quite evenly distributed between the Penticton and Vernon/Salmon Arm Districts, burials in the Penticton District are about twice as likely to incorporate additional types of archaeological remains.

4.4.1.8 Earthworks

This is a rare class of archaeological remains in the Okanagan TSA, represented at only six sites (0.5% of the site inventory). Five of these are within the Penticton Forest District, where they are reported as earthen mounds of unknown function. One site, near McIntyre Bluff at the mouth of Vaseaux Creek, is a natural mound of glacial outwash sediments with traditional legendary significance. Only one of the earthworks in the Penticton District is associated with other types of remains, this being located within a pithouse village. The single earthwork in the Vernon/Salmon Arm Districts is associated with a rectangular housepit in Ellison Provincial Park, on the northern part of Okanagan Lake.

4.4.1.9 Trails

A total of 20 trails or sections of trails have been recorded as archaeological sites within the Okanagan TSA, representing about 1.6% of the TSA site inventory. This includes features counted as historical archaeological remains in the site database. All but one of them are within the Penticton District, where they represent about 2.4% of the sites in that district.

Six of the trails within the Penticton District are reported to be of historic attribution, of which three occur together with other historical remains, and one has no other associations. Two of the putative historical trails are associated with prehistoric cultural materials, so clearly represent

traditional routes as well. Thirteen trails in the Penticton District are associated with prehistoric archaeological remains, primarily lithic surface scatters (n=9), but also pictographs (n=3) and subsistence features (n=1).

The single documented trail in the Vernon/Salmon Arm Districts is a section of the H.B.C. Fur Brigade Trail associated with a pictograph. Another pictograph site in the same locality is beside a different section of the same trail (Arcas Consulting Archeologists 1992a), though not so documented in the Archaeological Sites Register.

4.4.2 Historic Sites

A total of 139 historic sites have been documented from all parts of the Okanagan TSA, where they represent about 15% of the total site inventory. Historic sites are roughly twice as common in the Penticton Forest District as they are in the Vernon/Salmon Arm Districts, possibly representing more aggressive designation of built heritage sites in the southern Okanagan.

The actual inventory of historic sites is considerably under-represented in this study, because it was not possible to obtain access to an uncompleted database of historic sites in the *Thompson - Okanagan Heritage Resource Overview*, prepared for the Heritage Conservation Branch (Ministry of Small Business, Tourism and Culture) by historical geographer Justine Murdy. The sites which are within the database mainly represent those which have been recorded by archaeologists or designated by Regional Districts and municipal heritage committees. Table 13 presents absolute and relative frequencies of the documented historic sites in the Okanagan TSA, broken down into six broad categories:

- **Built Heritage** sites are those containing structural remains, usually intact, of historic significance. Two historic petroforms in the database are treated as built heritage in Table 13.
- **Cultural Materials** refers to historic sites where archaeologists have documented physical remains on or beneath the ground, in the form of structural wreckage, artifacts, and cultural features.
- **Industrial Remains** include intact structures of historic grist mills and saw mills, cultural features associated with mining and railway operations, and at least one preserved tugboat.
- **Human Remains** primarily refer to historic cemeteries, usually associated with First Nations communities but also with isolated graves in rural locations.
- **Remains - Indeterminate** are historic archaeological sites whose nature and configuration cannot presently be determined from the Archaeological Site Register; sites listed in the

database as Historic, Habitation are considered to be indeterminate if no further information is included, because it cannot be established whether surface scatters of historic artifacts or standing structures are present.

- **Trails** in this category are those which are specifically described as historic in the Archaeological Sites Register; as previously mentioned (Section 4.3.1.9), some historic trails are directly associated with pre-Contact archaeological remains.

Table 13. Absolute and Relative Frequencies of Historic Sites in the TSA.

Site Type	Complete Okanagan TSA		Penticton District		Vernon/Salmon Arm District	
	n	f ¹	n	f ²	n	f ²
Built Heritage	64	41.0	40	37.7	24	48.0
Cultural Materials	42	26.9	34	32.0	8	16.0
Industrial Remains	10	6.4	7	6.6	3	6.0
Human Remains	9	5.7	5	4.7	4	8.0
Remains - Indet.	22	14.1	15	14.1	7	14.0
Trails	9	5.7	5	4.7	4	8.0
Total	156	99.8	106	99.8	50	100.0

¹ Frequencies calculated from total historic sites in Okanagan TSA
² Frequencies calculated from historic sites within respective districts

4.4.3 Trails in the Okanagan TSA by Ken Favrholt

4.4.3.1 Introduction

Little research has been conducted on aboriginal trails in British Columbia. A small booklet on transportation (Ministry of Highways 1980) includes a map showing Indian Trails which, although not entirely accurate, is suggestive of the extent of native trails across the entire breadth of the Province. Major aboriginal trails were trade routes for exotic products between various First Nations. Other trails were used to provide access to resource locations for hunting, fishing, plant collecting, and procuring lithic raw materials.

Although generally associated with the land-based fur trade in the Pacific Northwest, a major route through the Okanagan used by European fur traders (Pacific Fur and North West Companies

after 1812; Hudson's Bay Company after 1821), undoubtedly was part of an aboriginal trail network. Known as the brigade trail to the fur traders, this route was traversed by large trains of horses after 1826, although First Nations communities may have used small numbers of horses along this route before the arrival of the European traders.

4.4.3.2 Definition of Aboriginal Trails

For the purposes of this study, aboriginal trails are those that:

- can be clearly identified as aboriginal by archaeological or documentary data that pre-dates 1846, and
- are identified as native or Indian trails in documentary sources that post-date 1846, even into the 20th century.

Aboriginal trails may be further classified as those that can be confirmed as aboriginal, and those that are possibly or probably aboriginal, but cannot be confirmed as such.

Describing and locating aboriginal trails is difficult, not due just to the lack of historical documents. Many trails have been obliterated or otherwise transformed; obviously, many modern highways, thoroughfares, and other right-of-ways are situated on the routes of historic trail routes. Major aboriginal trails generally paralleled rivers and lakesides, the natural line of least resistance between settlements. Less significant trails also connected settlements with resource procurement locations in surrounding montane and alpine/subalpine environments.

Like modern roads, aboriginal trails may be categorized as local trails and mainline trails. An example of the mainline type is the major route along the west side of Okanagan Lake, subsequently used by fur traders and known as the Hudson's Bay Company Brigade Trail. This trail crossed the Interior Plateau from the mouth of the Okanagan River in Washington to Alexandria on the middle Fraser River. The portion of this aboriginal trail that ran through the Okanagan Valley is well-described, and defined in sections which permits linkage of destroyed or disturbed portions of the trail with intact segments. Local trails are more difficult to delineate; indeed, there were certainly countless short trails connecting settlements with resource use locations. A typical example of a local trail is the route up the Ashnola River to hunting areas in the Okanagan Range Ecoregion.

Mapping aboriginal trails from small-scale and occasionally inaccurate historical maps to digitized TRIM maps presents several difficulties. A degree of inaccuracy is to be predicted in transferring such information, even assuming that the aboriginal trails followed natural corridors. A more minor issue is that historical changes to local place names can result in locational confusion. By way of example, the names of Deep Creek and Trepanier Creek were evidently

switched in error at some time. Thus, Trepanier Creek on Samuel Black's (ca. 1835) map is named Jacques Creek.

A field reconnaissance might be able to confirm approximate routes with more accuracy. Fortunately, much of this research has already been undertaken in some parts of the TSA by interested individuals and organizations, such as the Okanagan Historical Society. The present study did not include fieldwork, relying on available documents and the work of others who have undertaken such work.

4.4.3.3 Sources of Information on Aboriginal Trails in the Study Area

Aboriginal trails which pre-date 1846 are automatically protected by the *Heritage Conservation Act* (1994). Sources of information about pre-1846 trails include fur trade records, particularly Hudson's Bay Company journals, letters, and maps. Information about aboriginal trails, however, may also be obtained from post-1846 records such as colonial surveys (and maps) of Indian Reserves and original pre-emptions, and diaries and letters by early travellers and settlers. Even 20th century reminiscences and oral history can assist with the identification of aboriginal trails.

Few maps with coverage of the Okanagan TSA predate 1846. Of particular note are manuscript maps by Alexander Ross (1821), Archibald McDonald (1827), David Douglas (1833), and Samuel Black (ca. 1835), the latter based in part on Douglas' observations. Except for Douglas' sketch maps, the other maps are small-scale and only provide approximate locations of the aboriginal trails they show.

Later (post-1846) maps, such as those produced by Alexander Caulfield Anderson (1867) (based on pre-1846 explorations), Joseph Trutch and J. B. Launders (1871), and George Dawson (1886), provide information that supports the earliest (pre-1846) maps and knowledge of aboriginal trails. Some large-scale survey sketches and plans made before the turn of the century are especially helpful in identifying aboriginal trails, often by the label native trail or Indian pass, or some similar remark. Sketch maps of Indian Reserves, such as those produced in the early 1860s by W.G. Cox (e.g., 1861a, 1861b, 1862) for the Colonial Government, are particularly useful.

One of the few explicit attempts to trace the routes of First Nations peoples was made by ethnographer James Teit, a resident participant in the Jesup North Pacific Expedition (American Museum of Natural History). Although Teit's work (e.g., 1920) is still in the form of rough sketches made around the turn of the century, they corroborate and identify aboriginal routes not necessarily shown as aboriginal on other, more detailed maps. Major trails identified by Teit include the Okanagan brigade trail, a trail on the eastern side of Okanagan Lake, and the Similkameen trail. Minor trade routes identified include (1) the Keremeos - Penticton trail, (2)

the Nicola River - Okanagan trail, (3) the Salmon River trail, (4) a route along the north side of Shuswap Lake, (5) trails between Enderby and the Arrow Lakes, and (6) trails between Shuswap Lake and the Columbia River (Teit 1920).

As well as historic maps, textual sources were consulted for this study, including some unpublished journals, reports, accounts, letters, and many published sources. The Hudson's Bay Company is the principal source of ethnographic information of the study area prior to 1846. Published fur trade accounts like Alexander Ross' *Adventures of the First Settlers on the Oregon or Columbia River* (1849) allude to trails in the study area. Other early sources include accounts by the early Jesuit missionaries, in particular that of Father Nobili who travelled through the Okanagan to Kamloops in 1841, and Oblate missionaries, including Father Pandosy in 1859. Still later, Bishop Sillitoe and his wife followed trails through the Okanagan in 1880.

Ethnographers such as Teit have also provided textual information on trading routes. In his posthumously published study of the Okanagan Indians (Teit 1930), he describes the changes that took place before and after the arrival of the horse, introduced probably early in the 18th century. According to Teit, before the advent of the horse in the Okanagan,

...trade went north via Okanagan River and Okanagan Lake to the Shuswap. The journey was easy, being accomplished almost entirely by water. From the head of Okanagan Lake the Shuswap had only a short distance to carry their goods to the navigable waters of Spellumcheen River [Shuswap River], Shuswap Lake, and South Thompson River, to Kamloops, which was a central point (Teit 1930:214).

Accounts by settlers also lend some insight into the use of aboriginal trails. C.W. Holliday (1948) in his reminiscences of the Okanagan notes that the

Indians at the north end of the valley had horses, but round the river and Shuswap Lake....were much more at home in canoes. And for some unknown reason the Indians round Okanagan Lake neither made nor used canoes... They were sometimes referred to as horse Indians, and those round the Shuswap Lake as canoe Indians.

4.4.3.4 Description of Trails - Salmon Arm Forest District

The major aboriginal trails in the Salmon Arm Forest District provided a connection between the between the Thompson - Fraser and Okanagan - Columbia drainages via Shuswap Lake and its principal tributaries such as the Seymour, Eagle, and Shuswap Rivers. The trails network is shown in Figure 3.

- (1) **Eagle River to Columbia River.** The route of the Canadian Pacific Railway and the Trans-Canada Highway was an early route. Walter Moberly, searching for a possible railway route in this area, followed an ancient Indian trail in 1865.

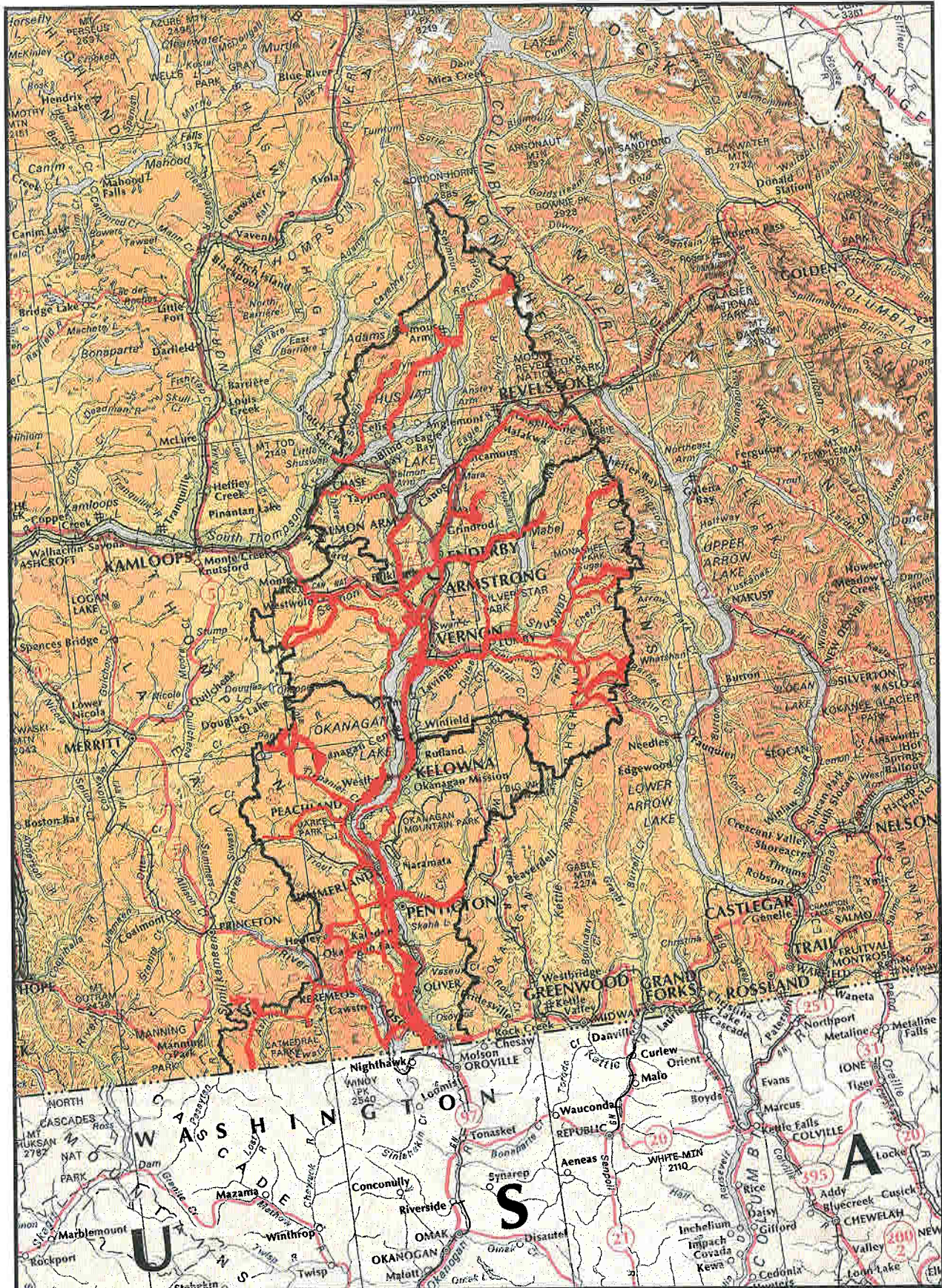


Figure 3. Distribution of trails (1:2,000,000).

- (2) **Shuswap Lake to the Okanagan Valley.** The main route between Shuswap Lake and Okanagan Lake was via the Salmon River or a Shuswap River - Mabel Lake corridor.
- (3) **Seymour Arm to Downie Creek (Columbia River).** Part of the Big Bend Trail, now known as the Ratchford - Pettipiece Trail. It is said to be one of the raiding trails of the Blackfoot Indians from Alberta (Bradley 1970).
- (4) **North shore Shuswap Lake across plateau to Albas and Seymour Arm.** Part of the trail system to the Big Bend, this trail was a short-cut avoiding the boat-trip around Shuswap Lake. It was used by placer miners in 1866. An ancillary trail noted by Dawson (1886) went from Seymour Arm to upper Adams Lake via Humamilt Lake.
- (5) **Scotch Creek to Pukeashun Mountain.** Noted by George Dawson (1886).
- (6) **Skimikin cut-off.** An old Indian trail which provided a shorter route between Little Shuswap Lake and Tappen Bay.
- (7) **Shuswap River to Mabel Lake.** A trail which connected with native fisheries, including a well-known site called The Islands on the river.
- (8) **Hunters Range.** An old Indian trail according to Shuswap Forest District, ca. 1920.
- (9) **Mabel Mountain Trail.** An old Indian trail according to a report by the Shuswap Forest District, ca. 1920. It began at Tsusius Narrows, the crossing place on Mabel Lake.
- (10) **Perry River.** A route along the west side of Perry Creek was probably an aboriginal trail. Charles Perry was a government surveyor who accompanied Walter Moberly; no documentation of this trail was found.

4.4.3.5 Description of Trails - Vernon Forest District

Aboriginal trails in the Vernon District include east - west connections between the Okanagan Valley and the Thompson River valley on the west, and east across the Monashee Mountains toward the Columbia River, via the Coldstream Valley.

- (1) **Hudson's Bay Company Brigade Trail - west side of Okanagan Lake to Monte Lake.** George Dawson described the trail as an Indian or natural trail (Cole and

Lockner 1989:391). There was a minor short-cut from Irish Creek near Head of the Lake to O'Keefe Siding.

- (2) **Equesis Creek Trail.** A trail possibly used by the HBC connected the northern end of Okanagan Lake and Westwold (Salmon River valley) via Equesis Creek and Pinaus Lake. This trail was possibly used when the Salmon River was in flood. However, the trail is steep and involves a rise of over 1900 feet (579 m) northbound from Okanagan Lake to Pinaus Lake, though only 700 feet (213 m) travelling southbound between Grande Prairie (a.k.a. Westwold) and Pinaus Lake.
- (3) **Upper Salmon River.** A trail connected Douglas Lake (Nicola Valley) with Grande Prairie (Westwold); there are two possible routes.
- (4) **Kalamalka Lake - Coldstream - Shuswap Falls - Cherry Creek - Monashee passes.** A trail through the Coldstream Valley from Kalamalka Lake provided access to a major salmon fishery at Shuswap Falls. When William C. Young explored the area for a route to the Columbia in 1862, he stated: We followed an old Indian trail which runs up the east side of Cherry Creek (Ormsby 1952:140). There were trails on both north and south sides of Camel's Hump. Trails traversed the Monashee Mountains to Fife Creek, Barnes Creek, and Inonoaklin Creek in the Columbia River drainage.
- (5) **Shuswap River - Sugar Lake - Monashee passes.** There were a few alternate routes across the Monashee Mountains between the Shuswap and Columbia Rivers. Three of these trails originated at Sugar Lake on the upper Shuswap River drainage.

4.4.3.6 Description of Trails - Penticton Forest District

- (1) **Hudson's Bay Company Brigade Trail.** The HBC brigade route along the western side of Okanagan Lake south of Fintry can be identified by particular landmarks such as Mauvais Rocher (Bad Rock). West of Kelowna, the trail ran along the benchlands presently traversed by Highway 97 through Westbank, descending to the lake before crossing R.de Jacques (on old maps -- presently Lambly Creek or Deep Creek). The trail then followed the shore of the lake, crossing Trepanier Creek. There were upper and lower roads at Westbank and from a point south of Peachland to Garnet Lake, as well as from the present location of Summerland to Shingle Creek. South of Penticton, the Upper Road headed via Shingle Creek and Marron Valley to Park Rill, dipping down again to the Okanagan Valley and rejoining the Lower Road near White Lake. The trail

continued south, crossing Orofino Creek and descending back to the Okanagan Valley at the site of Fairview.

Connecting trails in this locality include one between Cawston and the White Lake basin via Manuel Creek. Farther south, an old route circumvented the southern side of Richter Mountain (now followed by Highway 3 through Richter Pass) to Osoyoos Lake.

