BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

Beirne, P.D. and D.L. Pokotylo, Department of Anthropology and Sociology, University of British Columbia - Hat Creek Project - Inventory, Assessment and Evaluation of the Cultural Heritage Resources - September 1979

ENVIRONMENTAL IMPACT STATEMENT REFERENCE NUMBER: 60

HAT CREEK PROJECT: INVENTORY,
ASSESSMENT AND EVALUATION
OF THE CULTURAL HERITAGE RESOURCES

Patricia D. Beirne and David L. Pokotylo

DEPARTMENT OF ANTHROPOLOGY AND SOCIOLOGY
THE UNIVERSITY OF BRITISH COLUMBIA
VANCOUVER, B.C.

Final version
September 1979

HAT CREEK PROJECT: INVENTORY,
ASSESSMENT AND EVALUATION
OF THE CULTURAL HERITAGE RESOURCES

CONTENTS

CONTENTS - (Cont'd)

APPENDICES

PART ONE - THE ASSESSMENT OF CULTURAL HERITAGE RESOURCES IN THE UPPER HAT CREEK VALLEY

CONTENTS

CONTENTS - (Cont'd)

TABLES

CONTENTS - (Cont'd)

CONTENTS - (Cont'd)

TABLES - (Cont'd)

CONTENTS - (Cont'd)

TABLES - (Cont'd)

FIGURES

CONTENTS - (Cont'd)

FIGURES - (Cont'd)

CONTENTS - (Cont'd)

FIGURES - (Cont'd)

Figure No.

CONTENTS - (Cont'd)

FIGURES - (Cont'd)

CONTENTS - (Cont'd)

FIGURES - (Cont'd)

PLATES

PLATES - (Cont'd)

SECTION 1.0 - SUMMARY

In this study, cultural heritage resources in the upper Hat Creek valley are inventoried and assessed to provide a reference for an Environmental Impact Statement being prepared by B.C. Hydro and Power Authority for its proposed Hat Creek Coal Development Project. Specifically, the study's terms of reference are 1) to inventory the cultural heritage resources; 2) to identify potential project-related impacts; 3) to evaluate the potential impacts' effects upon the resources; and 4) to recommend mitigation and compensation to ameliorate possible adverse effects and to enhance possible beneficial effects.

In accordance with the Heritage Conservation Act (1977) and its own policy, B.C. Hydro and Power Authority has sponsored a programme of fieldwork, laboratory analyses and report writing, which has culminated in this study, from 1 May 1976 to 31 December 1976 and from 1 May 1977 to 20 August 1979. A research design oriented towards questions of past subsistence and settlement has been implemented to satisfy the Office of the Provincial Archaeologist's and the sponsor's objectives, and to recover cultural heritage information for the public and the scientific community. The study has been divided into three parts: Phase I - a general overview of the resources; Phase II - an inventory of the resources, an identification and evaluation of potential project-related impacts, and recommendations for mitigation and compensation; and Phase III - an execution of a mitigation and compensation programme. This study is the result of Phases I and II.

Background information has been supplied for ethnographic, historic and archaeological research relevant to evaluating the cultural heritage resources. Reconstruction of native lifeways has been based upon several ethnographies of Interior Salish-speaking groups. A hunting-fishing-gathering subsistence economy linked with a semi-nomadic settlement pattern has been identified for the ethnohistoric groups. Library resources provided information about the region's early history, while archival sources and oral history detailed events in the upper Hat Creek valley from ca 1860 to present day. The mid-19th century was characterized by transient occupation, while later inhabitants were mainly homesteaders and farmers. In the 20th century, farming was replaced by ranching, and logging expanded from a local to a regional industry.

While archaeological research in the southern interior dates back to 1897, intensive archaeological research did not commence until 1954. Work at Lochnore and Nesikep creeks' confluences with the Fraser River has provided a basic chronological sequence for the region's prehistory, which has been refined by subsequent research near Lillooet. A summary of research in the following areas has also been included: Thompson River, Nicola valley, South Thompson River, Shuswap Lake, Arrow Lakes, Okanagan valley, Similkameen valley, Kootenays, Cariboo and Chilcotin.

Five categories of cultural heritage resources are recognized by this study: 1) artifacts; 2) archaeological sites; 3) archaeological zones; 4) archaeological and historical records; and 5) oral history, folklore and traditions. Inventory of resources in the regional study area and other areas archaeologically relevant to the upper Hat Creek valley has been structured by the following chronology: Late Nesikep period (A.D. 1 to A.D. 1800), Middle Nesikep period (3000 B.C. to A.D. 1), Early Nesikep period (5000 B.C. to 3000 B.C.) and Lochnore complex (? to 5000 B.C.). Many archaeological sites recorded and/or excavated are housepits and date to the Late Nesikep period. Sites dating to earlier periods appear to be less common. Little is known about cultural heritage resources in the uplands of the regional study area, as most research has concentrated on major river and lake valleys.

Variations in site densities, housepit diameters, artifact inventories and styles occur throughout the southern interior. Archaeological remains similar to those at Lochnore-Nesikep locality have been found along the Thompson and South Thompson Rivers, Nicola valley, Shuswap Lake and some areas of the Chilcotin and Cariboo. Okanagan-Similkameen, Arrow Lakes and Kootenay archaeology appear to be dissimilar. Cultural homogeneity appears to increase in later periods. Historic archaeology has been confined to a few historic housepit site excavations near Lillooet and historic site survey in the Kootenays.