- (2) **Okanagan to Nicola Valley (via Jacques River).** North of Peachland, a short-cut route to the Nicola Valley and Kamloops went around the north side of Mt. Gottfriedsen to Pennask Lake. This route was first noted by Samuel Black on his map of 1835 as Route to Jacques River. Black (1835) shows alternate routes on either side of Mt. Gottfriedsen. Jacques was likely the companion of Alexander Ross (1849).
- (3) **Okanagan - Princeton Trail, a.k.a. Allison's Trail (Peachland to Princeton).** This trail was an aboriginal trail used by John Fall Allison who settled at Vermilion Forks (now Princeton) in 1860. He later obtained property on Okanagan Lake in 1873, at the eastern end of this trail. The likely route of Allison's Trail is shown on Archibald McDonald's Sketch of Thompson's River District 1827 as an Indian Road between the Similkameen River and Nicola's Prairie, a location on Okanagan Lake shown on his map to be situated between Riviere Jacques and Trout River. According to Dawson, Allison calls it about 60 miles over to Hay's on the Similkameen (Cole and Lockner 1989:395). The trail went via Greata Creek and Trout Creek valleys until it reached a divide valley, in which lie Osprey, Link and Chain Lakes (Cole and Lockner 1989:396). Hay says that the second and third streams crossed on the OK-P trail unite shortly below the trail, flow to Okanagan Lake & is there called Trout Creek (Cole and Lockner 1989:399).
- (4) **Keremeos to Brigade Trail.** A trail went north along Keremeos Creek to Yellow Lake near the junction with the brigade route.
- (5) **Similkameen Valley.** A trail along the north side of the Similkameen River connected the Tulameen area to the junction of the Similkameen and Okanagan Rivers. This was the route taken by Alexander Ross in 1812, which he called the Sa-milk-a-meigh River (Ross 1849). Archibald McDonald (1827) also travelled along this route in October 1826 and showed it on his map. This trail became part of the Dewdney Trail after 1861; it is likely that few sections remain as the route is presently followed by Highway 3.

- (6) **Ashnola River.** Explored by George Dawson in 1877 and noted on his map (1886).
- (7) **Trails to Green Mountain and Apex Mountain.** The existing Green Mountain Road to Green Mountain and Apex Mountain does not follow the original route of this trail, which left Keremeos Creek farther south near Ford Lake. The trail was widened into a road in 1901. These routes provided access to berry-picking and hunting locations in the subalpine parts of these mountains.
- (8) **Eastern side of Okanagan Lake (and northwards).** A route ran to the north along the eastern side of Okanagan Lake, from Penticton to Kelowna (Okanagan Mission), and continued north. There were at least two trails, one close to the route of the present trail through Okanagan Mountain Park. This route is described in various sources as going through the Big Canyon (Wildhorse Canyon) in which pictographs are present. This was probably an aboriginal footpath but is not otherwise documented. However, a trail along the rim of the canyon is well-known as the route along which Thomas Ellis drove cattle in the early 1860s (Coryell 1890). A second trail, known as Pandosy's Trail (after Father Pandosy who travelled this way in 1859) passes near Chute Lake en route to Lebanon Creek. Both trails continued to L'Anse au Sable Creek, the site of Okanagan Mission (1860). North of the Mission, the trail passed through what is now Winfield and the Ellison District, and ran along the benches on the western side of Woods and Kalamalka Lakes to Priest's Valley (Vernon) and the Head of the Lake. John Jane (1876) shows an old Indian trail heading north from the site of the Mission. The east side trail is shown on Anderson's map (1867) between Penticton and Head of the Lake. Dawson followed this trail in 1877 and shows it on his 1887 map. He described it as very crooked, and rising to an elevation of 4000 feet (Cole and Lockner 1989:341).
- (9) **Penticton to Kettle River.** A trail between Penticton and Rock Creek via the Kettle River is shown on an 1862 sketch by W.G. Cox, as well as one by Launder (1865). The Kettle was known as Toi-Yepe River. A trail from the south Okanagan to Kettle Falls (Fort Colville) via Rock Creek, is shown on Black's map (1835).
- (10) **Nine Mile Creek (Similkameen to Rock Creek).** A small section of trail originating in Washington, it is probably part of the Kettle Falls road frequented by Indians shown on McDonald's map (1827). It is also shown on Launder's map (1865).

- (11) **Mission Creek to Kettle River.** A draft map by Launder (1865) shows a very low valley said to be a good pass to the Columbia River, which is likely to have been a trail used by First Nations people.

4.4.3.7 Results and Limitations

Aboriginal trails and routes can be identified using historic maps and archival sources. However, there are undoubtedly many routes for which there is no map evidence or other archival documentation. Therefore, this study cannot claim to be an exhaustive or complete inventory of every aboriginal trail in the Okanagan TSA. Trail research is time-consuming, and a thorough survey of archival maps and documents would require months of work. Some aboriginal trails may still be identified in the future, as a result of informant interviews.

Many archaeological sites are located along trails. Similarly, archaeological sites may be diagnostic indicators of trails nearby or trails connecting nearby sites. Corner (1968), discussing the south Okanagan and Similkameen River valleys, suggests some correlation between sites and routes of travel in the main valleys and on connecting trails over low passes between valleys. It is clear that some archaeological sites in the TSA are directly associated with trails, notably the Hedley pictographs along the Similkameen trail (which depict people on horseback), and pictographs along the HBC Brigade Trail on the western side of Okanagan Lake north of Westbank..

River valleys, lakeshore settings, canyons, benchlands, and open grasslands are natural locations where trails can be predicted. Trails are also common between valley bottoms and highland areas or mountaintops. Generally speaking, the main transportation routes followed rivers, lakes, and expansive stretches of lowland between major settlements or trading sites. Minor trails, usually found at higher elevations, were used to access resources. However, there were also important trails that crossed mountain divides via montane (often alpine or subalpine) passes, such as through the Monashee Mountains.

Many historic trails became the routes of the present-day road network, and have been widened, graded, realigned, or even obliterated by human development. In these instances, the original route may still be mapped, although the trail itself may not exist.

In the Salmon Arm Forest District, the numerous, broad trough-like valleys that emanate from Shuswap Lake resulted in criss-crossing of First Nation travel routes. Undoubtedly, all of the valleys were used by First Nations people, but there is little or no historical documentation to verify many of these trails.

Many trails offered upper and lower route options. Some valley bottom settings were more prone to seasonal flooding in the past, and trails at higher elevations provided alternate routes. Because glacial lakes filled most valley bottoms between about 10,000 and 8000 years ago, it is possible that the higher routes may represent very old trails used by the first inhabitants of the

region after deglaciation. An example of such a high road is one that traverses the Ellison upland between Okanagan and Kalamalka Lakes. Consequently, the correlation of archaeological sites with trails may be indicators of the age of those trails.

Aboriginal routes have probably been in continuous use for perhaps thousands of years, first as purely native trails. Trails were used as low-impact foot paths in earlier pre-Contact times, and not until the late 18th century were they used as horse tracks. The fur trade demanded heavier use of trails with horses, and by the gold rush period (late 1850s) mules and oxen were introduced. Beginning in the 1860s, some traditional trails were widened, cleared, and straightened by settlers and the colonial government to permit travel by wagons and stagecoaches. Nevertheless, many trails continued to be used as foot- or pack-trails by fur trappers, prospectors, and ranchers in the late 19th and early 20th centuries.

A significant issue with identifying traditional trails is being able to demonstrate use, if not construction, by First Nations people. Both First Nations and non-aboriginal people used the trails during the fur trade interval; after 1858, it becomes impossible to differentiate trail use unless specific references are discovered. Some post-1858 information is available which identifies traditional trails, so an image of a complex aboriginal trail network can be constructed in some detail.

5.0 METHODOLOGY

5.1 BACKGROUND RESEARCH

Background research for the Overview involved a review of relevant archaeological, ethnographic, palaeoenvironmental, and biophysical documents, professional reports, and archival records in the possession of ARCAS, Diana Alexander (ethnographic consultant), and the Culture Department Library (Ministry of Small Business, Tourism, and Culture). Particular attention was paid to projects describing the development and application of archaeological potential models.

Information about archaeological sites recorded within the TSA was obtained from an electronic database (the Canadian Heritage Information Network -- CHIN) maintained by the Archaeology Branch. Maps for all sites were copied by Sharon Keen at the Archaeology Branch offices in Victoria.

Biophysical variables that were intended to be input into the potential model were acquired from mapped data available in electronic or hard-copy formats from the Ministry of Environment, Lands, and Parks, Ministry of Forests, Ministry of Transportation and Highways, and MAPS-BC.

5.2 CONSULTATION WITH FIRST NATIONS COMMUNITIES

First Nations involvement in the archaeological overview assessment was discussed at a project start-up meeting in Penticton on May 1, 1996. Originally, the Ministry of Forests had held meetings with some First Nations communities in 1995 and 1996 without being able to achieve a consensus on how to proceed with this project. There was concern that the consultation process would be difficult to co-ordinate because of the potential for a large number of communities being involved (nine bands claim traditional territories within the Okanagan TSA). It was decided that initial contact would be made through the Aboriginal Liaison Officers in each District, Brent Turmel, (Penticton), Carl Mashon, (Vernon), and Dave Nordquist (Salmon Arm).

The consensus that arose from the discussions that followed was that consultation with the Bands should have begun long before the contract for the overview assessment was awarded.

- May 21, 1996: Meeting with Neskonlith Band members in Chase (Bob Manuel, Dan Manuel, and Bonnie Andrew). Also present were Paul Birzins (MoF, Salmon Arm), Dave Nordquist (Aboriginal Liaison Officer, Salmon Arm), and Arnoud Stryd (ARCAS). Bob Manuel stated that the Shuswap Nation Tribal Council would prefer to see Archaeological Overview Assessments conducted by the First Nations, and, with the Ministry of Forests acting as lead proponent for the Okanagan TSA, he did not feel that Secwepemc involvement would serve much purpose.

- May 22: Meeting with the Spallumcheen Band in Enderby (Morgan Felix, Val Jensen, Ron Christian, and John Fleming) along with Carl Mashon (ALO, Vernon) and Dave Nordquist (ALO, Salmon Arm), Paul Birzins (MoF Planner, Salmon Arm), and Arnoud Stryd (ARCAS). Spallumcheen representatives focused mainly on reviewing a number of woodlot developments that were pending. The need for a traditional use study was discussed.
- June 11: Meeting with representatives from Bands in the Penticton Forest District: Roger Hall Jr. (Osoyoos), Steve Borcsok (Osoyoos and Upper Similkameen), Dixon Terbasket (Lower Similkameen), and Greg Gabriel (Penticton Band). As was the case with the Neskonalith, concern was expressed that the Archaeological Overview Assessment had been initiated without First Nations' involvement and that consultation at this point was not practical. Questions were posed as to how the final product would be used and if, in fact, there was a danger that it could have negative impacts against them in future land use discussions.
- August 16: Meeting of the Okanagan Inter-tribal Natural Resources Committee (OINRC) at the Osoyoos Band Office in Oliver. Attendees were Steve Bryson, chair, (Osoyoos Indian Band), Dixon Terbasket (Lower Similkameen Band), Byron Louis (Okanagan Indian Band), Philippe Batini and Charlene Allison (Upper Similkameen Band), Scotty Holmes, Dan Manuel, and Fabian Manuel (Upper Nicola Indian Band). Richard Brolly represented ARCAS; Judy Steeves attended on behalf of the Ministry of Forests (Penticton). Rob Hutton (Forest Renewal Coordinator for OINRC) as well as Brent Turmel (ALO, Penticton) and Carl Mashon (ALO, Vernon), were also present. Unhappiness with the way the overview process had progressed was again expressed, particularly due to the lack of any consultation prior to the start-up of the project. Attendees also stated their annoyance over the process of choosing consultants and the lack of regular communication.
- September 23: In the hopes of addressing some of these concerns, a letter was sent by ARCAS to all First Nations Communities with an interest in the area. ARCAS was particularly interested in hearing feedback from First Nations on the design and operation of the archaeological potential model. Up to this point there had been much criticism of the process but practically no discussion of the actual decision-making tools that were being developed (i.e., the archaeological potential model). Offers were made to set up meetings to discuss the project, but there was no response to this initiative.
- November 1: Meeting at the Ministry of Forests office in Penticton. First Nations representatives Byron Louis (Okanagan Indian Band) and Dan Manuel (Upper Nicola Indian Band) were present, as well as Carl Mashon (ALO, Vernon) and Rob Hutton (OINRC). Okanagan TSA Archaeological Overview Assessment team members included Paul Birzins (MoF, Salmon Arm), Ross Porcheron (MoF, Penticton), Arnoud Stryd

(ARCAS), and Grant Beattie (ARCAS). Byron Louis stated that he felt communications, particularly on the part of the Ministry of Forests, had been poor and that First Nations were no longer aware of where the project stood. Dan Manuel from the Upper Nicola Band reiterated that since they had not been included from the outset, his community was not interested in the Archaeological Overview Assessment and requested that any field survey in support of the modelling not be conducted in their territory. A commitment was made by Paul Birzins and Arnoud Stryd that a progress report would be prepared and distributed to all First Nations groups with an interest in the area.

- November 18: A Progress Report/Newsletter authored by Arnoud Stryd, was mailed out under the auspices of Paul Birzins (MoF, Salmon Arm). It described the activities and objectives of the Archaeological Overview Assessment in question and answer form.
- February 26, 1997: Meeting at the Westbank Indian Band office in Westbank, attended by Dixon Terbasket (Lower Similkameen Band), Philippe Batini (Upper Similkameen Band), Arnoud Stryd, Paul Birzins, Doug Glaum (Archaeology Branch), and other representatives of interested First Nations' communities. Batini expressed unhappiness that the Overview had proceeded after expressions of disapproval had been asserted at the August meeting. It was reiterated that communications with First Nations had been poor throughout the project. Further discussions focused on the actual project and application of the model, and were generally positive. Interest was expressed by various attendees in having Stryd discuss the project results further in their communities.

5.3 CONSULTATION WITH OTHER AUTHORITIES

Three aspects of the Okanagan TSA Overview were sub-contracted to other consultants. Digitizing of non-digital mapped data was done by Range & Bearing Environmental Resource Mapping Corporation. Data which was digitized included known archaeological sites, trails, and selected landforms from terrain and soils maps. Following review of variable coverages by ARCAS personnel, corrections and editing of input coverages was also done by Range & Bearing. The ethnographic review was carried out by Diane Alexander, and the heritage trails were researched by Ken Favrholt. These researchers prepared reports submitted to ARCAS for inclusion in the final report of the study.

Development and management of the digital map files was done by Ross Porcheron and Tim Bouwmeester of the Data Centre in Penticton (Ministry of Forests). This task involved assembling of the various TRIM base map files and inputting data from Range & Bearing. Once this process was complete, the Data Centre provided ARCAS with various map outputs displaying the variables used in the model as well as maps showing the modelled terrain.

Information on archaeological sites within the study area was obtained from the Archaeology Branch. This task involved initial selections of sites based on their presence within the three Forest District boundaries. Pradeep Singh (Inventory and Mapping Section) provided this list. Hardcopies of individual site maps were copied from the Archaeological Sites Register by Sharon Keen, and Site Inventory Forms were downloaded from the Canadian Heritage Inventory Network (CHIN). Doug Glaum (Assessment and Planning Section) was the Project Officer assigned to this project and was available for advice and consultation.

5.4 REVIEW OF THE ARCHAEOLOGICAL SITES DATABASE

Archaeological sites were the primary data resource used to test the effectiveness of the modelling process in this study. It was vitally important that their locations be plotted as accurately as possible. A review of individual site maps, CHIN records, and site locations plotted on 1:50,000 NTS maps by the Archaeology Branch was done to ensure accurate locations for each site. Even after this detailed investigation, however, several sites recorded prior to 1980 remained vaguely located. Sites plotted in error on the Branch's NTS maps were noted for subsequent correction by the Archaeology Branch (Section 7.1). Although site types were not used in the modelling process, they were reviewed in this report (see Section 4.3 above). The source for the site type information was the INVESTIGATOR'S TYPE field taken from CHIN records.

An attempt was made to develop a database of locations that had been reported as having historic or prehistoric remains but which had not received a Borden designation. The assumption was that there were a number of such anecdotal sites familiar to local residents and/or historical societies and museums. A total of 24 letters were sent to museums, archives, and historical societies throughout the Okanagan TSA. The response was rather low, and only two letters and two telephone calls were received. At least two authorities reported that a heritage resource overview study had been done for the Kamloops Forest Region under contract to the Provincial Heritage Conservation Branch. Unfortunately, this project was not completed and specific site locational information was not available for this study.

5.5 ARCHAEOLOGICAL POTENTIAL ASSESSMENT

The primary goal of this project was to produce a set of maps that assigned levels of potential for a landscape to have supported the types of traditional land use that would have resulted in the formation of archaeological sites. Using a Geographic Information System, several contributing variables were combined that, collectively, produced a potential grade for all terrain situations. These variables, discussed in detail below (Section 6.2 and Table 14), predominantly reflect biophysical and topographic attributes of the landscape chosen because of their presumed

correlation with archaeological site locations. The setting of levels of potential evolved throughout the life of the project and their final form is discussed in Section 6.6.2 and 8.3.

5.6 MAPPING

A Geographic Information System (GIS) was used in this study to describe and analyze the terrain of the Okanagan TSA, focusing specifically on landscape attributes commonly associated with past human activity. Information on these attributes, initially derived from the GIS, was used to develop a model of archaeological potential for the area bounded by the TSA. This study is, therefore, spatially based, using elements of the landscape that can be described with geographical shapes -- points, lines, and areal shapes (polygons). That these variables are predominantly biophysical in character is typical of most overview assessment studies dedicated to modelling prehistoric land use. The process of checking both the mapped input and the modelled outputs took two forms, a visual analysis of map products in both digital and printed formats, and basic statistical analyses.

5.6.1 Data Capture and Development

In order to develop an understanding of the suitability of various landscapes for past human use in the Okanagan TSA, 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 Section 6.0. The base maps used were 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.

- **Archaeological Sites and Trails.** The Archaeology Branch had plotted sites onto 1:50,000 NTS maps and individual site maps and CHIN records were used to maximize locational accuracy. A total of 955 sites were hand-plotted onto the TRIM base maps as points or areal shapes, depending on the information available. If the site boundary had been determined to be greater than 100 m, it was drawn as an areal or polygon figure. The Borden site registration number was used as the label for each site. Trails were hand-drawn onto the TRIM sheets with one of three codes assigned as an identifier. These codes were based on the degree of locational accuracy determined by the trail researcher. Both features were then digitized. A number of inaccuracies in the initial drawing of the trail network required further editing following a visual review.
- **Vegetation.** Forest inventory data for two species of trees of particular importance for First Nation people (see Appendix I), western red cedar and lodgepole pine, were taken

from digital Forest Coverages provided by the Ministry of Forests. Biogeoclimatic subzones identified as alpine settings were taken from digital Biogeoclimatic coverages, also supplied by the Ministry of Forests. Problems encountered with this data included the absence of information for areas covered by Tree Farm Licences, provincial parkland, or lands under private ownership.

- **Landforms.** Information on specific geomorphological landforms was derived from soil 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. It was originally intended to digitize individual landform polygons complete with their very detailed labelling structure and later use the computer to reclassify them as either lacustrine-glaciolacustrine deposits, fluvial-glaciofluvial deposits, alluvial fans, and glacial moraine deposits/sediments with aeolian veneers. In the case of the extremely detailed Ministry of Environment sheets (at a scale of 1:20,000), this proved too costly and time-consuming. The landform reclassification step was subsequently put ahead of the digitizing by hand-drawing enclosed polygons in the four more general categories, around the numerous small landform polygons.
- **Water Features.** Lakes and other watercourses were taken from the TRIM base maps. In some of the digital files, stream data in TRIM proved to be inconsistent (for example, stream classes had been assigned in error) and corrections had to be made by the Strategic Planning Group in Penticton. Problems were also identified with certain intermittent lake and wetland features that were not recorded in TRIM as closed polygons. The lakes were corrected by Strategic Planning staff but with the large number of wetland features, it was decided that the Forest Cover files would be used. Unfortunately, the problem of incomplete coverage of low-elevation settings was again encountered.
- **Slope.** This variable was derived from the spot elevation points within the TRIM Digital Elevation Model (DEM). An area is selected, for example a 10 m square, referred to as a *pixel*, and the percentage of slope is calculated on the basis of maximum and minimum elevation within it. The initial choice of a 10 m pixel size created an unwieldy volume of data, making map processing very slow. This was resolved by increasing the pixel size to 100 m. Individual pixels were then grouped into three slope percentage ranges for the model: 0-5%, 6-10%, and > 180%.
- **Miscellaneous.** Mountain passes and reaches of rivers from which traditional fish weirs had been reported were hand plotted and later digitized. Digitized ungulate winter range coverage was provided by the Ministry of Forests, and rock outcrop features were taken from the Forest Cover coverage. Again, a coverage problem arose with the latter, due to data missing from Tree Farm Licences, some provincial parks, and alienated lands in valley bottom settings.

5.6.2 Use of a Geographic Information System

Broadly defined, Geographic Information Systems are computer-based systems used to store and manipulate geographic information (Aronoff 1991). Once this information has been 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 areal 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).

5.6.3 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. A water coverage showing streams can be matched to a slope coverage to determine stream sections too steep to be included in the model, for example. Various *distance* and *connectivity* measurements can also be made. In this study, 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 areal 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.

5.6.4 Selection of Test Areas

To provide a detailed, progressive view of both the coverage outputs and of the modelled terrain, three test areas were selected within the TSA, one from each Forest District. Each test

area was made up of four connected TRIM sheets, output at a scale of 1:40,000. The three test areas were defined as follows:

- **Penticton Forest District.** The test area in this District was defined by a west - east strip along the International Boundary, including TRIM sheets 92H.010, 82E.001, 82E.002, and 82E.003. This test area was chosen because it represented a transect of two parallel river valleys (Similkameen and Okanagan), the mid-elevation hill country between them, and subalpine/alpine montane settings in the angle formed by the Similkameen River and Ewart Creek. As well as providing a diverse range of environmental settings in the Okanagan Range Ecoregion and the Okanagan Basin Ecoregion, this test area also incorporates a significant number of archaeological sites.
- **Vernon Forest District.** The Vernon test area was another west - east strip, more or less configured to the northwestern corner of the District and including TRIM sheets 82L.041, 82L.042, 82L.043, and 82L.044. The test area included forested montane environments of the Southern Thompson Upland Ecoregion and lowland settings at the northern end of the Okanagan Basin Ecoregion, and incorporated some small lakes and early landforms associated with glaciofluvial and lacustrine processes. Relatively few sites are within this test area, but include a rare mid-elevation site associated with Pinaus Lake and additional sites configured to early landforms.
- **Salmon Arm Forest District.** This test area was a south - north strip intended to test the steep shore of Shuswap Lake (Seymour Arm) and montane settings of the Shuswap Highland Ecoregion, and included TRIM sheets 82L.095, 82M.005, 82M.015, and 82M.025. Only a few sites -- associated with the shoreline of Shuswap Lake -- were present within this test area.

5.6.5 Reviews of Variable Coverages and GIS Modelling Outputs

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 if variables were being captured correctly. The same procedure was used in the initial modelling exercises.

6.0 MODELLING ARCHAEOLOGICAL SITE POTENTIAL

Although a GIS brings a great deal of analytical power to the archaeological potential modelling process, it can also restrict the user through its need for spatial information in digital form. This can be adversely affected by limitations within map datasets, such as missing features or an actual lack of digitized data for features that would be desirable in the model. The difficulty and high cost of acquiring such datasets can, in many cases, result in certain data elements being excluded from the model. These and other GIS-related problems are discussed below.

6.1 BACKGROUND

This study employs a model of **archaeological potential**, defined here as the capability of a landscape to support the types of traditional First Nations land use which would have resulted in the formation of archaeological sites. This differs from more traditional attempts in archaeology to probabilistically *predict* site locations. The level of understanding, not only of the natural but also of the cultural significance of particular landscape features, must be so comprehensive that meaningful predictions of archaeological probability are rarely possible. This study does not attempt to state that archaeological sites will be found in certain locations, only that, based on the known distribution of sites, the presence of certain landscape elements, and the regional expertise of archaeologists, degrees of archaeological potential can be assigned. The potential categories can then be used in subsequent management decision-making.

Confidence in an ability to model for archaeological potential is based on previous experience with a number of studies done by ARCAS, as well as other archaeological consultants throughout British Columbia. Typical of these are projects by A. Carlson for the Vanderhoof Forest District (1996) and by ARCAS for the Horsefly and 100 Mile House Forest Districts (Arcas Consulting Archeologists 1996b, 1996c), and joint overview projects for the Quesnel and Chilcotin Districts (Equinox Consulting Archeologists - Arcas Consulting Archeologists 1996; Antiquus Archaeological Consultants - Arcas Consulting Archeologists 1996). During the summer of 1996, an interim potential model was developed by ARCAS for operational use by the Vernon and Salmon Arm Forest Districts for proposed forestry development areas. This exercise combined the Chilcotin and Quesnel models with a site potential model developed by Jean Bussey (Points West Consulting) for an archaeological review of five-year forestry development plans in the Pentiction Forest District (Prager and Bussey 1997a, 1997b). The only purely-GIS-based project available for review is one in progress being conducted by Millenia Research as part of their Squamish Archaeological Overview Assessment (Millenia Research n.d.).

For the aforementioned studies, a set of variables similar to those adopted by the present project was selected and used to assign potential scores to different locations within their respective study areas. Unlike the present study, and with the exception of the Squamish study, they were carried out using manual measurements made directly to paper map sheets. The choice of variables used for this study, as well as initial buffer widths and scoring values, were derived from these studies (Table 14).

Table 14. Okanagan Timber Supply Area GIS Model.

AOA Category	Arcas Variable	Source GIS Coverage	Coverage Database Field	Field Attribute	Secondary Criteria	Value	<100	<150	<200	<250	<500	<750	<1000
SITES	Archaeological sites	know_a (point)	Borden #							6			
		know_2 (polygon)	Borden #							6			
	Trails	trail_a	trail_a-id	1					6				
				2							3		
				3									3
VEGETATION	Red cedar	f_fc.layer f_fc.species	layer order species percentage prjage	1 1,2,3,4,5,6 C or Cw >20 >121	within 500 m of lake > 1 ha; 200 m of 'P_mry' or 'S_dry' stream; 500 m of trail_a	2							
	Lodgepole pine	f_fc.layer f_fc.species	layer order species percentage prjage	1 1,2,3,4,5,6 pl >20 >121	500 m of lake > 1 ha; 500m of 'P_mry' or 'S_dry' stream; 500 m of trail_a	2							
	Subalpine - alpine	f_bgc	Zone/ sub_z/ Variant	ESSF_dc_1 ESSF_dc_2 ESSF_xc ESSF_vc AT		2							
LANDFORM	Lacustrine	landform		poly		2							
	Fluvial					2							
	Alluvial fans					1							
	Moraines w. aeolian veneer					1							
STANDING WATER	Large lake (= > 5000 ha)	twtr	fcode area	GB15300000 GB15300130 =>5000						2	1		
	Medium lake (500-4999 ha)	twtr	fcode area	GB15300000 GB15300130 =>500 <= 4999						2	1		

Table 14. Okanagan Timber Supply Area GIS Model.

AOA Category	Arcas Variable	Source GIS Coverage	Coverage Database Field	Field Attribute	Secondary Criteria	Value	<100	<150	<200	<250	<500	<750	<1000
	Small lake (2-499 ha)	twtr	area	GB15300000 GB15300130 =>2<=499						2	1		
	Wetlands, ponds	f_fc.pat twtr	npforestdesc fcode	S(=swamp) M(=marshes) GB15300000 GB15300130			1	1					
		twtr	fcode	GB15300000 GB15300130 <2 ha			1	1					
WATER COURSES	Primary streams	twtr.aat	fcode	GA90000110 GA90000120						2	1		1
	Secondary streams (definite)	twtr.aat	fcode	GA24850000 GA08800110	Slope 0-5%					1	1		
					Slope 6-15%					1			
	Intermittent stream (intermittent & indefinite)	twtr.aat	fcode	GA24850150 GA08800110	Slope 0-15%						1		
	Spring	twtr.aat	fcode	GF28750100			3						
TERRAIN	Slope (100 m ² pixels)	dem-slope_cl	class	0 - 5% 6 - 10% 180+ %		2 1 2							
MISCELLANEOUS	Montane passes	R&B				2							
	Waterfalls	twtr		GA10450000			3						
	Fish traps/weirs	R&B				4							
	Ungulate winter range	f_thgz	zone	ungulate		1							
	Rock outcrop	f_fc (.pat)	npforestdesc	R	<1km from Standing water, Primary stream; <200m from Trail	2							

6.2 SELECTION OF VARIABLES

6.2.1 Sites and Trails

A total of 955 archaeological sites were downloaded from Archaeology Branch records and hand plotted onto paper TRIM maps for subsequent digitizing and input into the GIS. A network of aboriginal trails was researched by Ken Favrholt and hand-drawn onto the TRIM maps. The close correlation between sites and trails was shown in Figure 4, in which approximately 50% of all archaeological sites in the Okanagan TSA are shown to lie within 250 m of a known trail. The plotted sites were also used to test the effectiveness of the variables used to develop the model, as well as the ability of the model to capture them within its site potential polygon boundaries. Figure 5 is a series of histograms that graphically portray these relationships.

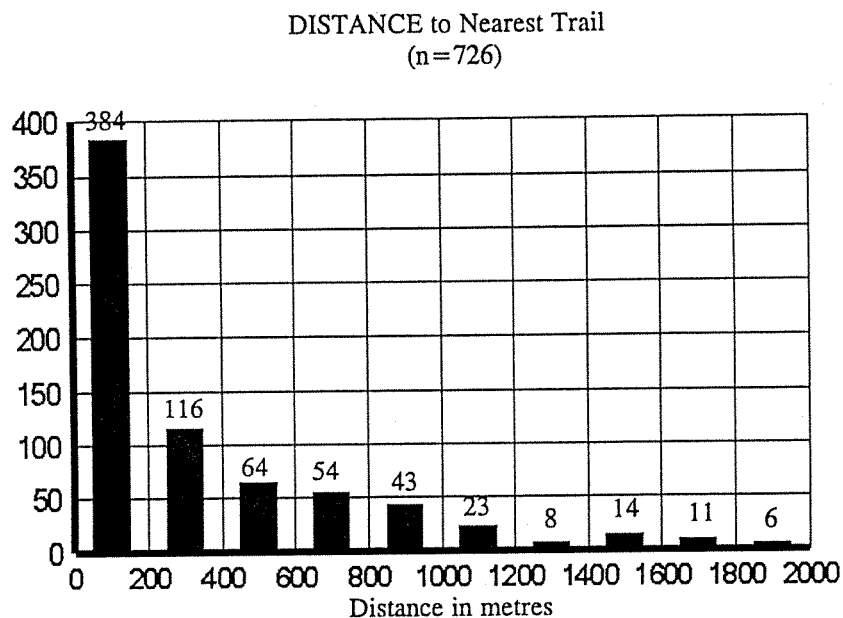


Figure 4. Distance relationships of SITES to TRAILS.

Documented archaeological sites are considered to contribute predictive power to the 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 remains. 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.

Trails are similarly important, because they represent corridors of movement through the traditional territories of one or more First Nations groups. As a natural focus for people moving through the corridor, several different types of activities -- directly or indirectly associated with the trail -- probably occurred in its proximity. It is suspected that most trail routes should be distinguished by linear concentrations of sites along their routes; by extension, such linear

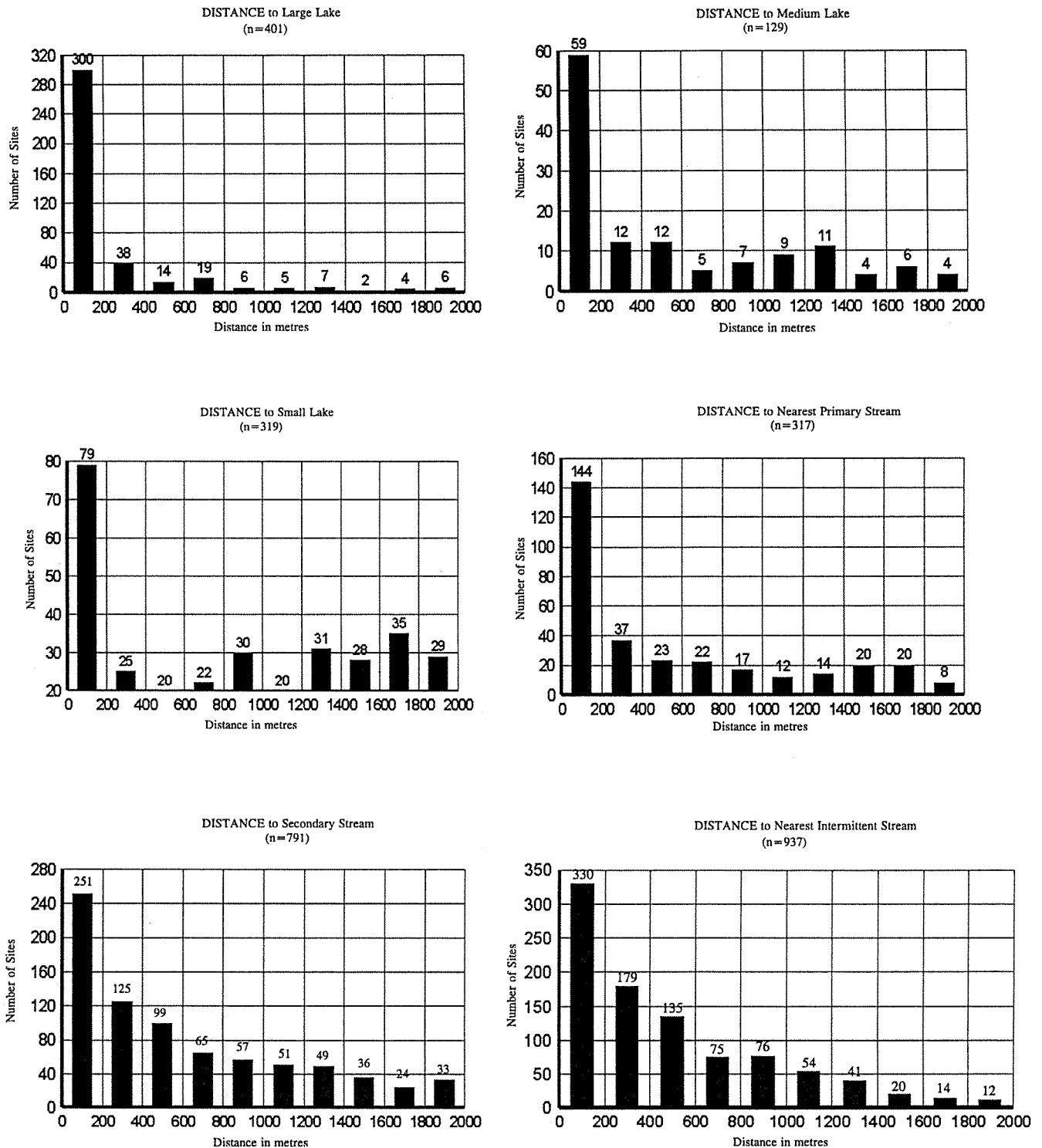


Figure 5. Distance relationships of SITES to various model variables.

concentrations of sites might represent ancient travel corridors for which no physical or documentary evidence now exists. Figure 3 in Section 4.4.3 displays the *buffered* trails network for the Okanagan TSA.

6.2.2 Vegetation

Figure 6 is a display showing the undifferentiated distribution of old-growth western red cedar and lodgepole pine forest stands, and subalpine - alpine biogeoclimatic subzones throughout the Okanagan TSA. Three different aspects of traditional land use were to be captured by the vegetational variables. Forest stand characteristics were obtained from digitized Forest Cover inventory mapping, while the distribution of subalpine - alpine zonation was determined from biogeoclimatic mapsets.

Old-growth western red cedar (*Thuja plicata*) stands were incorporated into the site potential model because there are a number of reports of culturally-modified red cedars being present in the Shuswap Lake area (Zacharias 1989b; Stryd 1997). Modified cedar trees that have been observed in this region bear large, rectangular bark strips that were removed from trees for bark slabs to be used as roofing, flooring, or wall-lining materials in traditional houses (Stryd 1997). Other types of modified cedars might be predicted wherever suitable trees occur within the TSA. For the most part, forest stands dominated by western red cedar are confined to the Interior Cedar - Hemlock Zone of the Salmon Arm and Monashee Mountains within the Vernon Forest District. As shown in Table 14, a number of secondary criteria were established to limit the extent of cedar stands that would be selected by the GIS. Specifically, the model was only to select forest stands with the following characteristics:

- dominated by red cedar in the first layer of the Forest Cover polygon label;
- where red cedar represented over 20% of the forest cover inventory;
- where the age of the trees was greater than 121 years; and
- within 500 m of a lake, primary or secondary stream, or trail.

The purpose of the secondary criteria were to restrict selection of cedar-leading stands to those locations where First Nations people were most likely to encounter cedar trees, of sufficient maturity in the 19th century, in the course of their normal settlement and land use patterns.

Old-growth lodgepole pine stands were also incorporated into the model because traditional use of this abundant species -- found throughout the TSA in montane settings -- was dominated by bark-stripping which leaves physical scars that could be identified by an archaeologists or ethnographer. Sites of this nature have not been documented within the Okanagan TSA, but were found in small numbers during a survey of mid-elevation settings in the Southern Thompson Upland, at the western edge of the study area (James and Oliver 1991). Modified lodgepole pines have not been energetically documented by many archaeologists who have worked in the Interior Plateau, but recent forestry-related assessments in the Lillooet Forest District suggest that the

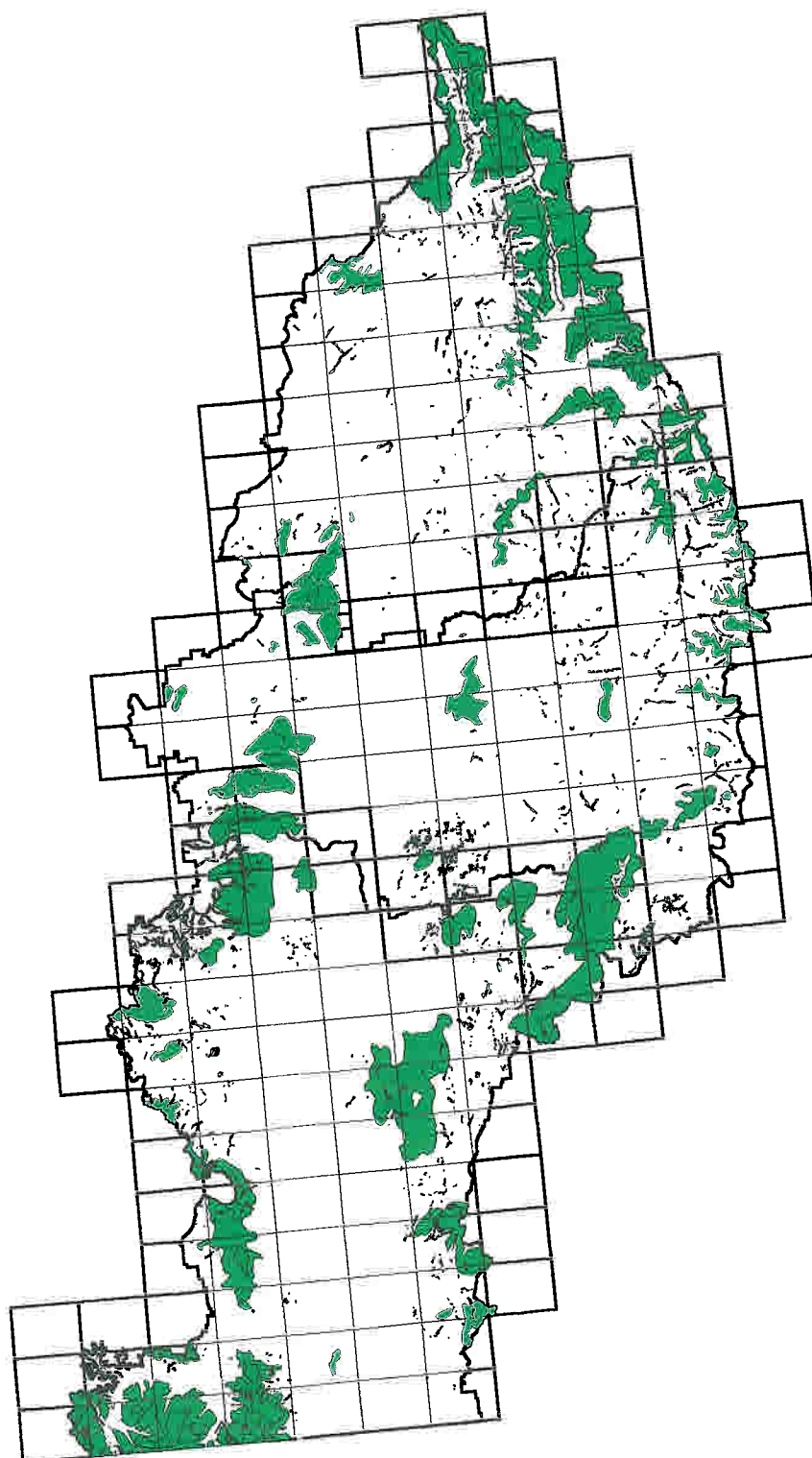


Figure 6. Distribution of VEGETATION variables (old-growth red cedar, lodgepole pine, subalpine-alpine settings).

actual frequencies of modified pines in some settings may be very high (M. Eldridge, Millennia Research, pers. comm., February 1997). In particular, heavy concentrations of bark-stripped lodgepole pines were associated with the routes of traditional trails, and it seems reasonable to suppose that a similar correlation will occur within the Okanagan TSA as well. A similar set of secondary criteria was established to restrict modelling on this variable by the GIS:

- forest stands must be dominated by lodgepole pine;
- lodgepole pine must exceed 20% of the documented forest inventory coverage;
- lodgepole pine trees within the stand must be over 121 years of age; and
- the stands must be situated within 500 m of a lake, primary or secondary stream, or trail.

Biogeoclimatic zonation was adopted to establish the distribution of settings where subalpine parklands and alpine tundra would be present. These variables were not intended to capture single site types as with the forest stand characteristics described above, but rather to identify environments where a variety of high-elevation land uses might have taken place. Only the Englemann Spruce - Subalpine Fir Zone (ESSF) is associated with subalpine parkland settings in the study area, and the **ESSFdc1** variant, **ESSFdc2** variant, **ESSFxc** subzone, and **ESSFvc** subzone were considered to contain the highest percentage of parkland settings. It is important to state that parkland settings are not differentiated within any of these subzones or variants, and most lower-elevation locations within the variable coverages doubtless represent closed-canopy coniferous forests with lesser archaeological site potential.