Most recorded sites in the local study area are either lithic scatters without cultural depressions or cultural depressions without artifacts. Many lithic scatters have intentionally modified tools. The majority of sites are located on terraces, in ponderosa pine parkland, near a primary or secondary river. Less than 10 percent lie between 2500 feet to 4500 feet (762 m to 1372 m) asl and most lie below 2500 feet asl.

Quadrat survey was the primary inventory methodology employed during Phases I and II. Sampling strata were defined during Phase I by a forest-grassland dichotomy; during Phase II, by proposed development components. Quadrats were selected randomly within the strata, except for strata defined by the proposed powerplant, mine surface facilities and headworks reservoir. These were totally surveyed. A 7.8 percent sample of the study area was surveyed during Phase I. Sampling fractions varied during Phase II, but were higher than 7.8 percent. Reconnaissance surveys were conducted along the cooling water supply pipeline's preliminary design and portions of the proposed access road and 60 kV transmission lines system. Most offsite facilities were not surveyed because their preliminary designs were unavailable. A special historic structures inventory was also implemented. Objectives of the excavation programme were to examine relationships between surface and subsurface remains, to determine the nature of subsurface remains and to recover samples suitable for radiocarbon dating. Components of

10 archaeological sites were tested, including seven cultural depressions and six lithic scatters. Library and archival searches supplemented the data obtained through fieldwork.

Phase I survey recorded 85 prehistoric sites and predicted 962 prehistoric sites within its study area (which excludes most of Medicine Creek and the Trachyte Hills). Cultural depressions co-occur with artifacts at 12 sites and without artifacts at five sites. Lithic scatters without cultural depressions number 67. More than 50 percent of the sites are smaller than 100 m^2 and 50 percent have less than 151 artifacts. Site size ranges up to 9404 m^2 and 74 800 artifacts. Artifacts chipped from vitreous basalt predominate. Debitage is the most common artifact type, but intentionally modified tools occur at 61 percent of the sites. Most sites are located in grassland and on plains or gentle slopes. Elevations range between 2850 feet to 4400 feet (869 m to 1341 m) asl.

In Phase II, year 1, 101 prehistoric sites and site components were recorded and approximately 352 sites are predicted within its study area (which includes Medicine Creek and the Trachyte Hills, but excludes most of the valley south of Ambusten Creek). Seven sites are cultural depressions without artifacts; five sites, cultural depressions with artifacts; and 89 sites, lithic scatters without cultural depressions. While sites up to 12 766 m^2 in size and yielding 110 141 artifacts have been recorded, 45 percent of the sites are less than 100 m^2 and 47 percent have less than 100 artifacts. Like sites recorded during Phase I, these sites' artifacts are mostly chipped from vitreous basalt and are debitage. However, 72 percent of sites recorded in Phase II, year 1 have intentionally modified tools. Sites located in the northern upper Hat Creek bottomlands tend to be large and have high artifact densities compared to other sites in the valley, whereas sites in the Medicine-Harry creeks' drainages tend to be small with low artifact densities. Most sites are located in parkland and on plains or gentle slopes. Elevations range between 2848 feet to 4400 feet (868 m to 1341 m) asl. No archaeological sites have been recorded in the proposed powerplant zone. In Phase II, year 2, 13 prehistoric sites and site components have been recorded in the proposed mine surface facilities zone and 22 have been predicted. Fifty percent have less than 250 artifacts.

Nine radiocarbon dates, ranging from 140 ± 50 years B.P. (before present) to 2245 ± 50 years B.P., were obtained through excavations of cultural depressions. Four dates are greater than 2000 years B.P., while three dates are less than 1000 years B.P. Only one depression is interpreted as a housepit (EeRj 1, cultural feature No. 10). Its radiocarbon date of 140 ± 50 years B.P. and its mixed prehistoric and historic artifact assemblage suggests a protohistoric occupation. The remaining excavated depressions are interpreted as earth ovens. No radiocarbon dates were obtained from test excavations of lithic scatter components, and only excavations at EeRj 92 recovered a substantial amount of faunal remains from a lithic scatter. Four sites yielded more than 50 microblades through excavation (977 at EeRj 159). Numerous retouched stone tools were collected as well as blades and debitage.

Most of the 19 historic sites and site components recorded are interpreted as homesteads or farms, some of which were occupied by native peoples. Seldom seen types of occupation include a sawmill and a coal mine. Thirty-seven historic structures were recorded at these sites and most are of log construction. Collected artifacts include glass, ceramics, metal, wood, plastic and leather; some apparently were made during the late 1800s. Evidence for several Indian homesteads was also found.. Occupations span the period between 1880 and the 1930s.

On the basis of environmental characteristics and the nature of cultural heritage resources, 29 archaeological zones have been identified. The Hat Creek Archaeological Project has the only scientifically documented artifact collection from upper Hat Creek valley. One extensive amateur collection has been observed, two others may also exist. Extensive archaeological records have been made by the Hat Creek Archaeological Project, while limited records have been made by three other agencies. Very little research has been done on the extant historical records. Some aspects of European oral history and ranching lifeways have been recorded, such as economy, but social aspects have been neglected. No ethnography of native peoples in Hat Creek Valley has been done. Since the valley lies on the boundary between ethnohistorical social groups, extant ethnographies do not describe adequately the admixture of lifeways which occurred in transitional cultural groups, such as the Bonaparte and Pavilion bands.