Subalpine parkland settings are generally considered to have higher site potential than true alpine settings in the TSA, which have not been differentiated into subzones. As a result of the latter fact, montane glaciers and icefields were included within preliminary versions of the potential model, giving false high-potential readings for some locations which have no discernable potential.

6.2.3 Landforms

As described in Section 5.6.2, a series of map sets was used to build a landform coverage. This data was reclassified into four broad groups (lacustrine/glaciolacustrine, fluvial/ glaciofluvial, alluvial fans, and morainal sediments with aeolian veneers), then input as a separate digital coverage and scored accordingly (Table 14). Figure 7 displays the *combined* distribution of these variables in the TSA. As seen in Table 14, this set of variables was quite effective in assessing archaeological site potential, impacting 44.4% of all sites within the TSA.

Both kinds of lacustrine landforms are of limited distribution in the Okanagan TSA, and predominantly at lower elevations. Lacustrine and/or glaciolacustrine landforms in the TSA are mainly confined to the Okanagan Basin Ecosection, though some are found along the western margin of the Salmon Arm Forest District in the Eastern Thompson Upland Ecosection. Lacustrine landforms will be confined to the shorelines of existing lakes, and would include

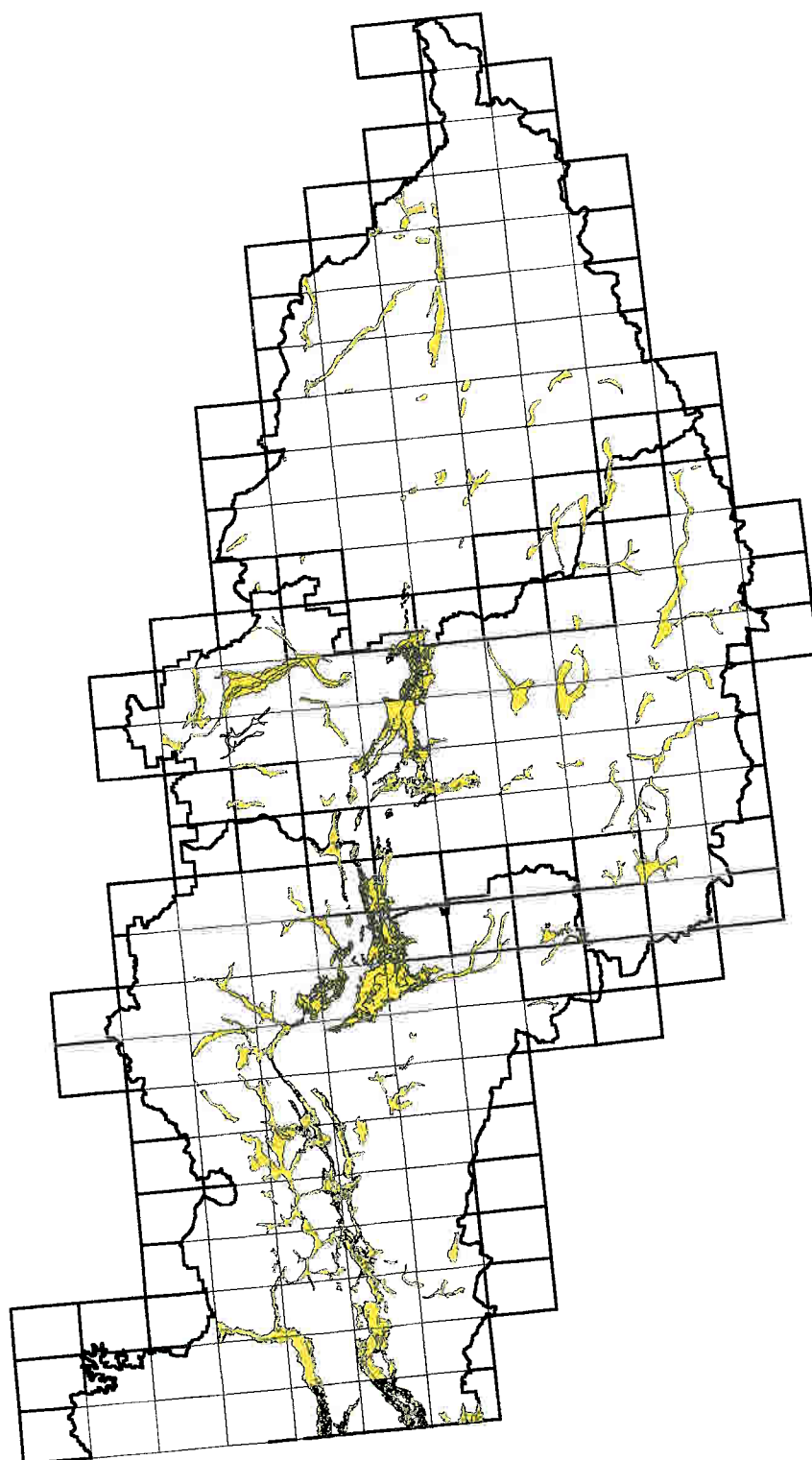


Figure 7. Distribution of undifferentiated LANDFORM variables.

middle Holocene and younger beach terraces that would not usually be picked up by the terrain /slope variable coverage. Glaciolacustrine landforms will nearly always be found at higher elevations than modern lacustrine features, and refer to Pleistocene to early Holocene landforms that could have supported sites of Early Prehistoric age.

Fluvial and/or glaciofluvial landforms are widely distributed throughout the TSA at middle and lower elevations. Similar to the lacustrine landforms, fluvial features are associated with modern drainage systems, and are dominated by alluvial terraces along rivers and secondary streams. Glaciofluvial features are more prevalent at higher elevations, as Holocene rivers and streams at lower elevations have largely eroded evidence of earlier landforms in most parts of the study area. However, the Spallumcheen Valley and Salmon River valley represent significant areas within the TSA where glaciofluvial features are predominant at low elevations.

Alluvial fans represent a specialized class of fluvial landforms that are considered to weakly influence archaeological site potential. Only alluvial fans at lower elevations were believed to be important for the potential model. They tend to be concentrated along the nick points between valley bottoms and valley slopes and are most important because younger fans may have deeply buried, and hence preserved, archaeological remains from early time periods.

Areas of morainal sediments that are capped with a veneer of aeolian sediments have quite limited distribution within the Okanagan TSA, but noteworthy examples of these landforms are common in the Spallumcheen and Coldstream Valleys, and the rolling terrain east and north of Kelowna. Aeolian sediments could also cap other landforms, including lacustrine and fluvial features. Deposition of aeolian sediments is reckoned to have ceased by about 6000 BP, so sites associated with such landforms could of considerable antiquity.

Some types of landform data were not considered to be notably relevant to the site potential model. Glacial moraines without aeolian caps are so widespread throughout the TSA that they have little utility for the site potential model. As a rule, they are characteristic of montane settings at middle and higher elevations. Some glaciofluvial landforms of extremely limited distribution, such as eskers, would be highly rated for their archaeological potential if they had been mapped within the study area. It was initially desired to include talus slopes within the model, but consistent digitized coverage could not be obtained for low-elevation settings where these landforms are often associated with burials.

The inconsistency of surficial geology and terrain mapping represented a serious impediment to application of landform variables to the model. In particular, middle and high elevation settings on either side of the Okanagan Valley were poorly served by terrain mapping, and only soil maps were available for such locations. Because archaeological site locations are frequently associated with medium- to coarse-textured, well-drained sediments, soil mapping might represent a more appropriate means of obtaining landform-related data in future revisions to the model.

6.2.4 Standing Water

Four distinct variables are subsumed under this heading: (1) large lakes, or those greater than 5000 ha in area; (2) medium lakes, ranging from 500 to 4999 ha; (3) small lakes, ranging from 2 to 499 ha in area, and (4) wetland and ponds, or open standing less than 2 ha in area. The distribution of all water-related variables in the Okanagan TSA is displayed in Figure 8. A correlation between open standing water and site location is well documented in this region (see Figure 5), even in consideration of the fact that much of the site inventory research in the TSA has focused upon lakeshore settings (e.g., Lawhead and McLeese 1976; Rousseau and Wales 1977; Howe and Rousseau 1978; Mohs 1980)

Lakes are considered to influence archaeological site potential by virtue of a number of attributes shared by most bodies of open standing water:

- during most times of the year (in pre-Contact times!), they represent a reliable source of potable water;
- the largest lakes rarely freeze, thus moderating winter temperatures in the region; they also moderate summer temperatures, particularly in the Okanagan Valley;
- they are significant corridors for waterborne travel, particularly Okanagan, Shuswap, and Mabel Lakes, parts of which are flanked by extremely steep terrain;
- they support a wide range of subsistence resources, particularly including fish, but also edible or technologically-useful plants and migratory waterfowl; game animals used lakes as watering holes, and smaller lakes represent high-productivity habitat for several species of fur-bearing mammals; and
- supplementary to the preceding, gravelly foreshore settings along lakes in the Thompson - Shuswap drainage supported runs of spawning sockeye (and perhaps also spring) salmon (Rousseau, Muir and Alexander 1991).

Through the model development process, efforts were made to determine if size distinctions between lakes were correlated to different distributions of archaeological potential. In the case of the buffering exercise, however, this did not prove to be the case, as all three lake-area categories ended up with identical buffer widths and scores (Table 14). In other words, the size of a lake did not affect the width of the buffer needed to encompass known archaeological sites (see Figure 5), and all lakes appear to have been equally attractive to pre-Contact First Nations people.

Associations between sites and ponds or wetlands are not well demonstrated in the Okanagan TSA, but an historical consideration -- whereby small, early- to middle-Holocene lakes were successionalily infilled and became wetlands or ponds -- was used to justify their inclusion in this model. Wetlands and ponds, especially in low-elevation settings, have high biodiversity relative to surrounding habitats, particularly in xeric environments, and support a wide variety of traditional plant resources not associated with larger bodies of open standing water.

6.2.5 Watercourses

Four variables are also incorporated within this heading. A stream classification system was adopted for this study, based on how watercourses are recorded in TRIM: (1) primary streams and rivers, output in TRIM as two-line streams, (2) secondary streams, output as single-line

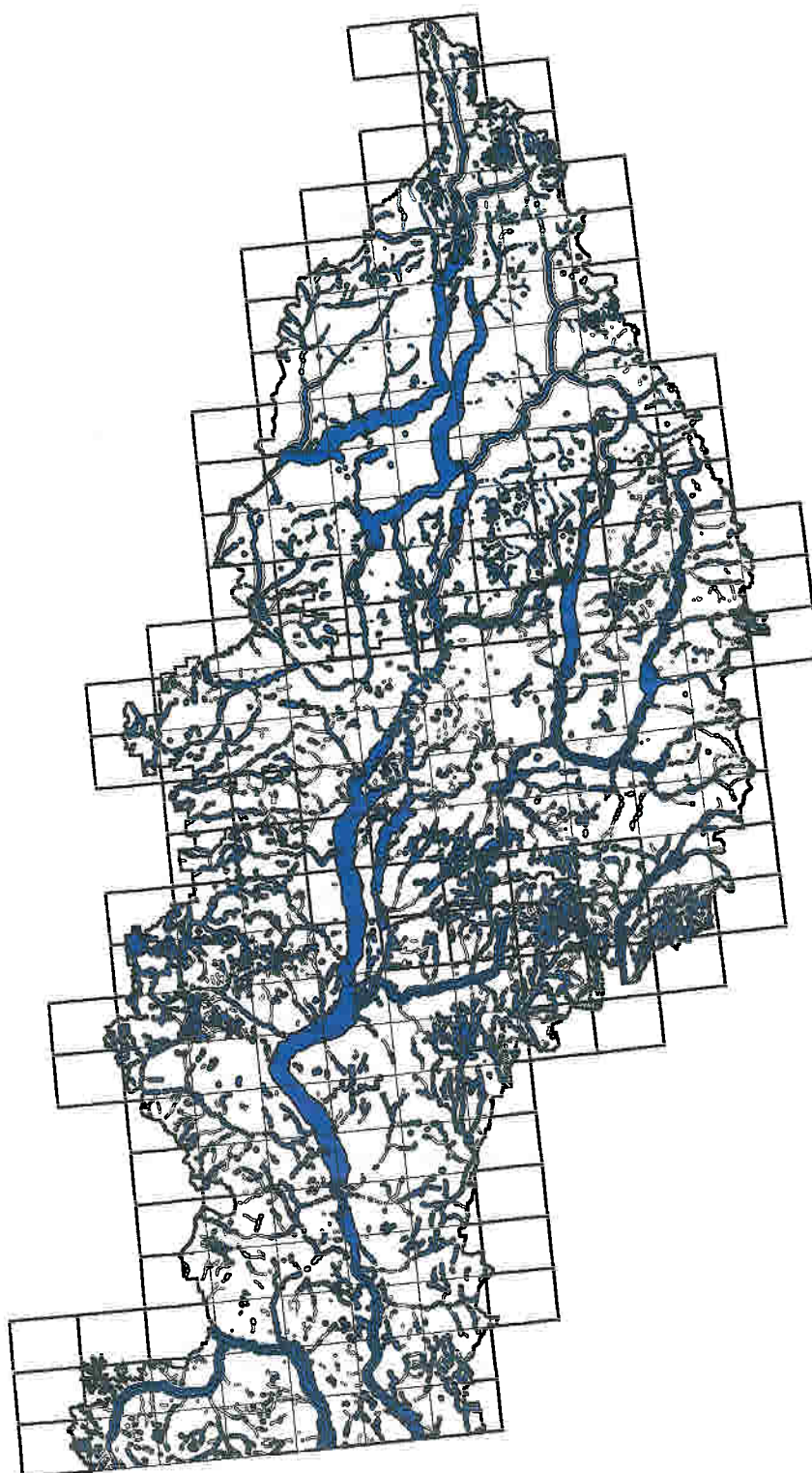


Figure 8. Distribution of WATER variables (standing water and watercourses combined).

streams, (3) intermittent and indefinite streams, ephemeral or seasonal watercourses output as dashed-line streams, and (4) springs. Displays of the primary and secondary watercourses, along with standing water features, are shown in their *buffered state* in Figure 8.

Primary streams represent rivers or reaches of rivers and major streams where both banks are distinguishable; it may be assumed that every watercourse of this category will be named. Secondary streams are slightly smaller watercourses, and may also represent the upper reaches of primary streams near their headwaters. Secondary streams are assumed to have water flow throughout the year, and nearly all streams of this class will be named. Intermittent and indefinite streams are ephemeral watercourses displayed as dashed lines, and would be periodically dry. Intermittent streams in TRIM might also represent the highest reaches of larger streams near their headwaters, and would tend to carry more water more frequently than indefinite streams; some streams of this class would be named. Indefinite streams would rarely hold any water in modern times, and only rarely would have official names. Many streams in the indefinite category may represent the channels of Pleistocene and/or early-Holocene streams, and associated sites could be of considerable antiquity. Springs do not appear to influence the locations of *documented* sites in the TSA, but they are often an important focus for non-subsistence-oriented traditional use, and as such, some types of archaeological remains could be predicted in association with springs known to First Nations people.

Watercourses influence archaeological site potential in ways generally similar to bodies of open standing water, but with a few important variations:

- potable water would almost always be available from streams and rivers;
- primary streams rarely freeze, at least in the Okanagan and Similkameen River valleys; they exercise a moderating influence on summer temperatures;
- larger rivers represent significant travel corridors; except for reaches of the Okanagan River, the lower Shuswap River, and the South Thompson River, most watercourses in the TSA are too rapid for watercraft; and
- they support a lower diversity of subsistence resources than lakes, but resources like salmon occur in very significant numbers where present; resident fish are also present in all primary and most secondary streams; game animals come to streams to drink, and some species of fur-bearing mammals are commonly associated with watercourses.

Salmon are closely associated with rivers in the Thompson - Shuswap drainage basin, and to a lesser degree in the lower Okanagan River. In some archaeological potential models, salmon-bearing waters are accorded a much higher significance than those watercourses which do not support salmon runs. This approach was rejected in this study, because it was believed that the scores assigned to both standing water and watercourse variables were sufficient to account for the importance of salmon-bearing waters. Modelling on a separate salmon stream variable would have unrealistically weighted landscapes in the Thompson - Shuswap drainage basin higher than corresponding settings in the northern part of the Okanagan Basin Ecoregion.

6.2.6 Terrain (Slope)

Figure 9 displays the distribution of the two slope categories that were used for the final version of the model. Two slope classes, based on gradients of 0-5% and 6-10%, are considered to have an important influence on archaeological site potential. In general, level to gently-sloping terrain was favoured by most First Nations people for most traditional activities of the type that would have resulted in the formation of archaeological remains. One slope class could not be operationalized due to built-in failings of the GIS software; this referred to slopes with gradients greater than 180%, intended to capture near-vertical terrain that would be suitable settings for pictographs and rockshelters to occur.

6.2.7 Miscellaneous Variables

Five variables are subsumed under this category: (1) mountain passes, (2) waterfalls, (3) fish trap or weir locations, (4) ungulate winter range, and (5) rock outcrops. Figure 10 displays the distribution of ungulate winter range coverage incorporated into the model, but the other variables occur only as point data and cannot be displayed at this scale.

Mountain passes represent locations in montane settings at middle to higher elevations where First Nations people could gain relatively easy access to neighbouring watersheds. For this reason, some passes are associated with trail networks, but many more passes were identified than trails that ran through them. Because passes represent watershed divides, there is often an area of more or less level ground associated with such locations. In subalpine settings near water, passes may be favourable sites for hunting and plant-gathering basecamps. Moreover, the summits of passes are convenient way stations for people who may have struggled up one incline or the other, and decide to set up a transitory camp to overnight. Where montane passes have been examined by archaeologists, as in the Rocky Mountains of the East Kootenays, small sites are frequently identified (W.Choquette, pers. comm., August 1978).

Like springs, waterfalls are distinctive landscape features attractive to First Nations people for a number of reasons not necessarily associated with the seasonal subsistence round. As a focus for potential ritual land use, waterfalls might be associated with transitory camps in rockshelters, pictographs, and petroform features. Although waterfall features are supposedly present as a discrete dataset in TRIM, they did not influence any documented archaeological sites within the 100 m buffer assigned to them (see Table 16).

Fish traps or weirs are cultural features constructed by First Nations people to maximize harvesting of fish -- usually salmon -- in rivers within the TSA. They represent archaeological remains that actually occur within river or stream channels, as opposed to the banks of rivers. They are rare features in this region; only one or two are recorded as archaeological sites, but some undocumented features are also known. Reaches of salmon-bearing rivers suspected to have potential for containing fish traps or weirs were drawn on the paper TRIM maps by hand and

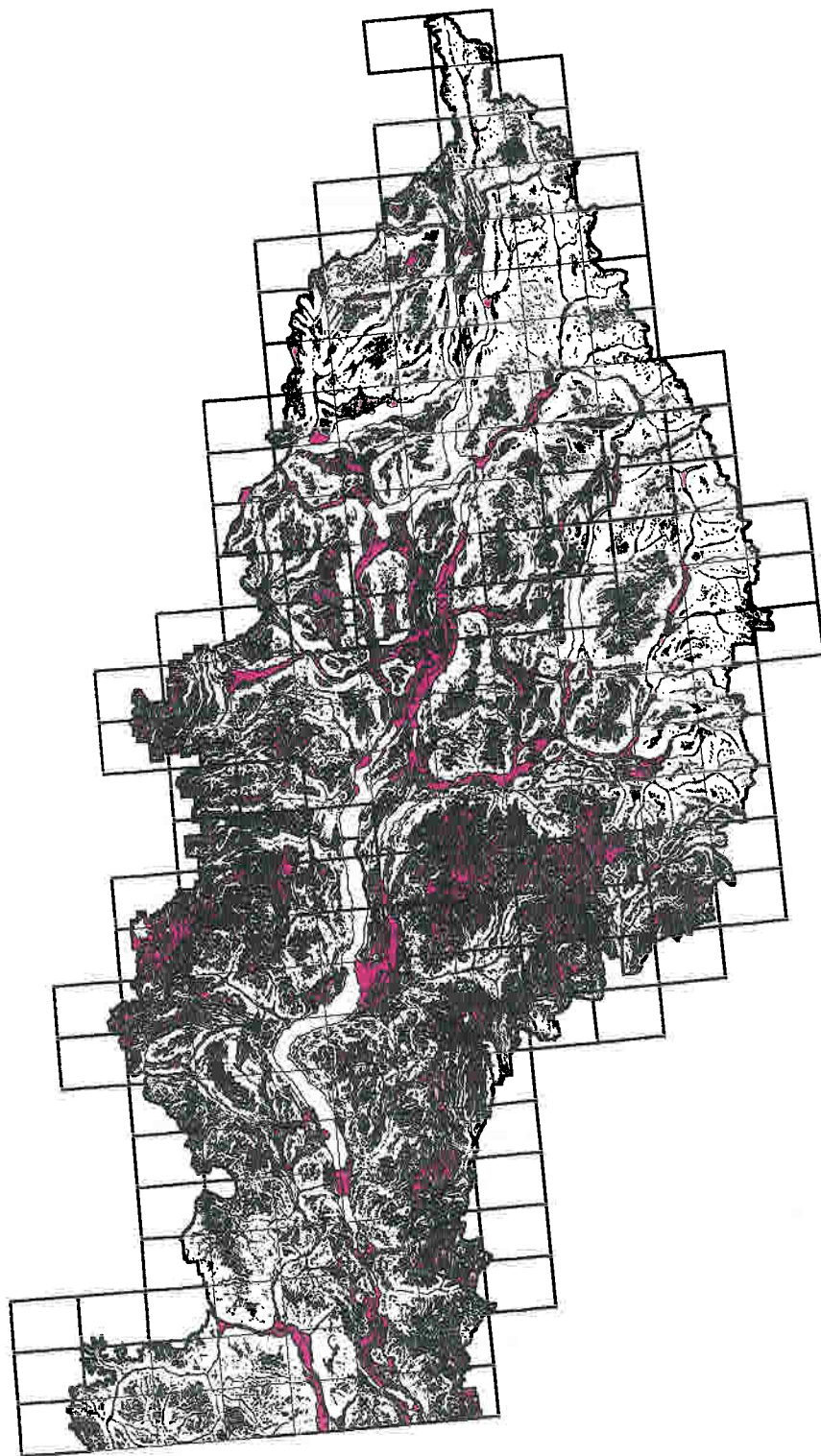


Figure 9. Distribution of TERRAIN variables (two slope categories).