Both scientific- and public-oriented criteria were used to assess cultural heritage value. Value indices were computed to indicate the relative value of the resources as a whole in a regional context. In most instances, value for the palaeoenvironmental criterion was indeterminable. Prehistoric sites have high value indices for uniqueness, integrity, technology and cultural heritage resource management. Archaeological zones have high value indices for uniqueness, integrity, socio-economics, technology and methodology. Exceptional sites and zones have high values for other criteria. Native ethnography and European ethnography/oral history have high values for uniqueness, chronology, socio-economics, technology, ecology and heritage. Native ethnography has a high education value, whereas European ethnography has high evolutionary and integrity value. The Hat Creek Archaeological Project artifact collections and records have high values for all criteria except recreation and tourism. High values have been accorded local collections for uniqueness, integrity, ecology, methodology and management. Historical records have not been evaluated. Cultural heritage resources in the upper Hat Creek valley have value for their pertinence to resolving research questions including the nature of upland subsistence-settlement adaptations, the nature of early prehistoric periods, the cultural implications of microblade technology and the acculturation of native peoples to European lifeways.

Impacts have been classified as either directly related to the proposed development, indirectly related, or potentially caused by proposed project actions. Categories of adverse and beneficial effects have been identified with possible sources of impact and their schedule. Most direct and potential impacts coincide with predicted disturbed areas, though impact should be negligible after a depth of 3 m (9.8 ft). Local community dispersal may be another source of direct impact. Indirect impacts may be associated with project-related increases in population and development, and possibly altered drainage and erosion. Minimal impacts are expected without the proposed project, mainly from agriculture, logging and limited recreation and tourism.

At least 198 archaeological sites in the upper Hat Creek valley may suffer adverse effects initiated by the proposed development. In addition, at least 300 sites in the valley may suffer adverse effects indirectly related to the proposed development. Offsite facilities may cause adverse effects in 12 archaeological zones outside the valley. Indirect impacts may occur in 16 zones. No estimates have been made for potential impacts. However, they are most likely in zones with high site densities and post-Pleistocene sedimentary deposits. Portions of European oral history/ethnology as well as local artifact collections are expected to be lost through project-related community dispersal. Continued curation of Hat Creek Archaeological Project's artifacts and records will be necessary. Beneficial effects will accrue from the discovery and study of archaeological sites.

In regional perspective, depreciated values incurred by these impacts include uniqueness, integrity, technology and ecology for prehistoric sites; uniqueness, integrity, technology and management for historic sites; and uniqueness, integrity, socio-economics, technology, methodology and management for zones. In local perspective, socio-economic, evolution, methodology, recreation, tourism, heritage and management values will be depreciated for prehistoric sites. Indirect impacts will affect all high values of most of the resources. Upper Hat Creek valley cultural heritage resources are deemed valuable for their potential contribution towards illuminating important aspects of southern interior plateau prehistory.

SECTION 2.0 - INTRODUCTION

2.1 TERMS OF REFERENCE

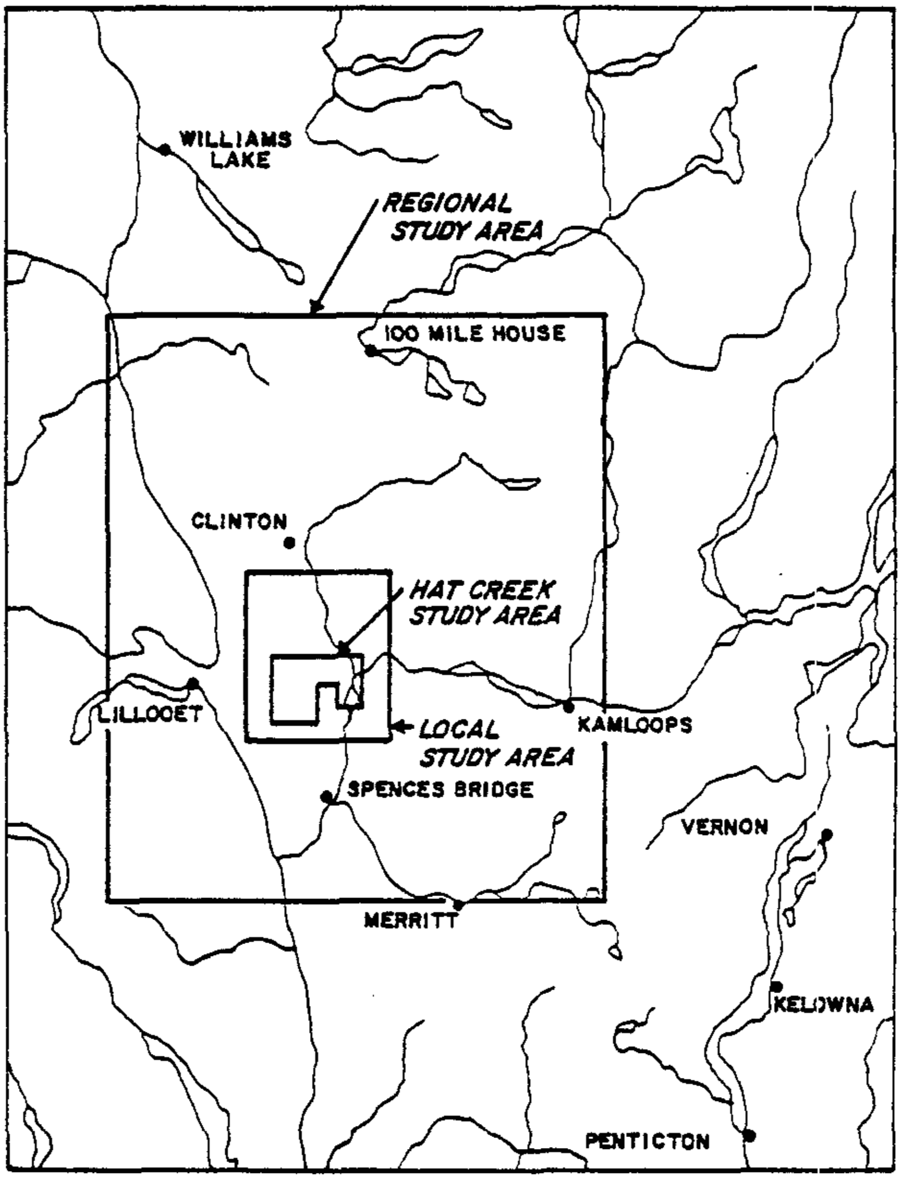
British Columbia Hydro and Power Authority is investigating the feasibility of constructing a 2000 MW coal-fired thermal electric generating plant and developing an open pit coal mine in the upper Hat Creek valley, British Columbia. These investigations include the preparation of an Environmental Impact Statement to identify and assess the environmental effects of the proposed Hat Creek Development. One item to be addressed and evaluated in the overall report is the cultural heritage resource base in the site, local and regional study areas (see Fig. 2-1).