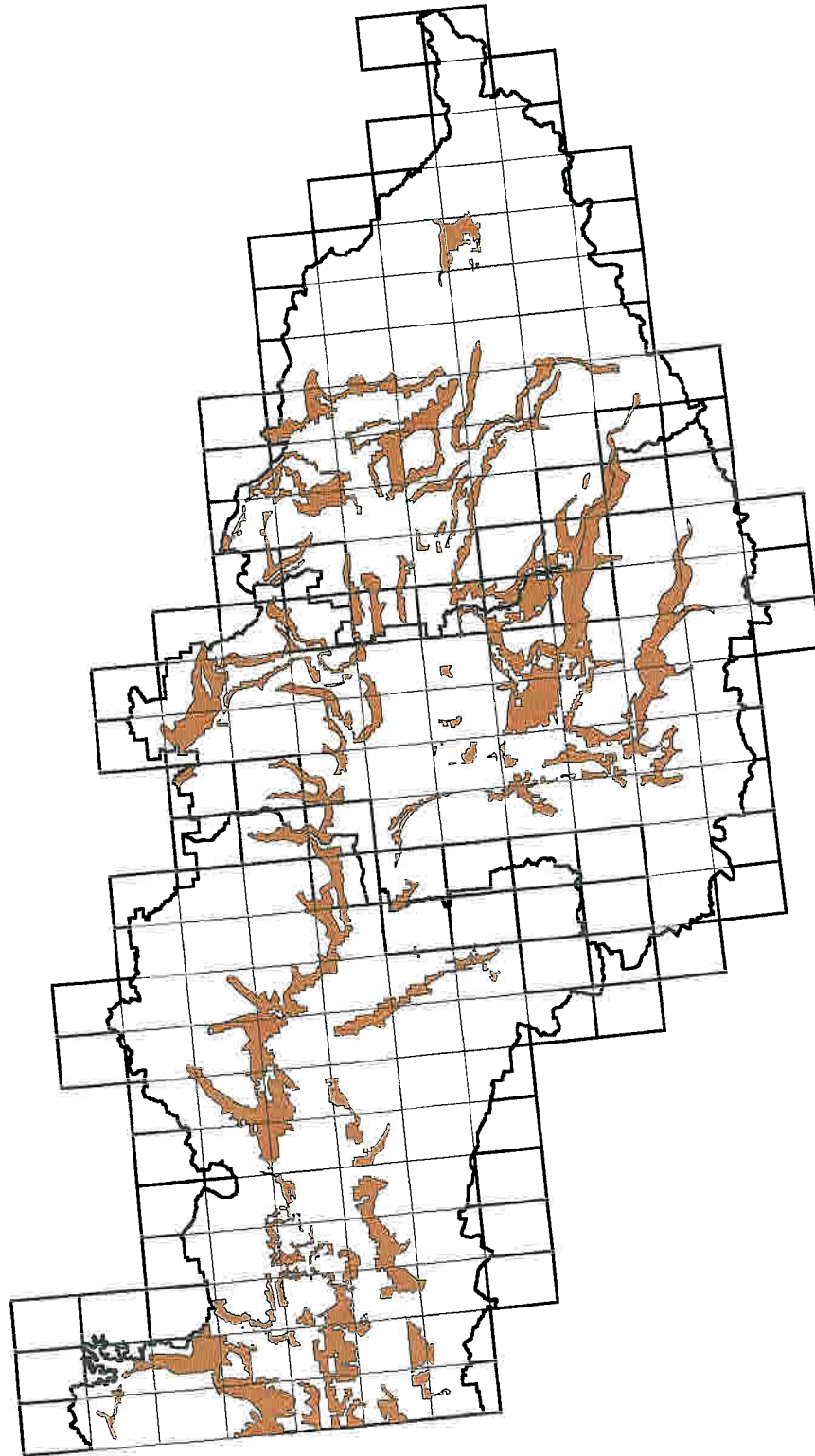


Figure 10. Distribution of UNGULATE WINTER RANGE variable.

digitized. A section of the South Thompson River downstream from Chase was selected for this variable, but because the boundary of the TSA actually ran along the left bank (south side) of the river, it did not exert any influence on archaeological potential in this locality.

Ungulate winter range is considered to influence site potential by identifying areas of the landscape where pre-Contact First Nations hunters could predict to find game during winter months. This was regarded as a particularly important variable in the northern part of the Okanagan Basin Ecosection, where no seasonal salmon runs were available. Some authorities (R. Muir, Equinox Consulting Archaeologists, pers. comm., May 1996) regard ungulate biophysical data as an unreliable indicator of archaeological site potential, because it is ahistorical and does not consider variations in species distributions that may have occurred in the past. Acknowledging this criticism, winter range data was utilized in this study because it was reckoned to be a useful modelling variable for Late Prehistoric period sites in this region. The variable coverage display shown in Figure 10 does not represent the actual distribution of land suitable for ungulate winter range in the TSA, because it was derived from digital forest cover mapping which excludes private lands in lowland settings.

The rock outcrop variable is a powerful for rock art and rockshelter potential in valley bottom and valley-wall settings; in some parts of the Okanagan and Similkameen River valleys, this variable might also be useful to predict petroform potential. Rock outcrop coverage, which was obtained from digital Forest Cover mapping, was chosen to replace the failed $>180\%$ slope variable (see Section 6.2.6). Similar to the situation encountered with ungulate winter range coverage, a significant data gap was identified with respect to the rock outcrop variable. Again, it is assumed that the rarity of rock outcrop coverage was primarily due to the fact that the Forest Cover mapping does not include private land-holdings, most of which are found in valley-bottom settings.

6.3 ASSEMBLING THE MODEL

As already mentioned, use of a GIS imposes certain limitations on the kinds of data that can be used and on the manner in which they are used. However, unlike the inductive, manual system used in most previous overview studies, ARCAS was not locked into a fixed set of decisions at the outset of modelling. Buffer widths and scores assigned to various polygon shapes can be (and were) changed repeatedly during the course of this project.

6.3.1 Establishing Buffers for Variables

The model shown in Table 14 represents the fifth version in a series that began in August 1996 (Figure 11). From the beginning, two different methods were used to determine scores that individual variables would contribute to the overall archaeological potential rating. If the feature was areal-in shape to begin with (such as a landform polygon), and the terrain contained within

it was pertinent to the model, the feature itself was assigned a score value. If a feature was areal in nature but the area it enclosed was *not* relevant to the model (a lake, for example), or, if the feature was either a point or a single line, buffers were generated outward from such features. These buffers were then assigned a score.

Buffer widths were initially determined by the background research and from previous field experience in the Okanagan and Shuswap regions. Three factors were considered:

- certain features in themselves would rate higher than others -- large lakes versus wetlands and ponds, or primary streams versus intermittent ones;
- certain features were known to have a strong association with prehistoric remains, notably aquatic features and particular landforms; and
- there is a distinct fall-off in archaeological survey coverage at distances greater than 250 m from certain features, and the buffers should reflect and encompass this fact.

Most features requiring buffering received two buffers to indicate higher potential near the feature and more moderate potential further away. STANDING WATER and WATER COURSES variables were dealt with in this way, with primary streams receiving a *third* buffer, reflecting the significance attributed to these landforms in the ethnographic record.

Archaeological sites were buffered to protect the terrain surrounding the site location -- which might contain as-yet undiscovered archaeological remains. It also helped in some instances to compensate for sites whose exact location could not be determined with reasonable confidence. In the case of trails, buffer width is based on the degree of confidence assigned to each section by the trails researcher. Where the location of a trail is well-known -- as for the H.B.C. brigade trail along Okanagan Lake -- a buffer width of 200 m was used. Where the route was less clear or only generally known, buffers of 500 m and 1000 m were used, respectively (Table 14). To compensate for vague locations, these wide buffers were not scored as highly as those for well-known trails (see Table 14).

Terrain or slope variables were treated somewhat differently. In this case, the entire Okanagan TSA was divided up into 100 m² *pixels*, and a slope calculation (rise over run) was done for each by comparing the highest and lowest elevations within them. Once these values were calculated, all slope pixels were then reclassified in ranges of 0-5%, 6-10%, 11-179%, and 180+ %. Adjacent pixels with the same slope value were then combined to form larger polygon shapes. These shapes thereby came to form three sets of slope polygons which were then scored accordingly: (1) 0 - 5% = score 2, (2) 6 - 10% = score 1, and (3) > 180% = score 2.

Once initial buffer widths for all variables had been established, one of the analytical capabilities of the GIS was used to see if these distances were effectively encompassing known sites. A function (known as NEAR) within the Arc/Info software was used to make measure the distance from the site to the nearest terrain feature in a particular class. The results are summarised on the histograms presented in Figure 5. It should be noted that for most of these variables the entire site universe (n=955) was not required in the analysis. A distance of 2000 m was

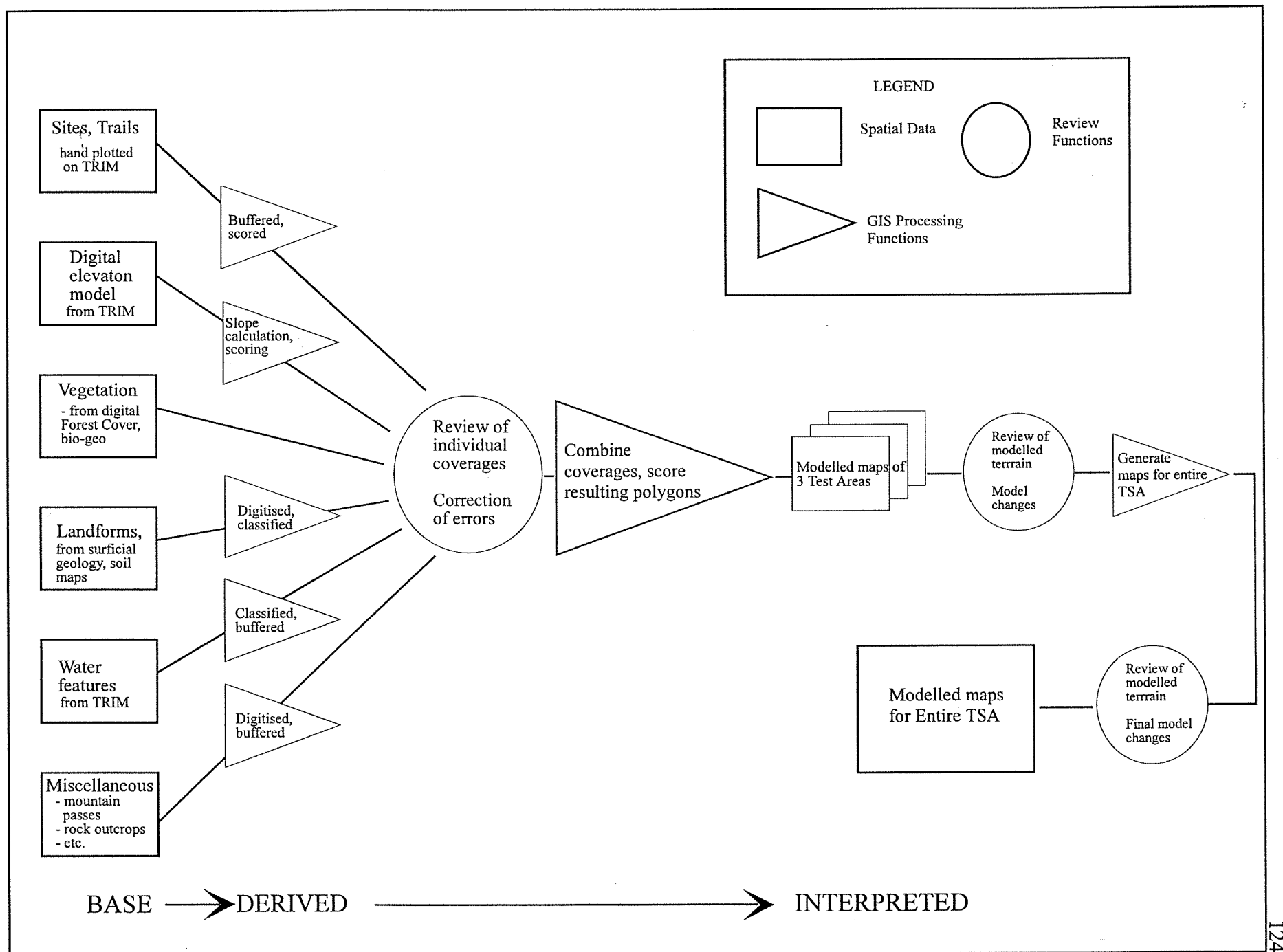


Figure 11: Okanagan TSA Modelling Flow Diagram.

chosen as a typical distance beyond which the influence of the particular variable on the site became suspect. This can be seen in the shapes of the histograms where the number of sites tails off significantly as distance increases. Large lakes, for example, are only relevant (i.e., within 2000 m) to the location of 401 sites. As shown by the histograms (Figure 5), a buffer of 250 m around the selected feature was quite effective in capturing known site locations. In practically every case (the exception being small lakes), at least 50% of known sites fall within a 500 m buffer.

These individual displays helped to determine the effectiveness of various buffer widths and pointed to situations where a widening or a narrowing was necessary. This knowledge was fed back into the model development process.

6.3.2 Assigning Values to Variables and Buffers

The next stage in the modelling process was to determine how particular variables should contribute to the score for archaeological potential. Again, the same system of progressive experimentation adopted for assigning buffer widths was used; an initial set of score values was given to each areal shape, whether buffer or polygon feature. These were subsequently assessed and, if necessary, changed. The initial score values were again based on the background research and the investigators' sense of how critical the variables were for establishing archaeological potential. Table 14 shows the final scoring scheme. In the case of buffered variables, the narrowest buffer receives a score of its own plus the score of any outer buffer that may be present. For example, with the Large Lake variable the total score for the innermost (i.e., to 250 m) buffer is 3, the product of its own score (2) and the 1 assigned to the outer buffer (i.e., to 500 m). In other words, the buffers overlay each other and are additive. The polygon variables received a single score, dependant on their perceived importance for archaeological potential. As with the buffer widths, these scores were amended a number of times throughout the various review stages.

6.4 COVERAGE DISPLAYS

Before the buffering and scoring process was applied, it was necessary to ensure that the selected variables were being accurately stored in the GIS. Each variable, sometimes in combination with others, was displayed on a paper mapped output. For some variables (lakes and streams for example), this was done for the entire Okanagan TSA. This provided an opportunity to detect any problems before modelling of the complete area commenced.

As a result of this review, the following problems were identified and, where possible, adjustments were made. Some issues, however, remain as gaps in the data, and are discussed further in Section 7.0.

- Because many smaller lake features were connected by double-lined streams, they were being erroneously classified as part of a larger lake; for example, Mara Lake - Shuswap Lake, in which the former is a medium lake connected to a large lake by Sicamous Narrows. These connections were clipped in the GIS where identified.
- Some intermittent or ephemeral lake features were recorded on the TRIM base maps as having indefinite shorelines and were not appearing as features on the maps. The Data Centre (Penticton Forest District) had to re-digitize the linework for these features.
- Some watercourses with both banks present (i.e., double-lined rivers) were initially shown as lake features. These were reclassified in the GIS.
- Some channelized streams, classified as ditches on the TRIM base maps, were excluded in the initial coverage test plot.
- A number of plotting errors were associated with the first version of the trails network, particularly at the edges of TRIM sheets. Extensive manual corrections were required to correct these errors.
- The initial modelling of the slope variable was too detailed (i.e., 10 m² pixels), which made processing too difficult; the pixel size was increased to 100 m².
- Problems were encountered in determining slope values greater than 180%; in fact, this problem was never satisfactorily resolved.
- The digital forest cover data was not effective in displaying alpine environments. The problem was resolved by switching to biogeoclimatic zonal mapping.
- The digital forest cover data did not include lands under Tree Farm License tenure, nor did it contain provincial parkland or private land-holdings. Some TFL data became available towards the end of the study. This particular problem was the source of the most egregious data gaps, since forest stand characteristics, wetlands, rock outcrops, and ungulate winter range variables were all to be derived from this dataset.

6.5 INITIAL MODEL DISPLAYS OF TEST AREAS

The three test areas that had been previously selected (see Section 5.6.3) permitted a manageable review of the preliminary operationalization of the model. Not only did they provide a close-up view of the results, at a reasonably large scale (1:40,000), they also made computer processing tasks less onerous due to the lower volume of data involved.

These outputs were used in much the same way as the variable coverage displays discussed in the previous section. Both the amount and type of terrain encompassed by the model variables, and the model's ability to capture known sites, were evaluated. It was also possible to assess the initial attempt at assigning grades of potential within the model. Although the precise manner in which the underlying variables had contributed to the assessment was not then available, it was still possible to obtain a good sense of this from the paper maps.

A secondary role for these maps was to provide the information to guide a short field-testing exercise of the model. This ground-truthing component was carried out in November with a windshield survey of terrain features in the Vernon and Penticton Forest Districts. Although by no means a thorough survey, it provided useful feedback into the model review process, particularly for ensuring that benchlands were included either within lake buffers or under the slope categories.

6.6 COMPLETE MODELLING OF THE ENTIRE TSA

6.6.1 Test Outputs and Review

By the end of December 1996, understanding of the variable coverages and the modelling process had progressed to the point where the site potential model could be applied to the entire TSA. Based on the reviews of the plots that were output for the test areas, a number of changes were instituted. For the most part, these involved changes to buffers and variable scores, and the inputting of new and updated data (such as landforms for the entire study area, a corrected trails dataset, and the montane passes variable which had not been available until this point).

Initially, it was decided to print the modelled output in the form of three Action Categories reflecting the archaeological potential of the terrain. This system was chosen in consideration of the primary function of the site potential model, which was intended for operational decisions about land-altering developments and their possible impact on archaeological resources. Essentially, the selected categories determined whether **No Further Action**, a **Field Reconnaissance**, or an **Archaeological Impact Assessment** should be required as part of the regulatory requirements for a land-altering development in a particular location, based on its modelled site potential. At the request of the Archaeology Branch and the Ministry of Forests, this scheme was not adopted for the final version of the model, as these authorities believed the purpose of the study was to provide information for resource management decision making.

The sheer volume of data represented a significant drawback when reviewing modelled output for an area as extensive as that encompassed by the Okanagan TSA. This issue was resolved in two ways. Hard copies of paper map output were produced at a scale of 1:150,000, which provided each Forest District with an operational tool that displayed (in gross form) the impact of model application. These outputs are not suitable, however, for detailed review. Enquiries as to why particular locations were scored the way they were cannot be addressed at this scale. This

problem was solved by exporting all necessary map files onto CD-ROM, where it was possible to review them using an Arc/INFO-related, PC-based software called ArcView. In this way, ARCAS was able to check individual coverages and to zoom in on specific locations to see how effectively the model was working.

During this final review interval, input was received from Ministry of Forests staff in the Penticton and Salmon Arm Districts. Their concerns can be summarized as follows:

- Glaciers in alpine settings of the Salmon Arm District were being shown as medium-potential lands. This was determined to be a byproduct of low slope values and the presence of the subalpine - alpine biogeoclimatic zone coverage. Although unlikely to impact future forestry operations, it did call into question the integrity of the model, and glacier features were consequently clipped from the final version of the model.
- Concern was expressed over the designation of a considerable area of high elevation lands that required impact assessments. Similar to the previous point, extensive areas of level to gently-sloping mountain-top and ridge-crest terrain primarily account for this distribution, but this aspect of the model was not modified, because subalpine - alpine settings in the TSA have already been shown to contain archaeological remains.
- The Salmon Arm reviewers also questioned whether the buffer widths and scores were sufficient around large and medium lakes and rivers. Adjustments were made accordingly.
- A question was raised by the Penticton Forest District over the inclusion of old-growth lodgepole pine stands as a model variable. Skepticism was expressed that there was any evidence for past First Nations use of this resource, and whether the forest stands selected by the model actually contained specimens old enough to warrant inclusion. Some of the requirements for inclusion of this variable (see Table 14 - Secondary Criteria) were reduced, from 1000 m to 500 m from a watercourse or trail, and the overall score value was decreased.
- The **Action Categories** from the map legend were changed to a more neutral four-level classification structure. It was argued that resource management decisions are the responsibility of the Forest District Managers or the Archaeology Branch.