General terms of reference provided by B.C. Hydro to all environmental study components, including cultural heritage resources, state the purpose of these environmental studies as follows:

> Identify and evaluate the effects of the design alternatives of the proposed Hat Creek coal mine, associated thermal generating station and off-site facilities on the natural and cultural resources of the area, both in the short and in the long-term. Compare these with the evaluation of the area and its resources without the project. Assist in the development of practical mitigation measures. In co-operation with the design consultants and B.C. Hydro, ensure a satisfactory compromise between environmental constraints and engineering requirements. (British Columbia Hydro and Power Authority 1977).

Information categories to be supplied by the environmental studies for input into project planning have also been specified by B.C. Hydro. In the context of a cultural heritage resource study, they include:

1. An inventory of cultural heritage resources.



Regional, Local and Hat Creek Site Study Areas

Figure 2-1

2.1 TERMS OF REFERENCE - (Cont'd)

2. An identification of project impacts on cultural heritage resources.

3. An evaluation of project impacts on cultural heritage resources.

4. A recommended program of mitigation and compensation to minimize adverse impacts and to enhance beneficial effects.

2.2 SCOPE AND PURPOSE

(a) Introduction

Historic and prehistoric cultural remains are a non-renewable environmental resource, of value to society at large and not just to the archaeological profession. Increasing professional and public awareness of the potential effects that society's actions can have on limited and non-renewable parts of the environment, has given rise to provincial legislation (i.e. the "Heritage Conservation Act", 1977) that provides for the conservation and protection of cultural heritage resources in British Columbia.

Given this legislative mandate, the Office of the Provincial Archaeologist, Heritage Conservation Branch, Ministry of Recreation and Conservation, approached B.C. Hydro for the funding of a cultural heritage resource impact assessment of the proposed Hat Creek Development. In compliance with the "Heritage Conservation Act", B.C. Hydro, with the counsel of the Office of the Provincial Archaeologist, negotiated contracts with the University of British Columbia in 1976, 1977 and 1978 to carry out the cultural heritage resource assessment in upper Hat Creek valley. The studies were incorporated into their development plans and actions. Artifact and scientific record collections resulting from the assessment studies will be curated by the

2.2 SCOPE AND PURPOSE - (Cont'd)

Laboratory of Archaeology, Museum of Anthropology, University of British Columbia. Total expenditures by B.C. Hydro for these 3 years of studies is $410 350. In addition, the University of British Columbia provided approximately $30 400 in services not covered in the budget.

(b) Schedule of Study

In response to a request from the Office of the Provincial Archaeologist of British Columbia, an initial proposal for a cultural heritage resource inventory and assessment of the upper Hat Creek valley was submitted by the University of British Columbia in February, 1976 (see Pokotylo 1976). After review by the Office of the Provincial Archaeologist and B.C. Hydro, a Memorandum of Agreement was signed between the University of British Columbia and the Provincial Archaeologist, acting as agent for B.C. Hydro, to carry out the initial phase of the study from 1 May to 31 December 1976.

The following outlines the 1976 schedule of research activities.

May-June 1976 - Two principal investigators, two research supervisors and 15 field crew members were engaged in inventory field work in upper Hat Creek valley. The field crew comprised staff and students of the University of British Columbia Archaeological Field School course.

July 1976 - Termination of the course, engagement of nine field crew members as salaried research assistants; retention of one principal investigator and one research supervisor to continue inventory fieldwork.

August-December 1976 - Termination of the entire field crew. Engagement of part-time research assistants to carry out lab analysis and to complete the inventory through brief periods of fieldwork during the period from August to November.

Upon receipt of a prospectus for continued cultural heritage resource research in upper Hat Creek valley circulated by the Office of the Provincial Archaeologist, the University of British Columbia submitted a proposal for assessment studies, in April 1977 (see Pokotylo and Pearson 1977). The proposal was found acceptable by B.C. Hydro and a contract to initiate the second phase of the assessment program, from 1 May 1977 to 30 April 1978, was signed on 8 August 1977. In addition, a proposal for an extension of the contract, to continue a monitoring survey of exploratory drilling locations (see Pokotylo and Matson 1977) was submitted and approved in September 1977.

The 1977/78 schedule of research activities comprises the following:

May 1977 - Engagement of director, assistant director, two research supervisors, secretary/administrative assistant, and three research assistants. These personnel were involved in general start-up activities: hiring of field crew members, purchase/rental of equipment, logistical set-up of the field camp, initiation of vegetation studies, and the analysis of the 1976 data backlog.

June-September 1977 - Engagement of a camp cook, lab/camp manager, and field research assistants comprising an aggregate 55 person-months additional to the above personnel to carry out field investigations and laboratory analysis.

2.2 SCOPE AND PURPOSE - (Cont'd)

October-December 1977 - Termination of all field research assistants except two to continue monitoring survey of exploratory drilling locations until 30 November. Primary data analysis and preparation of inventory and assessment report.

January-April 1978 - Termination of research supervisors and secretary/administrative assistant. Continued data analysis, preparation of scientific and general reports on research results, formulation of future research designs.

A proposal for completing the assessment studies was submitted by the University of British Columbia in April 1978 (see Beirne et al. 1978). On 1 May 1978, an agreement based upon this proposal was made between the University of British Columbia and B.C. Hydro. Work commenced on this date as well. Alterations to the original structure of the project's personnel was necessitated in September 1978, by the contract officer's resignation. In addition, the due date of the final assessment report with recommendations for mitigation was extended from 30 April 1978 to 20 August 1979. The 1978/79 schedule of research activities follows:

May 1978 - Engagement of field director, two research supervisors, secretary/administrative assistant, lab manager, camp manager, cook and seven research assistants. Commencement of UBC field school with one director and nine students. These personnel carried out the general start-up activities and began the fieldwork programme.

June-September 1978 - Conclusion of field school on 30 June. Engagement of contract officer on 1 June and of six additional research assistants on 1 July. Completion of fieldwork programme on 15 September, as well as termination of field staff except the field director. Resignation of contract officer on 15 September. Position of acting contract officer assumed by the field director. Hire one graduate assistant, three undergraduate assistants, one illustrator, and three lab assistants. Part-time administrative consultant engaged.

October-November 1978 - Primary data analysis. Lab assistants terminated 30 November.

December 1978-April 1979 - Preparation of final report. All personnel terminated on 30 April 1979.

May-August 1979 - Preparation of final report. Temporary typists hired intermittently throughout period. Field director rehired from 1 July to 31 July. Administrative consultant engaged for 5 days.

(c) Goals for Cultural Heritage Resource Impact Assessment

While considering both industrial development and general public interest, cultural heritage resource impact assessments maintain a conservation philosophy. However, by removing resources, in whole or in part, from their environmental context in order to research them, cultural heritage studies themselves deplete the resource base. Thus, to accord with a conservation philosophy cultural heritage studies (for whatever reason) should recover any information which may contribute to either scientific or public knowledge (cf. McGimsey and Davis 1977: 28-29).

Two prime objectives exist for any archaeological research carried out under contract with federal, provincial or private sponsors within the current legislative framework: 1) to satisfy the contract sponsor's specific requirements; and 2) to recover cultural heritage information for the general public and the scientific community. These objectives' mutual goals are the identification, interpretation and evaluation of cultural heritage resources within proposed development areas. Fulfillment of these goals depends upon results produced from problem-oriented research (see Schiffer 1975: 4). For the upper Hat Creek valley, these goals were attained by structuring the research around questions about past subsistance and settlement behaviour in the region (see Binford 1964; Gummerman 1971; Struever 1968).

To facilitate effective management of cultural heritage resources, a multi-stage research program was designed to provide appropriate and sufficient information for each planning level within the Hat Creek Coal Development Project. Phase I of the research program provided an overview of the resource base in the site study area as identified at the preliminary planning level. Phase II utilized the detailed design information available at later planning levels to inventory and evaluate the cultural heritage resources within specific proposed development zones, and to identify the nature and extent of potential impacts to the heritage resources. Results from Phase II have provided the bases for: 1) an assessment of the proposed development's predicted impacts; and 2) a program for mitigating the impacts (i.e. Phase III).* Phase II's results are contained in both this report and the preliminary report (see Pokotylo and Beirne 1978). The preliminary report is a reference document for this report and contains detailed summaries of archaeological data.

Exploratory activities by B.C. Hydro and its consultants which disturbed the land surface necessitated an adjunct to the cultural heritage resource study: an in-field monitoring

---

* Phases I, II and III are equivalent to Stages I, II and IV, respectively, of the "Guidelines for Coal Development" (Environmental and Land Use Committee, British Columbia 1976).