The final review stage involved separate meetings in Penticton, first with members of the Steering Committee on February 25, 1997 and with the District Forest Managers on February 26, 1997. Lastly, a meeting was held in Westbank on February 26, 1997, with representatives of some Okanagan First Nation communities. These meetings represented occasions to present draft mapped outputs for clients and interested parties. They also provided opportunity to receive guidance on various management and post-project issues. Minor changes to some model scoring were recommended, and an action sequence was designed to illustrate the approval process for future land-altering developments.

6.6.2 Model Results

The primary outputs from running the model are maps showing four classes of archaeological potential. In CD-ROM form, this material represents a source of data to be used for decision-making for future development projects within the Okanagan TSA. These data on the CD-ROM should also help to assess the impact and effectiveness of the model in general, and of the performance of the model variables in particular. Tables 15 and 16 summarize some of this information.

Table 15. Site and Forest District Breakdown by Potential Class				
Forest District	Archaeological Potential Class	Known Site Locations	Area of the Forest District (ha)	Ratio (Sites per Square km)
Penticton	1	25 (4.2%)	521,679 (56.0%)	0.0050
	2	21(3.5%)	170,452 (18.3%)	0.0120
	3	116 (19.5%)	140,969 (15.0%)	0.0800
	4	433 (73.0%)	98,188 (10.5%)	0.8000
Vernon	1	4 (2.4%)	503,385 (62.0%)	0.0008
	2	16 (13.3%)	109,035 (13.4%)	0.0150
	3	42 (26.0%)	122,866 (15.0%)	0.0340
	4	100 (62.0%)	79,899 (9.8%)	0.1300
Salmon Arm	1	3 (1.5%)	470,723 (67.0%)	0.0006
	2	22 (11.0%)	101,507 (14.5%)	0.0200
	3	45 (22.7%)	76,914 (11.0%)	0.0600
	4	128 (65.0%)	53,018 (7.5%)	0.2400
Percentages are of the number of sites or amount of area within each class, within each Forest District.				

The classification system can be described as follows:

- **Class 1:** Lands in this class are considered to have little potential for having supported the types of traditional land use that would have resulted in the formation of archaeological remains.
- **Class 2:** This class of lands is considered to have low-to-moderate potential for containing archaeological remains. Only one or two relatively weak variables are usually being modelled in Class 2 lands.

- **Class 3:** Lands in this class are considered to have moderate-to-high potential for containing archaeological remains. Up to three model variables are being modelled in these lands.
- **Class 4:** Lands in this class are considered to have high potential for having supported the types of traditional land use that would have resulted in the formation of archaeological remains. Four or more variables are usually being modelled, but there is technically no limit to the number of variables that might be modelled in Class 4 lands.

Table 15 shows both the extent of the model's impact on lands within the three Forest Districts of the TSA, as well as its ability to capture known site locations in the various archaeological potential categories. The amount of territory falling within areas of medium to high potential (Class 2 - 4) ranges from 44 % (Penticton District) to 33 % (Salmon Arm). For all three Districts, an inclusion rate of greater than 95% was achieved for site locations in the medium to high range. This rate is consistent with previous results of overview and assessment projects (e.g., Antiquus Archaeological Consultants - Arcas Archeological Consultants 1996). Archaeological sites falling within the low potential category (Class 1 lands) were reviewed in detail to determine why they were not within modelled terrain. This review showed that non-captured sites were dominated by pictographs that were not being captured because of data gaps (i.e., modelling problems with calculating slope or showing rock outcrops in lowland settings). The only consistent anomalies were historical sites, which often do not conform to the traditional settlement patterns the model was designed to reflect.

A further point demonstrated by Table 15 is the high frequency of site inclusion in the highest site potential category (Class 4), from 65 % (Salmon Arm District) to 73 % (Penticton), with an overall rate of 71 % capture.

Table 16 illustrates the performance of the variables used to model the Okanagan TSA. Every actual archaeological site location was checked to determine which variables were contributing to the scoring of potential at those locations. As had been anticipated, various water features played a strong role in establishing potential. If the three distinct lake variables are collapsed into one, 57% of all sites in the Okanagan TSA are in close enough proximity to be included within a lake buffer. The other powerful variables were landforms (44.4%) and slope (43.3%). The second factor shown in this table identifies gaps in data coverages for some variables. It is estimated that over 90% of all sites would fall within the area encompassed by ungulate winter range if coverage for this variable was extended to include privately held lands. The forest stand and biogeoclimatic variables also illustrate an interesting data gap, this one in the area of archaeological survey. Cathedral Provincial Park (Okanagan Range, Penticton District) represents the only case in the entire TSA where alpine settings have been surveyed for archaeological remains, resulting in the identification of 11 prehistoric sites (Vivian 1989b).

Table 16. Sites Impacted by Archaeological Potential Model Variables.

AOA Category	Variable	Forest Districts									Entire TSA		
		Penticton			Vernon			Salmon Arm					
		No impact	Impact	%	No impact	Impact	%	No impact	Impact	%	No impact	Impact	%
VEGETATION	Red cedar	595	0	0.0	162	0	0.0	193	5	0.0	950	5	0.5
	Lodgepole pine	586	9	1.5	162	0	0.0	198	0	0.0	946	9	0.9
	Subalpine/Alpine	584	11	1.9	162	0	0.0	198	0	0.0	944	11	1.2
LANDFORM	Landform	275	320	53.8	72	90	55.6	184	14	7.1	531	424	44.4
STANDING WATER	Large lake	428	167	28.1	74	88	54.3	115	83	41.9	617	338	35.4
	Medium lake	551	44	7.4	145	17	10.5	175	23	11.6	871	84	8.8
	Small lake	506	89	15.0	159	3	1.9	184	14	7.1	833	122	12.8
	Wetlands	580	15	2.5	158	4	2.5	190	8	4.0	929	26	2.7
WATER COURSES	Primary stream	464	131	22.0	142	20	12.4	91	107	54.0	697	258	27.0
	Secondary stream	328	267	44.9	106	56	34.6	142	56	28.3	576	379	39.7
	Intermittent stream	424	171	28.7	122	40	2.7	139	59	29.8	685	270	28.3
TERRAIN	Slope	372	223	37.5	93	69	42.6	77	121	61.1	542	413	43.3
MISCELLANEOUS	Mountain Pass	595	0	0.0	158	4	2.5	184	14	7.1	937	18	1.9
	Waterfall	595	0	0.0	162	0	0.0	198	0	0.0	955	0	0.0
	Ungulate winter range	521	74	12.4	153	9	5.6	174	24	12.1	848	107	11.2

7.0 DATA GAPS

To facilitate resource management and land use decision making, it is important to be able to assess zones of archaeological potential with reasonable certainty. Crucial to the development of a robust archaeological potential model is the availability of good mapped representations of archaeological site locations and of the various landscape elements required by the model. Information used to build the model should come from all parts of the study area, and should not be biased towards certain types of archaeological or environmental data. Furthermore, the information should be complete, accurate, and current.

This overview of the present state of knowledge about the distribution of archaeological sites and environmental variables in the Okanagan TSA identified five areas where gaps occurred which impacted on the effectiveness of the model for archaeological potential. Each presented particular problems for the modelling process; some were resolved during the project, others remain as issues to be addressed in future studies of this nature. These are: (1) incomplete geographic coverage in the existing archaeological site inventory, (2) emphasis on particular types of sites in the inventory, (3) limited information on past environments, (4) problems with the digitized map coverages, and (5) the lack of participation by First Nations in the study. Each of these data gaps is briefly discussed below. A set of recommended actions is also included.

7.1 ARCHAEOLOGICAL SITE INVENTORY COVERAGE

Most archaeological surveys in the Okanagan TSA have been initiated as part of impact assessments for proposed land developments. Most of these assessments have focused on valley-bottom and lakeshore settings, where most settlement and development are concentrated. Secondary streams and minor lakes have received some (but inconsistent) inventory coverage, whereas the coverage of montane environments is virtually non-existent. Consequently, archaeological sites not associated with primary streams and valley-bottom lakes are conspicuously rare in the current site inventory. This is particularly true for subalpine parkland and alpine settings, and montane passes, many of which will have considerable archaeological potential. Uneven geographic coverage made it hard to evaluate trial applications of the site potential model to locations without recorded archaeological sites.

As somewhat of an aside, by opting to use the TRIM digital maps for the base mapping, a conflict in scale arose between these map datasets and the digital site location files supplied by the Archaeology Branch. Since the Branch's data is based on 1:50,000-scale (NTS) mapping, it was decided that re-plotting the sites onto paper TRIM map sheets would be preferable. This placed the sites on maps with the same scale as the base mapping and provided an opportunity to check the locations with a combination of individual site maps, CHIN site records, and the Archaeology Branch NTS maps. By way of example, most of the earliest recorded sites in the region were very crudely plotted on hand-drawn, small-scale maps. During this review process, 43 sites on the

1:50,000 NTS maps were determined to be plotted in error. A report will be forwarded to the Archaeology Branch describing these locational problems. In consideration of this variable quality in site plotting accuracy, it was decided that a 250 m buffer be placed around all known site locations as a means of correcting potential discrepancies.

A major disappointment in this study relates to the futile attempt to plot historical and so-called anecdotal sites (see Section 5.4). Although not specifically part of the study requirements, it was hoped that a adequately-documented inventory of such locations could be used to enhance the broader planning and heritage management capabilities of the Overview.

7.2 SITE TYPE COVERAGE

Specific archaeological site types were not intended to play a direct role in the site potential modelling. However, site types were considered, when it was discovered that some sites fell outside areas modelled as showing potential. Typically, such sites were either pictographs or historic sites, and confirmed a known problem with the data in the GIS (see Section 6.6.2 and Section 7.4), specifically with the inability to model cliff-face settings.

While not a grievous problem for the overview, the rarity of particular site types within the Okanagan TSA could hinder future applications of the potential model. Most of the archaeological surveys carried out in the study area have been non-systematic in method, and focused either on high-visibility site types such as pithouse villages, or on high potential locations with a restricted range of site types. Types of archaeological resources that could reasonably be expected but which have been infrequently or never recorded include: petroglyphs; lithic resource quarries; defensive sites (fortifications); culturally modified trees (primarily lodgepole pine and other trees stripped for cambium); transitory resource-harvesting camps distant from the principal rivers and lakes; and Early Prehistoric sites associated with ancient landforms such as glacial lake margins.

7.3 PALAEOENVIRONMENTAL INFORMATION

While not actually a gap in *archaeological* information, the scarcity of materials on past environments in the study area presents a major barrier to the understanding of how people may lived on the land in the distant past. This, in turn, limits an ability to assess archaeological site potential for prehistoric periods when environmental conditions were substantially different than have prevailed over the last 200 years. Studies in the Kootenays and other parts of the B.C. Interior suggest that prehistoric human adaptations to such conditions may have been very different from the situation recorded at the time of Contact. It can be assumed that such variations also occurred in the Okanagan TSA, and the spotty coverage of palaeoenvironmental research in the region represents a significant gap in the data required to model Early Prehistoric settlement patterns and to predict the archaeological potential for early sites.

7.4 DIGITIZED MAP COVERAGES.

Data gaps were encountered in three sets of the pre-digitized coverages used in the overview assessment. They are discussed individually.

7.4.1 TRIM Base Maps

Three discrete problems with these maps were identified by Tim Bouwmeester, GIS analyst with the Data Centre (Ministry of Forests, Penticton):

- Water courses had been placed in an incorrect feature class on a number of digitized map sheets within the Penticton Forest District; instead of a natural mix of intermittent and secondary streams, all had been coded as secondary. For these areas, only secondary streams contribute to the potential modelling, which may have inflated the results slightly.
- Two landscape features, wetlands and ephemeral lakes with fluctuating shorelines, were recorded as *cartographic* features only; that is, there was no associated linework that could be used in the analysis. Although it was possible for Ministry of Forests staff to redraw boundaries for the limited number of ephemeral lake features, the very large inventory of wetlands in TRIM had to be ignored. Some wetland features were obtained from the digital forest cover mapping, but this was only possible for Crown Lands (see Section 7.3.2).
- Breakline features, often used to indicate cliff faces or cultural features that artificially break slope contours (road cuts, for example), were incorrectly coded in the TRIM datasets, making it impossible to calculate the high slope values ($> 180\%$). Some data on rock outcrops was available from the digital forest coverage, but again only for Crown Lands. Modelling for pictograph sites remains a persistent problem.

7.4.2 Digital Forest Cover

These datasets were provided by the Ministry of Forests, but proved to incorporate the most problematic gaps for this study. The primary reason for this was that forest cover mapping does not include lands under private ownership, most provincial [and federal, where applicable] park lands, and Tree Farm Licences. As a result, coverage for nearly all valley-bottom settings was cut off throughout the Okanagan TSA. These gaps were most seriously felt in the case of wetland and rock outcrops coverage. The forest stand characteristics used in the model were not affected as strongly, since most of the stand types selected were situated away from valley-bottom locations or were configured to areas where little or no private lands were present. Absence of forest cover information for provincial parks, however, remained a problem that cannot be resolved at present.

A possible data gap in the forest cover mapping with implications that were not fully explored during this study, relates to the validity of the information in the stand label. Anecdotal information indicates that there may be serious problems with interpretation of forest inventory data. Ministry of Forests personnel pointed out that care must be taken when reading these labels (L. Sapinsky, Salmon Arm Forest District, pers. comm., October 1996). If western red cedar is the species being used for modelling and it is recorded as the leading species (e.g., CH stands), the age-class may be considered trustworthy. However, if it is the second species (e.g., FC stands) -- indicating that it may represent as little as 20% of the stand -- the age-class applies only to the *leading* species, in this case Douglas-fir, which *may not* be valid for the cedar. This is especially problematic with stands where Douglas-fir or western larch are the leading tree types, but less so in the case of western hemlock-leading stands. According to Ms. Sapinsky, ongoing research is being carried out to establish how reliable age-class data is in various settings. For the present, this data should be treated with caution.

For the purposes of the present study, any forest stand with an inventory label showing a 20% or greater red cedar or lodgepole pine presence was included as a modelled polygon (so long as it met the other inclusion requirements). This decision was based on advice from Ross Porcheron, (Penticton Data Centre, pers. comm., 1996).

7.4.3 Ungulate Winter Range Coverage

Although ungulate habitat maps used to be available in paper form from MAPS-BC, a digitized version of the ungulate winter range was available from Ministry of Forests and was used instead. As with other forest cover mapping, this coverage did not include provincial park lands, Tree Farm Licenses, or private lands. It is suspected that as many as 90% of the known archaeological sites in the TSA would have been influenced by this coverage had it been complete.

7.5 FIRST NATIONS PARTICIPATION

As described in Section 5.2, a number of initiatives were undertaken through the life of the project to try and stimulate First Nations' involvement in the development of the archaeological potential model. The general consensus expressed among First Nations people present at the various meetings, however, was that these approaches were of a too little, too late nature and that their communities should have been involved in the Overview prior to preparation of the original Request for Proposals. Lack of First Nations' participation represented a significant limitation to the overview research, because it denied access to unrecorded archaeological site locations known to First Nations people, and also local knowledge of trail routes that would not have been available to the trails researcher.

7.6 ADDRESSING DATA GAPS

To address the data gaps identified during the overview research, it is recommended that:

- (1) Geographic coverage for biogeoclimatic and terrain variables be extended to include all Tree Farm Licence tenures, provincial parklands, and private lands within the Okanagan TSA. In archaeological modelling exercises, a primary goal is to simulate, as closely as possible, the landscape as it was prior to European contact. The various tenure issues encountered during this assessment created numerous difficulties during the modelling.
- (2) The techniques used to calculate slope in a GIS should be reviewed and better standards should be developed; a number of issues were identified:
 - test whether degrees of slope are preferable to slope percentages;
 - compare grid-based slope calculation to a Triangulated Irregular Network (TIN) structure;
 - ensure that the density of digital elevation points is sufficient for the calculation in a grid-based structure; and
 - ensure that data errors in the TRIM base map system do not interfere with the slope calculation -- erroneously coded breakline features in the TRIM datasets made slope calculation impossible for settings > 180%.
- (3) The Ministry of the Environment should be informed of problems and errors encountered with the TRIM base map system used by this study.
- (4) In consideration of the potentially enormous datasets generated by nearly all GIS-based archaeological overview assessments, data management issues must be investigated. In the present study an attempt to produce a single map covering the entire TSA proved impractical, because the entire 1.6 gigabyte hard drive of the computer was required to store it. The use of map libraries, as a means of providing more manageable map layers and files, should be explored (Environmental Systems Research Institute 1996).
- (5) Personnel working with the GIS should make every effort to communicate to the non-technical team members any problems in the approaches to capturing and analysing the data. If tasks prove to be impractical or too costly for implementation in the GIS, alternatives or work-arounds must be presented.
- (6) The Archaeology Branch should review the use of digital site locations produced by GIS-based archaeological overviews, to correct their digital 1:50,000 NTS records. This will entail comparing locational co-ordinates of the two datasets and deciding the

efficacy of re-plotting sites, as done in the present study, as a potential standard requirement for future archaeological overview assessments

- (7) Archaeological inventory surveys should be conducted to test the model presented here, to address three gaps in the archaeological record: (i) the rarity of site surveys in certain landscapes, some of which are rated as having high archaeological potential on the output maps; (ii) the uncertainty whether known sites in the Okanagan TSA reflect real-world distributions in this region, particularly as they relate to particular environmental units, and (iii) the veracity of apparent distinctions between the Thompson - Shuswap and Okanagan - Similkameen drainage basins, in terms of site distributions and/or settlement patterns.

Gaps in the site inventory in the TSA should be addressed by archaeological inventory surveys configured to environmental units. The Ecoregion/Ecosection system developed by the Ministry of Environment, Lands and Parks (MoELP) is considered to be more manageable than the biogeoclimatic system of the Ministry of Forests, because the MoELP system is based on larger classification units than the fine-grained MoF biogeoclimatic subzones (and variants), which are widely scattered in hundreds, if not thousands, of tiny habitat polygons. Conversely, the major biogeoclimatic units (e.g., Bunchgrass Zone, Ponderosa Pine Zone) are too gross to be of any analytical use for assessing pre-Contact environmental preferences in the archaeological record.

As described in Section 4.2.3 (Table 8), the Okanagan Basin is the best-known Ecosection in the TSA, while predominantly montane Ecosections or Ecoregions are the least-known. Future archaeological site inventory studies should focus first upon poorly-surveyed Ecosections. Probabilistic quadrat or systematic transect surveys of discrete watersheds (or portions of larger watersheds) would probably be the preferred research strategy, with the assumption that one watershed in a given locality is probably representative of most others.

A second phase of site inventory research is recommended to increase understanding of under-represented environmental settings within well-known Ecosections. Thus, mid-elevation benchlands and the Okanagan River between Osoyoos Lake and McIntyre Bluff represent poorly-understood segments of the otherwise well-surveyed Okanagan Basin Ecosection. Similarly, although the lower Shuswap River have been thoroughly surveyed, the upper reaches of the river above Mabel Lake has never been surveyed in detail. As a third example, mid-elevation small lakes in plateau settings throughout the TSA are not well-known, whatever Ecosection they are within, despite the fact that some sites are associated with almost every lake where surveys have taken place. For this phase of site inventory, it is recommended that a stratified sample of particular settings be selected. Chosen locations could probably be surveyed by simple judgemental traverses or transect interval testing.

It is recommended that the existing potential model be used to guide selection of locations for site inventory surveys, but it is important to include at least a minimal sample of Class 1 terrain for examination during such a project, to verify the assumptions that classified such lands as having low archaeological potential.

8.0 APPLICATION OF OVERVIEW RESULTS

In this section, proposed applications of the overview results are discussed. This discussion reviews archaeological site protection and the management of archaeological sites in British Columbia, and proposes a relationship between archaeological site potential and site management, in the form of recommendations for potential management actions in response to proposed developments in the Okanagan TSA. Lastly, this section contains several recommendations for the continued updating of this overview.

8.1 ARCHAEOLOGICAL SITE PROTECTION

Archaeological sites are protected under the *Heritage Conservation Act* (1994), which is administered by the Archaeology Branch (Ministry of Small Business, Tourism and Culture - MSBTC). Provisions of the *Act* apply whether archaeological sites are located on public or private lands. Archaeological sites are protected through designation as Provincial heritage sites under section 4 of the *Act*, or through automatic protection under section 6 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 6 of the *Heritage Conservation Act*, without a Permit issued by the Minister or designate under sections 5 or 7, or an order issued under section 7, of the *Act*. The *Act* affords considerable discretionary authority in determining if, and under what circumstances, such Permits are to be issued.