2.2 SCOPE AND PURPOSE - (Cont'd)

programme. The locations of these activities were inspected prior to any commencement of work to ascertain any potential impact to cultural heritage resources. Impacts to significant resources were mitigated through relocating the proposed activity or recovering information from the endangered resource. This programme was generally successful, except, in three incidents, when a communication breakdown resulted in unmitigated damage to a cultural heritage resource.

2.3 ETHNOGRAPHIC BACKGROUND

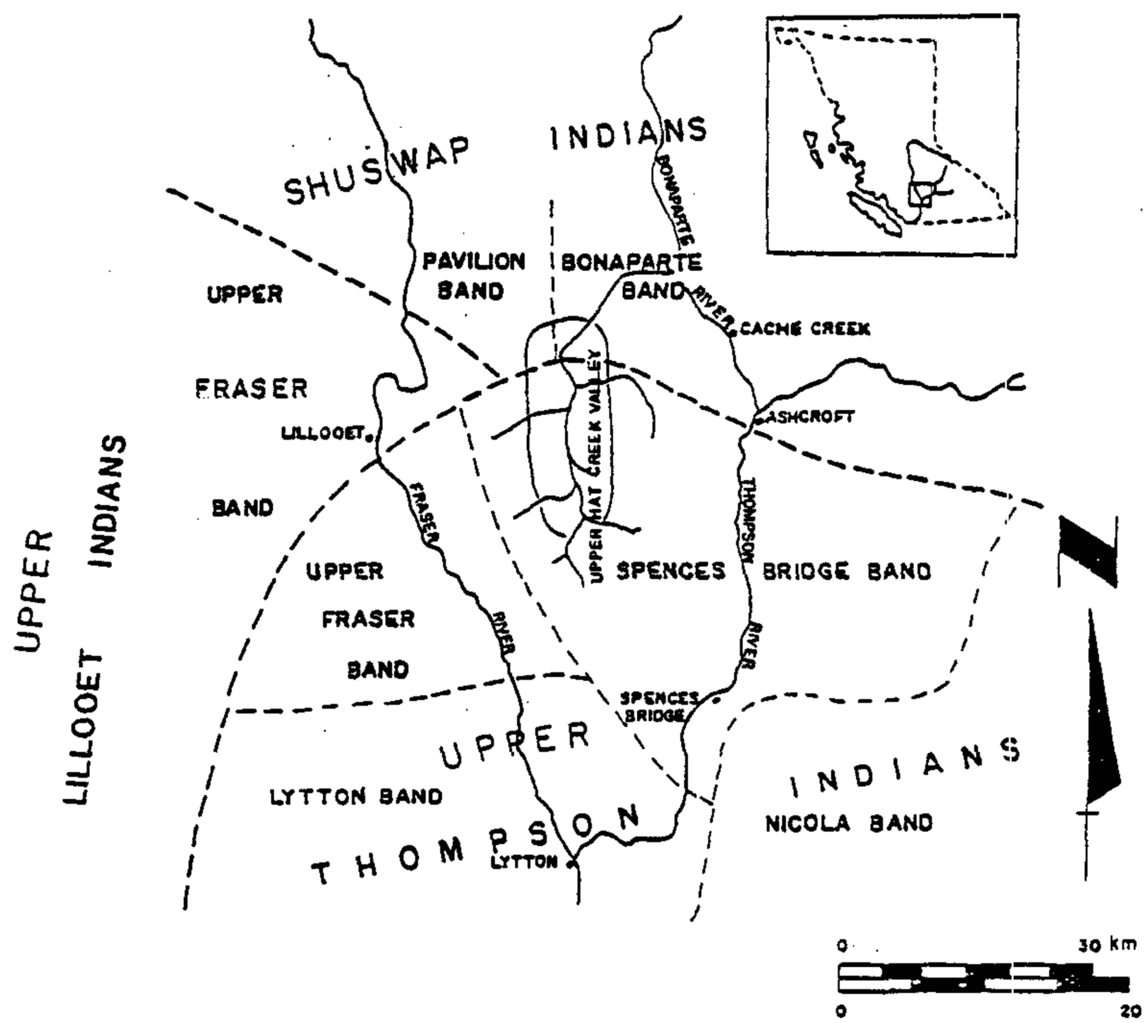
Ethnohistorically, the southern interior plateau of British Columbia was occupied predominantly by native populations speaking languages of the Interior Salish family. The Upper Thompson, the Shuswap and Upper Lillooet peoples inhabited most of the regional study area (see Figs. 2-1 and 2-2). Of particular relevance to this report are the Thompson-speaking Upper Fraser and Spences Bridge bands,* the Shuswap-speaking Bonaparte and Pavilion bands, and the Lillooet-speaking Fraser River band. Their combined territories comprise the local study area (see Figs. 2-1 and 2-2) (Teit 1900, 1906, 1909).

(a) History of Ethnographic Research in the Regional Study Area

Simon Fraser and his party, during their historic journey along the Fraser River in 1808, were the first Europeans to contact the Interior Salish-speaking peoples directly (Lamb 1960). During his encampments with the Fraser River peoples, Fraser noted that European trade goods had preceded him into the southern interior plateau (Fraser 1966: 83; Kennedy and Bouchard 1978: 51). In general, Fraser's observations of native peoples

---

* In this report, the term "band" refers to a unit of socio-political organization present in ethnographic populations, rather than present-day administrative divisions recognized by the government (see Service 1966).



NORTHERN INTERIOR SALISH ETHNOGRAPHIC GROUP BOUNDARIES (AFTER TEIT 1900)

Figure 2-2

tend to be fragmentary and confusing (Lamb 1960; Kennedy and Bouchard 1978).

No reliable ethnographic data were recorded until G.M. Dawson (1891) made some notes on the Shuswap during his geological fieldwork in the southern interior during the years 1877, 1888, 1889 and 1890. Boas' brief note on the Shuswap (Boas 1890) is the first intentional ethnographic account of the native peoples in the regional study area. Shortly thereafter, Boas organized the Jesup North Pacific Expedition. This project sponsored J.A. Teit's investigations among the Thompson, Lillooet and Shuswap peoples. Teit's work culminated in the three major ethnographies for the regional study area (Teit 1900, 1906, 1909). C. Hill-Tout (1899, 1905) is the only other major ethnographer of the Thompson and the Lillooet at the turn of the century.

More recent research on native groups of the southern interior include V. Ray's (1939, 1942) studies of linguistic and cultural trait distributions and E.V. Steedman's (1930) ethnobotanical study of the Thompson Indians, based on Teit's field notes. J.G. Jorgensen (1969) reworked previous ethnographic information into a statistical study of linguistic and cultural relationships among Salish-speaking peoples. Similarity between two groups was measured by several statistical tests based upon the sharing of traits.

Beginning in the late 1960s, R. Bouchard and D.I.D. Kennedy conducted extensive ethnographic and linguistic fieldwork among the Lillooet (Bouchard 1968 to 1977, 1973c; Bouchard and Kennedy 1977; Kennedy 1971 to 1977; Kennedy and Bouchard 1975, 1978). Bouchard has also studied the Thompson (Bouchard 1973a) and the Shuswap (Bouchard 1973b) languages. Combining fieldwork with information gleaned from previous ethnographies, G.B. Palmer (1975a, 1975b) compiled an ethnobotanical report for the Shuswap and reconstructed the pre-contact Shuswap's cultural ecology. N.J. Turner (1972, 1974, 1978) has recently completed research on interior peoples' ethnobotany.

(b) Aspects of the Environment in the Regional Study Area of Ethnographic Importance

Lying in the rain shadow of the Coast Mountains, the regional study area is characterized by semi-arid, continental climate with warm summers and cold winters (Pokotylo 1978: 40-41). Plateaus, highlands, mountains and entrenched river valleys modify the general climatic parameters into mumerous ecozones (Vance 1979). Variations in elevation within the regional study area are manifested in four predominant biogeoclimatic zones: Alpine Tundra, Engelmann Spruce-Subalpine Fir, Interior Douglas Fir and Ponderosa Pine-Bunchgrass (Krajina 1965). Other geographical variations have produced four other zones in the regional study area: Cariboo Aspen-Lodgepole Pine-Douglas Fir, Coastal Western Hemlock, Mountain Hemlock and Interior Western Hemlock (ibid.).

The major rivers in the regional study area are the Fraser and the Thompson. Secondary and tertiary tributaries are numerous, and several of these small rivers and streams function as outlets to lakes. Lakes, with and without access to the Fraser River drainage system, are common, especially in the Cariboo.

Plants utilized ethnographically for food by native peoples in the southern interior may be divided into four main types: 1) roots (including bulbs, tubers and rhizomes); 2) berries (including fruits and drupes); 3) vegetables (including shoots, leaves, stems and cambium); and 4) nuts and seeds. These plant foods varied in availability and productivity within the regional study area. Variations in their geographic distribution are attributable to habitat.

Roots were available throughout the regional study area, but were most plentiful in the southeastern quarter (Teit 1906: 222, 1909: 514). Generally, edible roots were more numerous in the uplands (e.g. Botanie valley) than in the low, dry valleys (Teit 1900: 231; Steedman 1930: 477). An exception was the bitter-root (Lewisia rediviva Pursh) gathering grounds ("100-Mile Flats") in the vicinity of Ashcroft (Davidson 1915). Table 2-1 lists the major species with edible roots, along with their habitats and seasonal availability.

Berries were more extensively distributed than roots; however, the berry crop in the Lillooet territory was not as large as that in the Thompson territory (Teit 1906: 222). Table 2-2 lists the major species in the regional study area, with their habitats and seasonal availability. From this table, it can be inferred that berries are more common and more varied in dry, open valleys and slopes than in wooded areas.

Of the many plants utilized as vegetables by the native peoples, only white-bark pine (Pinus albicaulis) cambium, prickly-pear cactus (Opuntia sp.) and balsamroot (Balsamorhiza sagittata Pursh) have a limited distribution. The latter two species are confined to the more arid habitats (Hitchcock and Cronquist 1974; Teit 1909; Turner 1978). White-bark pine most often grows above 1900 m (6494 ft) (Vance 1979). Table 2-3 lists the species eaten extensively as vegetables.