8.2 ARCHAEOLOGICAL SITE MANAGEMENT

The management of archaeological sites 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 site impact management is shared by the MSBTC and the Ministry of Forests. 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 sites. 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 sites and other cultural heritage resources into management plans and operations. 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 sites, 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 determines the potential for archaeological sites in a location proposed for development or for resource planning. The AOA is intended to predict archaeological site locations and guide subsequent impact assessment studies. AOAs can be undertaken for large planning areas, such as the Okanagan TSA, or for small development locations such as a proposed subdivision or new road alignment. AOAs for specific developments usually involve a review of detailed topographic, forest cover, and other kinds of maps; an examination of aerial photographs; documentary research; and consultation with individuals or organizations with knowledge of the archaeological sites of the area. In addition, an AOA may include some field work to assist with the assessment of archaeological site potential. In this report, these various AOA activities collectively are referred to as a Reconnaissance Assessment (see below).

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 about equally frequently is ordered without an overview being conducted, especially in locations perceived as having high site potential. An AIA usually addresses the full range of archaeological site types possible in a development area. An AIA includes an archaeological site inventory of the development area through a field survey (examination) of all or part of the area, evaluation of the significance of any archaeological sites present, assessment of potential impacts to sites 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 remains are present.

Impact management (AIM) involves the implementation of measures to manage adverse impacts to archaeological sites. Usually these measures are intended to avoid or reduce impacts. Other impact management options include data recovery through excavation, tree-ring dating of culturally modified trees, and monitoring of construction activities. Lastly, surveillance of development activities is sometimes ordered to ensure correct implementation of mitigative recommendations.

8.3 ARCHAEOLOGICAL SITE POTENTIAL AND RESOURCE MANAGEMENT

The overview assessed the archaeological site potential of the Okanagan TSA. This assessment took into account the location of recorded archaeological sites and the potential for as-yet undiscovered archaeological sites. The assessment results are presented in terms of four classes of archaeological site potential: Class 1 (low site potential), Class 2 (low-to-medium site potential), Class 3 (medium-to-high site potential), and Class 4 (high site potential). These were defined in Section 6.6.2. The classes are mapped digitally across the entire TSA, and are available in the form of digital files or paper maps (at a scale of 1:150,000) from the Inventory and Mapping Section of the Archaeology Branch in Victoria.

All proposed land-altering developments, should be reviewed to determine if any archaeological studies are required under the Archaeological Impact Assessment and Review Process (see above). Figure 12 illustrates how the results of the overview can be used in this review.

Digital or paper maps are needed for this review. First, the development area should be located on the appropriate archaeological site potential map. Then, the archaeological site potential of the development area should be determined, using the four classes on the maps. Use the flow chart (i.e., Figure 12) to determine the recommended management action. Begin with Step 1 in the upper left corner, and follow the decision-making process. If the development area contains land of more than one class of site potential, the highest value should be used for the review.

Figure 12 identifies three possible management actions in response to a proposed development: (1) no action, (2) reconnaissance assessment, and (3) AIA. No further action is an appropriate response to developments planned on lands with low archaeological site potential (Class 1). A reconnaissance assessment is recommended for developments on lands with low-to-medium and medium-to-high site potential (Classes 2 and 3), whereas an AIA is recommended for developments on lands with high site potential (Class 4).

As suggested above, a reconnaissance assessment can consist of a variety of activities. The main purpose of the reconnaissance is to fine tune the archaeological site potential assessment for the development area, using detailed information that was not practical or available for use in model development for the Okanagan TSA. 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 trails or other kinds of traditional use sites provided by First Nation communities. A reconnaissance assessment might include a preliminary field reconnaissance (PFR) as defined in the *British Columbia Archaeological Impact Assessment Guidelines*. A PFR 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 site potential. Shovel testing is sometimes needed during a PFR to confirm site potential. If so, such a PFR must be conducted in accordance with a Heritage Inspection Permit issued by the MSBTC, pursuant to section 7 of the *Heritage Conservation Act*.

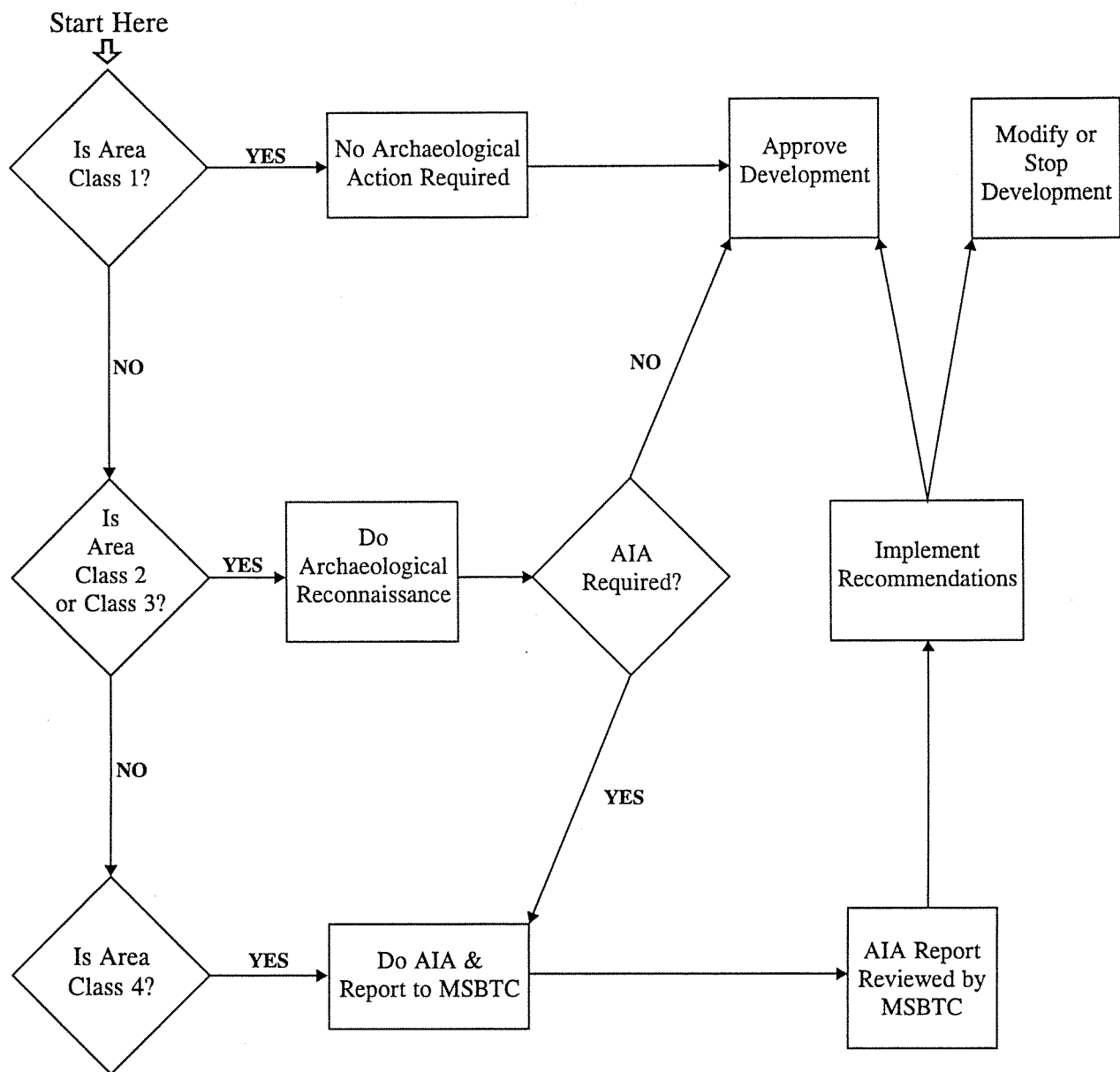
The reconnaissance assessment will result in recommendations either to conduct a full AIA or to carry out no further archaeological investigations for a particular development area. If no AIA is recommended, the reconnaissance assessment usually completes the archaeological work required for that development.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

A reconnaissance assessment is recommended for both Class 2 and 3 potential lands. For lands of Class 2 potential, an in-office review of information may be the only reconnaissance activity required. For lands of Class 3 potential, a PFR should be expected in most cases, in addition to the in-office review of information. Consultation with First Nation communities may be undertaken as part of a reconnaissance assessment for either Class 2 or 3 lands.

An AIA is recommended for all lands of Class 4 archaeological site potential. All AIAs must be carried out under a Heritage Inspection Permit. The results of AIAs must be reported to the MSBTC, who will review the assessment and forward recommendations for the management of possible impacts to archaeological sites 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/development plans are modified to avoid or reduce adverse impacts.

Table 17 shows the relationship between archaeological site potential classes, site management actions, and actions in the forestry development plan approval process. This table is included because it is anticipated that the forest industry will be particularly interested in site management actions that may be required for future forestry developments, such as timber harvesting blocks and access roads.

Archaeological Review of Proposed Developments Using the Results of Archaeological Overviews



AIA = Archaeological Impact Assessment

MSBTC = Ministry of Small Business Tourism and Culture

Figure 12. Flowchart illustrating process of archaeological resource management.

8.4 REVISING OVERVIEW RESULTS

The Okanagan TSA overview represents the first attempt at a GIS-based archaeological site potential assessment of the Okanagan - Shuswap regions. The results of the overview are limited by the quality of the digital information available for developing the potential model. The principle data gaps, with recommendations for addressing those gaps, are presented in Section 7.0. As new information becomes available through future archaeological studies, digitization of new datasets, and from First Nations communities, it is important that the site potential model be revised, and that the revised model be applied to the TSA to remap geographic coverage of the site potential classes. It is anticipated that the model will be revised periodically whenever new information becomes available.

To ensure that revisions to the site potential model have access to the results of all future archaeological studies in the TSA, it is recommended that:

- (1) The Archaeology Branch (and MoF, with respect to provincial forest lands) require that the results of all reconnaissance assessments be reported in writing and submitted to the Archaeology Branch and/or MoF.

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 MoF. As a result, few authorities are aware of these reconnaissance assessments, and they are not usually available to assist in the development of site potential models.

- (2) The Archaeology Branch (and MoF, with respect to provincial forest lands) identify an individual at those agencies who will be responsible for accepting and filing reconnaissance reports and other relevant information as it becomes available (e.g., trail information from First Nations researchers). It is understood that Aboriginal Liaison Officers in the Okanagan TSA will be responsible for this task on behalf of MoF in this region.
- (3) The Archaeology Branch should make a commitment to review and revise (if needed) the Okanagan TSA overview within the next five years, subject to the availability of funding.
- (4) The Archaeology Branch should support initiatives and studies required to address the data gaps identified in this overview.

It is anticipated that archaeological impact assessments for proposed forestry developments will be a critical source of information required to revise the site potential 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 evaluated in the field in terms of the criteria used by the model to assess potential. It will then be possible to compare site potential as predicted by the model with site potential as assessed in the field. Investigators also can use other criteria to assess site 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:

- (5) The Ministry of Forests require archaeologists undertaking impact assessments of proposed forestry developments to complete, as part of the AIA, a form evaluating archaeological site potential of the development area, in terms of the criteria used in the site potential model plus any other relevant criteria. Such a form should be distributed by the Ministry of Forests.

Table 17. Recommended relationship of overview results and Forestry Development Plan approval process.

OVERVIEW			FDP APPROVAL PROCESS			
Archaeological Site Potential Class	Archaeological Potential (in report)	Recommended Action	Action	Results of Action		
				Low Potential	> Low Potential	MSBTC Input
1	Low	None	None	Development proceeds	--	--
2	Low-to-Medium	Reconnaissance	Office and/or field review (under HCA* Permit if shovel testing involved)		AIA under HCA Permit; report to MSBTC	Development approved, modified, or stopped based on MSBTC review of AIA report and implementation of management recommendations from MSBTC
3	Medium-to-High	Reconnaissance	Office and/or field review (under HCA Permit if shovel testing involved)			
4	High	AIA	AIA under HCA Permit	Shorten AIA, report to MSBTC	Complete AIA; report to MSBTC	

* HCA = Heritage Conservation Act.

For definitions of other terms used in this table, please refer to text.

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APPENDIX I

Inventory of Tree Species in the Study Area Used by the Secwepemc and Okanagan - Colville

Note: This appendix is an inventory of tree species traditionally used by the Secwepemc and Okanagan-Colville peoples. Two species used by these peoples—western hemlock and vine maple—have been omitted from this appendix because these trees are not known to occur in the study area. Many of the descriptions of plant use are direct quotations from the references listed.

Biogeoclimatic Zones

BG: Bunchgrass
 PP: Ponderosa Pine
 IDF: Interior Douglas-fir
 ICH: Interior Cedar–Hemlock
 ESSF: Engelmann Spruce–Subalpine Fir
 AT: Alpine Tundra

Common English Name	Species Name	Habitat	Uses and Other Notes	References
alder, mountain	<i>Alnus tenuifolia</i>	<p>Widespread and locally abundant at low to subalpine elevations in moist forests, stream banks, near ponds, lakes, swamps, and other poorly drained sites. Most common in streamside, riparian wet, nutrient rich sites.</p> <p>In all zones except AT and higher elevation ESSF.</p>	<p>Technology: bark, mixed with roasted iron pyrites, used as black dye; bark and twigs boiled to make red dye; decoction of bark mixed with saskatoon berries used as a dye for buckskin; used to dye gaming sticks, quills, hair, feathers, straw, and dressed skins; said to be the most commonly used dye, along with wolf moss (Secwepemc).</p> <p>Medicine: decoction of bark used to wash sores; taken internally makes one “sweat everything out” (Secwepemc).</p> <p>Other: boughs used to strike body in sweathouse; twigs dipped in water and used for rubbing the body when sweat bathing; appears in mythology (Secwepemc).</p>	<p>Compton 1995:(5)53. Dawson 1892:23. Meidinger & Pojar 1991:59–60. Palmer 1975:59–60. Parish et al. 1996:79. Teit 1909:476, 603, 618, 628.</p>
aspen, trembling	<i>Populus tremuloides</i>	<p>Widespread at low to subalpine elevations in moist open forests to edges of dry grasslands.</p> <p>AT: absent. BG, PP: mostly moist and wet riparian sites. IDF: most commonly on moist and wet sites. ICH: widespread on mesic and wetter sites. ESSF: uncommon; mostly on warm, dryer aspects.</p>	<p>Technology: used to make tent poles and drying racks; branches used by boys for whistles; root used as base for fire drill; wood used to make a detachable foreshaft for a spear to catch beaver; bark used to make a high basket used near fire to melt snow, to keep water warm, to hold dye, skins, etc.; withes split and used to sew baskets (Secwepemc).</p> <p>Other: also known as “poplar.”</p>	<p>Compton 1995:(5)114. Dawson 1892:17. Meidinger & Pojar 1991:59–60. Palmer 1975:68. Parish et al. 1996:29. Teit 1909:496, 523.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
birch, paper	<i>Betula papyrifera</i>	<p>Widespread and common at low to mid elevations in moist forests, seepage sites, and on flood plains.</p> <p>AT, ESSF: absent. ICH: common seral spp. on mesic and wet sites. IDF: occasional on moist and wet sites. BG, PP: infrequent in riparian gullies.</p>	<p>Technology: Wood used to make: hair comb; pestle with which to mash berries; root digging stick handle; detachable foreshaft for a spear to catch beaver; cross sticks for snowshoes. Bark used to make: canoe (from a single piece of bark); cradle; dishes, or buckets of varying shape sewn with split spruce root (some for carrying or storing water); kettle for boiling water; small and large baskets for berry picking; basket for steaming food; small decorated basket used by girl at puberty; high basket used near fire to melt snow, to keep water warm, to hold dye, skins, etc.; large basket for storing provisions and household effects; painted cards; conduits for baby carrier; drinking cup; tray to hold fish; flooring for a canoe; snow shovel, snow bucket, and toboggan; temporary shelters; splints for broken limbs; to cover food, bark used to line storage caches, baskets, cradles, and cups; used to start fires (Secwepemc).</p> <p>Other: soap and shampoo made from leaves; hair washed in tepid water and birch leaves combined with children's urine, and a kind of clay or washing soda obtained from certain lakes; large birchbark basket appears in mythology (Secwepemc).</p>	<p>Boas 1891. Bouchard & Kennedy 1990:267. Compton 1995:(5)54. Meidinger & Pojar 1991:59–60. Parish et al. 1996:31. Teit 1909:475, 477–90, 483, 496, 500–01, 511–12, 514, 517, 523, 531–32, 534–35, 564, 566, 584–86, 588, 653, 724–25.</p>
cascara	<i>Rhamnus purshiana</i>	<p>Scattered and infrequent at low to mid elevations in dry to wet, often shady forests, mostly in mixed woods.</p> <p>AT, ESSF, BG, BP, IDF: absent. ICH: infrequent.</p>	<p>Medicine: decoction of bark used as a laxative (Secwepemc).</p>	<p>Compton 1995:(5)98. Palmer 1975:65. Parish et al. 1996:86.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
cedar, western red	<i>Thuja plicata</i>	<p>Scattered and infrequent on low elevation flood plains and seepage sites on the Okanagan Plateau. Tolerates saturated soils with a stagnant water table; prefers rich, moist sites; shade tolerant.</p> <p>ICH: common on a wide range of sites. ESSF wk1: common at lower elevations. IDF mu: common on mesic and wetter sites. IDF dw: occasional on moist and wet sites. AT, BG, PP: absent.</p>	<p>Technology: bark used to make clothing; flooring for canoe; long wide strips of bark used to cover shelters and lodges; 4–5 foot long roll of bark used to transport fire some distance; coiled cedar root used to make baskets to hold dried berries, boil food and to store water; baskets woven from red cedar root shaves (Secwepemc). Planks split off using horn wedges, then used for a-frame type shelters, and to cover the rafters of an underground house; wood used to make dugout canoes, frames for birchbark canoes, paddles, drum hoops, bows and arrows, dipnet frames; peeled cedar poles were set up on graves as markers; fibrous bark was used to make a covering for sweathouse frames and insulation for tule shelter, and to make a raised storage cache; bark used for weaving rough baskets; roots were split and used to make a strong, waterproof, coiled basket; when tule was not available, cedar bark was used for weaving mats (Okanagan-Colville).</p> <p>Medicine: infusion of boughs used for rheumatism, arthritis, and joint pain (Okanagan-Colville).</p> <p>Other: dancers wore necklaces and belts of red cedar bark; pubescent girls and young men in ritual isolation and training wore headband of red cedar bark; cedar root a trade item (Secwepemc). Cedar boughs boiled with Douglas-fir boughs and rose branches, and often a small quantity of stinging nettle to make a solution for washing skin and hair during sweatbathing—could also be drunk as a sweathouse tonic; boughs could be used to rub the skin in sweathouse; infusion of boughs used as a hairwash and dandruff treatment (Okanagan-Colville).</p>	<p>Compton 1995:(5)15. Dawson 1892:17. Meidinger & Pojar 1991:59–60. Palmer 1975:50. Parish et al. 1996:48. Teit 1909:487, 493, 505, 507, 531, 536, 579, 588–89.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
cherry	<i>Prunus</i> spp.		Technology: bark used to decorate baskets (Secwepemc).	Teit 1909:482–83.
cherry, bitter	<i>Prunus emarginata</i>	Occurs infrequently in study area; probably hybridizes with pin cherry. IDF, ICH: infrequent. AT, ESSF, BG, PP: absent.	Food: fruits eaten raw (Secwepemc). Technology: bark used as a basket trim (Secwepemc).	Meidinger & Pojar 1991:59–60. Palmer 1975:67. Parish et al. 1996:58.
cherry, choke, or chokeberry	<i>Prunus virginiana</i>	Scattered and locally abundant at low to mid elevations in open forests, grasslands and clearings on warm aspects; often on dry, exposed warm aspects, and among rocky outcrops; also common on warm aspect colluvial talus slopes. BG, IDF, ICH, ESSK wk1: as described. AT, ESSF: absent.	Food: fruit eaten fresh or dried for winter; roots used to make “beer” (Secwepemc). Technology: berries mixed with bear grease to make paint for pictographs (Secwepemc). Medicine: choke cherry juice consumed after sickness to regain strength (Secwepemc). Caution: stones and leaves contain cyanide, and are toxic in large quantities.	Bouchard & Kennedy 1990:272. Palmer 1975:67. Parish et al. 1996:58.
cherry, pin	<i>Prunus pensylvanica</i>	Scattered and locally common at low to mid elevations in moist warm climates, in dry to moist forests, and open places. Often abundant after burn. ICH: common seral spp. IDF: scattered and locally abundant. AT, ESSF, BG, BP: absent.	Food: fruits eaten fresh (Secwepemc). Technology: bark used to cover hand grip on bow (Secwepemc). Other: also known as “bird cherry” (Secwepemc).	Parish et al. 1996:58. Teit 1909:518. Turner 1978:189–91.

Common English Name	Species Name	Habitat	Uses and Other Notes	References
cottonwood, black	<i>Populus balsamifera</i> spp. <i>trichocarpa</i>	Widespread and common on moist to wet lowlands, riverbanks, gravel bars, stream banks, lakeshores, swamps, seepage sites and disturbed uplands. ICH: on a wide variety of sites. BG, PP, IDF: most commonly on moist and wet riparian sites. AT, ESSF: mostly absent.	Food: cambium eaten (Secwepemc). Technology: used for dugout canoes; for firewood; rotten wood used for smoking buckskin; gum from buds used to glue feathers to arrow shafts; cottony seed fluff used as a stuffing for pillows; inner bark used to make soap; bark used with pine needles to cover food in cache pits; long strips of balsam poplar bark used to cover shelters and lodges (Secwepemc). Medicine: buds used for sores; inner bark used as a medicinal tea (Secwepemc). Other: appears in mythology (Secwepemc).	Compton 1995:(5)115. Dawson 1892:14, 22. MacKinnon et al. 1992:25. Palmer 1975:51, 68. Parish et al. 1996:28. Teit 1909:493, 519, 739. Turner 1978:174, 206.
fir	<i>Abies lasiocarpa</i> &/or <i>Pseudotsuga menziesii</i> var. <i>glauca</i>		Technology: willow wands and fir saplings woven with spruce root to create cradle frame; fir twigs used to cover floor of canoe; fir used as frame, or "ground stick" for snowshoes. Branches used as floor covering in lodge; for bed for widow or widower; for temporary snowshoes (Secwepemc). Other: headdress and tunic of branches worn by girl at puberty; boughs used to strike oneself in sweathouse; widows and widowers had to wash every morning at some stream, rubbing their bodies, especially their eyes, with fir branches; appears in mythology (Secwepemc).	Teit 1909:531, 534, 564, 587, 589, 593–95, 603, 633, 643, 698; 745.

Common English Name	Species Name	Habitat	Uses and Other Notes	References
fir, Douglas-	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	<p>Widespread and common at low to mid elevations; restricted to warm dry aspects at high elevations.</p> <p>IDF: common. ICH: common seral spp. on dry to moist sites. BG, PP: common on wet sites. AT, ESSF: absent.</p>	<p>Food: seeds eaten (often taken from the winter stores of squirrels and mice); sap from boughs accumulates in sugary form that was eaten, or if abundant, collected and taken home for use in winter—it was sometimes mixed with other foods such as black tree lichen and balsamroot seeds as a sweetener (Secwepemc). Sugary sap from boughs eaten, or used as a sweetener for black tree lichen; could also be mixed with balsamroot seeds (Okanagan-Colville).</p> <p>Technology: wood used for firewood; warmed branches used for camp bed; saplings used for frames of snowshoes; branches used inside pack on side contacting one's back if used to carry meat; used to make canoe poles, and occasionally canoes; boughs used for canoe cushions, and clean beds on which deer could be butchered; used for makeshift shelters (Secwepemc). Used to make teepee poles, spear shafts and other items; boughs used as roofing for temporary shelters; the Lakes people used fir boughs, with the ends stuck in the ground for under-flooring for their winter houses; boughs of young firs used to cover the floor of the sweathouse, or as a scrubber for skin during the sweatbath; boughs were placed under a deer being butchered; needles used to dye cedar roots yellow (Okanagan-Colville).</p> <p>Medicine: pitch applied to burns, swelling, and blisters (Secwepemc). Decoction of first year growth shoots used to treat high fever and anaemia accompanied by loss of weight, energy, and appetite; decoction of outer bark used for unspecified medicinal purposes (Okanagan-Colville).</p> <p>Other: tea made from twigs and needles, and drank in the sweathouse for purification; twigs dipped in water and used for rubbing the body when sweat bathing; knotted branches used as target in arrow shooting game; consid-</p>	<p>Boas 1891. Bouchard & Kennedy 1990:272–73 Compton 1995:(5)22. Dawson 1892:13, 22. Palmer 1975:51–53. Parish et al. 1996:47. Teit 1909:515–16, 533–34, 586–87, 589, 618, 643. Turner 1978:64–65. Turner et al. 1980:34–35.</p>

(Continued next page....)

Common English Name	Species Name	Habitat	Uses and Other Notes	References
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fir, Douglas-
(Continued)

ered to have supernatural properties; used in training boys and girls, in washing twins, menstrual lodges for girls, beds for widows and widowers, and in mourning ceremonies (Secwepemc). Widow, or widower sleeps on fir boughs, the boughs turn yellow over night—when the boughs stay green, the period of mourning is over; bereaved people scrubbed themselves with boughs as a purification ritual; a wash for sweatbathers was made by boiling boughs alone, or with bundles of cedar and rose branches and a bit of stinging nettle; this was used to wash the skin and hair, and was also drunk as a tea during sweatbathing; needles dried and powdered and mixed with marrow to make a hair tonic (Okanagan-Colville).

Common English Name	Species Name	Habitat	Uses and Other Notes	References
fir, subalpine	<i>Abies lasiocarpa</i>	<p>Widespread and common in cool, moist, snowy subalpine forests; also common at low to mid elevations in moister climates.</p> <p>ESSF, ICH: common and widespread on dry to wet sites. IDF dw: occasional on mesic to wet sites. AT: scattered shrubs. BG, PP: absent.</p>	<p>Food: cambium sometimes eaten; seeds eaten (Secwepemc).</p> <p>Technology: large temporary baskets made from the bark; boughs used as bedding, or on the floor of the sweathouse, and as a wash; good firewood (Secwepemc). Pitch could be rubbed on the backs of bows after they were wrapped with bitter cherry bark; boughs sometimes used as bedding in the sweathouse (Okanagan-Colville).</p> <p>Medicine: decoction of bark drunk for tuberculosis, and other sickness; soft pitch applied to sores; gum (pitch) from inside bark next to wood drunk like that from spruce (Secwepemc). Important medicine, especially the clear liquid pitch from the blisters beneath the bark; taken as a purgative for consumption; pitch taken in small doses for ulcers, appendicitis, and a general feeling of weakness and loss of appetite; pitch mixed with deer marrow applied externally to cure a goitre; decoction of bark used to treat bad stomach, or loss of appetite, or a bad cough; a person who had fainted was revived with the strong smelling branches (Okanagan-Colville).</p> <p>Other: sometimes erroneously referred to as "balsam"; hard pitch used to clean teeth (Secwepemc). Bark and boughs were used as a deodorant and cleanser; needles, dried and powdered were mixed with marrow to make a hair dressing, to make the hair smell nice and to keep one from going bald; baby bathed in a solution of boughs to make it short and strong (Okanagan-Colville).</p>	<p>Compton 1995:(5)16. Dawson 1892:22. Palmer 1975:51. Parish et al. 1996:39. Teit 1909:198. Turner et al. 1980:23–25.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
juniper, Rocky Mountain	<i>Juniperus scopulorum</i>	<p>Widespread and common at low to mid elevations on dry, rocky or sandy soils, grassy slopes, dry open forests; most common on warm, dry south-facing slopes.</p> <p>IDF xw, xm, dk: common, mostly on dry warm aspects. IDF dk: infrequent on very warm aspects. BG, PP: common on dry to moist sites. AT, ESSF, ICH: absent.</p>	<p>Technology: wood used for bows (Secwepemc & Okanagan-Colville).</p> <p>Medicine: a medicine for flu and colds was made by boiling the sap from strips of bark (from the bottom of the tree) to make a tea; branch tips were dipped in boiling water, needles and all, and the solution was given to a person who was haemorrhaging internally to stop the bleeding; branches were mashed and dampened and used as a poultice for skin sores and arthritic joints; the berries were said to be poisonous, but could be used in small amounts to make a drink for taking (cautiously) in the sweathouse; berries also said to be good for tuberculosis (Okanagan-Colville).</p> <p>Other: used for keeping earwigs and bedbugs out of the house; used like Common juniper [decoction of boiled twigs (with sage and soapberry) used in sweathouse as a drink, and a wash for purification] for drinking and in the sweathouse (Secwepemc). Wood used to make a type of spoked wheel that was used as a moving target in a (spear-like) stick throwing game; arrowheads, soaked overnight in a solution of pounded branches (with berries) and water, said to cause a deer's blood to coagulate when it was wounded so that it couldn't run far—this "poison" was equally effective in killing people in warfare; smoke from burned boughs used to fumigate a house after a family member's death—adding rose branches said to make the treatment more effective; rose and juniper branches were boiled and the house and environs washed with the water to prevent the return of a dead person (Okanagan-Colville).</p>	<p>Compton 1995:(5)14. Dawson 1892:17. Palmer 1975:50. Parish et al. 1996:99. Turner et al. 1980:19–20.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
larch, western	<i>Larix occidentalis</i>	<p>Widespread and common in mixed upland stands; often associated with drier cedar/hemlock forests at low to mid elevations in the Columbia drainage and mid-elevation Douglas-fir/lodgepole pine forests east of Okanagan Lake.</p> <p>IDF, ICH: common. PP, ESSF: uncommon. BG, AT: absent.</p>	<p>Food: sap eaten like candy (Okanagan-Colville).</p> <p>Technology: larch pigment, mixed with the sticky resin from cottonwood buds, was used as a red paint; sticks were sometimes used as salmon spreaders (Okanagan-Colville).</p> <p>Medicine: liquid pitch used for unspecified medical purpose; decoction of the tops of the young trees was used for “changing the blood” in spring and fall, or as a blood purifier (especially when mixed with Oregon grape); tops could be boiled and used as an antiseptic wash for cuts and sores, and to soak arthritic limbs and severe skin sores (Okanagan-Colville).</p> <p>Other: gum chewed (Secwepemc & Okanagan-Colville). Girls used larch pigment to paint their faces red; appears in mythology; also referred to as “tamarack” (Okanagan-Colville).</p>	<p>Parish et al. 1996:32. Turner et al. 1980:25–27.</p>
maple, Douglas	<i>Acer glabrum</i>	<p>Widespread and common at low to subalpine elevations in eastern half of the study area, in dry to moist open forests, openings and clearings; particularly on warm southerly aspects, also on seepage sites and moist gullies on dry plateaus.</p> <p>ICH: common on a variety of sites. ESSF wk1: warm aspects with drier than mesic, at lower elevations. PP, IDF: common on warm aspects. AT, BG: absent.</p>	<p>Technology: “mountain-maple” used as frame, or “ground stick” for snowshoes; to make wooden hoops and frames to make baby carrier; fibrous inner bark woven into rope (Secwepemc).</p> <p>Medicine: root or stem peeled and boiled for any kind of sickness (Secwepemc).</p> <p>Other: wood used for gambling sticks, used to play stick game; maple bark appears in mythology (Secwepemc).</p>	<p>Compton 1995:(5)26. Palmer 1975:56. Parish et al. 1996:73. Teit 1909:484–85, 534, 564, 666.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
pine	<i>Pinus</i> spp.		<p>Technology: needles used with cottonwood bark to cover food in caches; split pine sticks used to make a trout trap; split withes used for fine sewing on canoes; layers of dry needles supported on sticks, to dry berries (Secwepemc).</p> <p>Other: appears in mythology (Secwepemc).</p>	<p>Dawson 1892:16. Teit 1909:477, 516, 633. Turner 1978:174.</p>
pine, lodgepole	<i>Pinus contorta</i> var. <i>latifolia</i>	<p>Widespread and common from low to high elevations.</p> <p>IDF, ESSF: abundant. ICH: common. AT: infrequent. BP, BG: absent.</p>	<p>Food: cambium eaten, or dried for later use (Secwepemc). Cambium eaten (Okanagan-Colville).</p> <p>Technology: wood burned in fire; bark made into a tray used before the fire to catch fat drippings; long wide strips of bark used to cover shelters or lodges (Secwepemc). Young trees used to make teepee poles (Okanagan-Colville).</p> <p>Medicine: cambium chewed and taken for coughs and tuberculosis; for TB it is good to drink lodgepole pine medicine all the time instead of water; after drinking the strong pitch, it is necessary to take broth to avoid getting sick (Secwepemc). Cambium is good medicine for stomach troubles such as ulcers; decoction of tops of young trees used as "tea" drunk as a tonic for aches and pains that came during the damp weather of spring; sap from the bark of young trees boiled into "tea" that was drunk to cure ulcers; pitch mixed with deer fat or bear grease to make a salve for sores and aching muscles; a strong tea made from the needles was drunk by a woman to bring about an abortion (Okanagan-Colville).</p> <p>Other: grizzly bears often rip off the outer bark, and eat the cambium underneath; cones placed in a basket of water to bring rain, or burned to stop the rain; needles from the tops of the tree were burned and thrown into the air to bring wind in hot weather (Okanagan-Colville).</p>	<p>Bouchard & Kennedy 1990:268–69. Compton 1995:(5)19. Dawson 1892:22. Palmer 1975:51. Parish et al. 1996:35. Teit 1909:493, 501. Turner 1978:58–59. Turner et al. 1980:28–29.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
pine, ponderosa	<i>Pinus ponderosa</i>	<p>Found in hot, dry valleys at low elevations, and moderate elevations on dry southern exposures.</p> <p>PP, IDF: abundant. BG, ICH: uncommon. ESSF, AT: absent.</p>	<p>Food: nutlets eaten as a snack food; cambium eaten fresh or roasted (Secwepemc). Cambium eaten; seeds gathered and eaten like nuts, usually fresh, but could be stored (Okanagan-Colville).</p> <p>Technology: bark burned when camping because it cools quickly and enemies cannot tell how long ago camp was broken; wood used for smoking buckskin; dried needles used as a mattress; pollen used to as yellow dye (Secwepemc). Outer bark used as roofing on winter houses, as containers, as trays and platters for meat and other food, and as fuel and lining for underground cooking pits; wood was sometimes used for dugout canoes, cache poles, and for general construction; the top section of last year's growth was dried and used as a drill in fire-making; it burned well because it was so pitchy; the needles were used as tinder; the pitch was used to cover and cement fish spears, to cement feathers onto arrow shafts, and to caulk and waterproof bark canoes; the rotten wood was good for smoking deer hides (Okanagan-Colville).</p> <p>Medicine: decoction used to bathe dangerously ill infant; branches boiled and the water used for bathing those people suffering from colds; when sufficient lodgepole cambium was not available, ponderosa pine could be substituted for treating colds; pitch said to soothe burns and draw out infections (Secwepemc). Cambium believed to be a good stomach medicine; soft white pitch used to poultice boils; pitch mixed with grease and rubbed on a baby's skin; it was good for the complexion and the smell made the babies sleep soundly; the new growth from the tops of young trees, with needles removed, was boiled to make a drink for fever or internal haemorrhaging; two or three dried spring buds boiled to make an eyewash; if a mother's milk failed to flow after childbirth she was given a hot broth of meat or fowl, and hot pine needles were</p>	<p>Compton 1995:(5)21. Dawson 1892:18, 22. Palmer 1975:52. Parish et al. 1996:34. Teit 1909:638. Turner 1978:60–62. Turner et al. 1980:32–34.</p>

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Common English Name	Species Name	Habitat	Uses and Other Notes	References
pine, ponderosa (Continued)			<p>placed on her breasts (Okanagan-Colville).</p> <p>Other: boughs or needles rubbed under arms as a deodorant; boughs used as a brush to stimulate skin while in sweathouse, or to hit oneself after leaving sweathouse; appears in mythology (Secwepemc). Hard red pitch was used as a chewing gum; children used to chew on the green buds and suck the juice, but pregnant women should never chew them as this would lead to a miscarriage; needles were spread on the floor of the sweathouse to ward off "witchcraft"; bottom ends of cones were set on fire and the smouldering cones tossed into the air in the direction of rain clouds to make the rain stop; appears in mythology (Okanagan-Colville).</p>	
pine, western white	<i>Pinus monticola</i>	Widespread and common in Columbian Mountains near Shuswap Lake, at low to subalpine elevations on a wide range of sites from bogs to well-drained sandy soils. ICH: common. IDE, ESSF: uncommon. BG, PP, AT: absent.	<p>Food: green cones sliced and eaten in small quantities (Secwepemc).</p> <p>Technology: single piece of bark, turned inside-out, used to make small canoes; baskets made of white pine (Secwepemc). Bark formerly being used by the Lakes people to make "sturgeon-nosed" canoes (Okanagan-Colville).</p> <p>Medicine: pitch used medicinally; bark is good for tuberculosis (Secwepemc).</p>	Boas 1891. Compton 1995:(5)20. Dawson 1892:14-15. Palmer 1975:51-52. Parish et al. 1996:38. Teit 1909:531-33. Turner 1978:211. Turner et al. 1980:29.
pine, whitebark	<i>Pinus albicaulis</i>	Scattered at high elevations; frequently on dry, southern exposures and exposed ridges. AT: scattered shrubs. ESSF xv: common on dry slopes. ESSF wc3: infrequent on dry exposed slopes and ridge crests. BG, PP, IDE, ICH: absent.	<p>Food: roasted seeds crushed and mixed with (saskatoon) berries for eating, or pounded to make a fine flour; large seeds or "nuts" roasted and eaten, and regarded as a special treat "like peanuts"; cambium sometimes scrapped off and eaten (Secwepemc). Seeds gathered by women and girls, and eaten, or sun dried, stored, then eaten (Okanagan-Colville).</p> <p>Technology: fibrous roots were used to sew bark together, and to weave watertight containers and canoes (Secwepemc).</p>	Dawson 1892:22. Parish et al. 1996:36. Turner 1978:56-57. Turner et al. 1980:27-28.

Common English Name	Species Name	Habitat	Uses and Other Notes	References
spruce, Engelmann &/or white	<i>Picea engelmannii</i> &/or <i>P. glauca</i>	<p>Engelmann: widespread and common at mid to subalpine elevations; can occur at low elevations on seepage sites, flood plains, and lakeshores.</p> <p>White: typically at low to mid elevations, in wet draws, depressions, swamps, floodplains, and seepage sites.</p> <p><i>Note: distribution of these two species overlaps, and hybrids form.</i></p> <p>Engelmann: ESSF: abundant. ICH: common. IDF: uncommon. BG, PP, AT: absent.</p> <p>White: IDE, ESSF: uncommon. PP: very rare. BG, ICH, AT: absent.</p>	<p>Food: a pleasant tea was made by boiling a few branches in water (Okanagan-Colville).</p> <p>Technology: baskets made from tough roots of spruce cut into strips; birch-bark baskets sewn with split spruce roots; spruce bark was used for making canoes, and split spruce root was used for sewing them; canoe made from single piece of bark; tray used to catch drippings in front of fire; high basket used near fire to melt snow, to keep water warm, to hold dye, skins, etc.; a temporary basket used to boil berries, soak skins etc.; long wide strips used to cover shelters and lodges; flooring for a canoe; withes split to sew into baskets, or for fine sewing on canoe (Secwepemc).</p> <p>Medicine: decoction of bark used to treat tuberculosis and other respiratory ailments, or as a spring tonic (Okanagan-Colville).</p> <p>Other: hard resinous pitch of white spruce chewed (Secwepemc).</p>	<p>Compton 1995:(5)18. Dawson 1892:18. Palmer 1975:51. Parish et al. 1996:44–45. Teit 1909:477–78, 487, 489, 493, 496, 501, 516, 531–33. Turner et al. 1980:27.</p>

Common English Name	Species Name	Habitat	Uses and Other Notes	References
willow	<i>Salix</i> spp. &/or <i>Cornus stolonifera</i>		<p>Technology: berry-drying mats made from willow twigs; wood used for float or buoy, to catch fish at lake; used to make wooden hoops and frames for baby carriers; willow switch with crotched or hooked end, used to carry small fish to camp; split wands, or withes used for sewing and fastening canoe; small poles, sticks and limbs of willow used for making fish weirs; basket of willow wands or light rods used to make a fish trap; bark used to make clothing; rotten roots used as punk to carry fire while travelling (Secwepemc).</p> <p>Other: girls planted willow twigs during puberty rites; young men vomited after placing twigs down their throats; bark headband used by boy or girl at puberty; appears in mythology (Secwepemc).</p>	Boas 1891. Dawson 1892:16–17. Teit 1909:484–485, 505, 507, 525, 527–29, 531–33, 585, 588–89, 628.
willow, Scouler's	<i>Salix scouleriana</i>	<p>Widespread and common at low to mid elevations in upland forests, seepage areas, clearings and wetlands.</p> <p>Upper ESSE, BG, PP, IDF, ICH: as described. AT and lower ESSE: absent.</p>	<p>Technology: wood burned for smoking salmon; framework of fish weirs, and net floats made from willow; split willow used for sewing bark canoes; used to strengthen cradles; rotten willow roots used as punk; strips of bark used to string corms of avalanche lilies (Secwepemc).</p> <p>Other: headband of inside bark of willow used by pubescent girls and young men in ritual isolation; willow twigs planted by girls during puberty rituals. Appears in mythology (Secwepemc).</p>	Boas 1891. Compton 1995:(5)116. Palmer 1975:68. Parish et al. 1996:77.
yew, western	<i>Taxus brevifolia</i>	<p>Scattered and locally common at low to mid elevations in moist coniferous forests, moist depressions, and ravines; distribution limited to eastern half of study area.</p> <p>IDF: common. ICH: uncommon. BG, PP, ESSE, AT: absent.</p>	<p>Technology: wood used for bows (Secwepemc & Okanagan-Colville). Dry wood was ground and mixed with fish oil to make a red paint (Okanagan-Colville).</p>	Compton 1995:(5)24. Dawson 1892:17. Palmer 1975:53. Parish et al. 1996:98. Teit 1909:518–19. Turner et al. 1980:35.