Nutlets could be harvested from the conifer species listed in Table 2-4. Hazelnuts (Corylus cornuta Marsh) could be found on open, rocky slopes throughout the regional study area (Turner 1978: 126). Balsamroot seeds are edible, but as noted above, this species is confined to arid habitats (Teit 1900: 233; Turner 1978).

TABLE 2-1

EDIBLE ROOTS IN THE SOUTHERN INTERIOR:
HABITAT AND SEASONAL AVAILABILITY
(cf. Turner 1978)

EDIBLE ROOT	HABITAT							SEASON				
	dry, open slopes	dry, open plains	dry, open woods	meadows	mountains and high valleys	moist woods	swamps and marshes	early spring	late spring	early summer	late summer	autumn
sweet cicely Osmorhiza chilensis						X		X				
balsamroot Balsamorhiza sagittata	X	X						X				
waterleaf Hydrophyllum capitatum				X		X			X			
yellowbell Fritillaria pudica	X	X	X					X	X	X		
water parsnip Sium suave							X	X	X	x		
mariposa lily Calochortus macrocarpus	x	x						x	x	x		
yellow avalanche lily Erythronium grandiflorum					X			X	X	X	X	
chocolate lily Fritillaria lanceolata				X				X	X	X	X	
wild onion Allium sp.	X	X	X					X	X	X	X	
Chocolate tips Lomatium dissectum	X								X	X		
wild carrot Lomatium macrocarpum	X	X							X	X		
spring beauty Claytonia lanceolata	X			X	X	X			X	X		
bitter-root Lewisia rediviva	X	X								X		
Tiger lily Lilium columbianum				X		X			X		X	X
cinquefoil Potentilla anserina							X				X	X
wild thistle Cirsium edule	X	X		X		X						X

TABLE 2-2

EDIBLE BERRIES IN THE SOUTHERN INTERIOR:
HABITAT AND SEASONAL AVAILABILITY
(cf. Turner 1978)

EDIBLE BERRY	HABITAT					SEASON			
	dry, open slopes, clearings and valleys	dry, open woods	moist woods and stream banks	coniferous forests	meadows	spring	early summer	late summer	autumn
wild strawberry *Fragaria virginiana*	x	x				x	x		
saskatoon *Amelanchier alnifolia*	x						x	x	
squaw currant *Ribes cereum*	x						x	x	
soapberry *Shepherdia canadensis*		x					x	x	
wild raspberry *Rubus idaeus*	x	x	x					x	
blue elderberry *Sambucus cerulea*	x							x	
oregon grape *Berberis* sp.	x							x	
kinnikinnick *Arctostaphylos uva-ursi*	x							x	x
chokecherry *Prunus virginiana*	x	x	x					x	x
bilberry *Vaccinium* sp.	x		x	x				x	x
blueberry *Vaccinium* sp.					x			x	x
cranberry *Viburnum edule*			x						x

TABLE 2-3

SPECIES EATEN AS VEGETABLES BY NATIVE PEOPLES IN THE SOUTHERN INTERIOR
(cf. Teit 1900, 1906, 1909; Steedman 1930; Kennedy and Bouchard 1978; Turner 1978)

Common Name	Scientific Name
wild rhubarb	Heracleum lanatum
chocolate tips	Lomatium dissectum
wild celery	Lomatium nudicaule
fireweed	Epilobium angustifolium
balsamroot	Balsamorhiza sagittata
prickly pear cactus	Opuntia sp.
stinging nettle*	Urtica dioica
black tree lichen	Alectoria fremontii
lodgepole pine cambium	Pinus contorta
ponderosa pine cambium	Pinus ponderosa
white-bark pine cambium	Pinus albicaulis
trembling aspen cambium	Populus tremuloides
cottonwood cambium	Populus trichocarpa

*Turner (1978:209) states that the Upper Lillocet may have learned to use this plant from Europeans.

TABLE 2-4

SOURCES OF NUTLETS, NUTS AND SEEDS
IN THE SOUTHERN INTERIOR
(cf. Teit 1900, 1906, 1909; Steedman 1930;
Kennedy and Bouchard 1978; Turner 1978)

	Common Name	Scientific Name
Nutlets	lodgepole pine	*Pinus contorta*
	ponderosa pine	*Pinus ponderosa*
	white-bark pine	*Pinus albicaulis*
Nuts	hazelnut	*Corylus cornuta*
Seeds	balsamroot	*Balsamorhiza sagittata*

Four kinds of salmon migrate into the regional study area: pink (Oncorhynchus gorbuscha), coho (O. kisutch), spring (O. tshawytscha) and sockeye (O. nerka). Pink salmon do not migrate above the Bridge River confluence on the Fraser River, but have large runs into the Thompson and Nicola rivers (Kew 1976: 3-4). The other salmon are wide-spread throughout the Fraser River system (ibid.). Sockeye and pink salmon have the largest runs, but their numbers fluctuate drastically from year to year (ibid.). Downstream points have more and larger salmon available than upstream points (Kew 1976: 7, 8; Idler and Clemens 1959).

Many species of fish other than salmon were available to native peoples in the regional study area (see Table 2-5). Most of these freshwater fishes spawn during the spring and early summer (Carl, Clemens and Lindsey 1973). However, Dolly Varden (Salvelinus malma), kokanee or land-locked salmon (O. nerka) and mountain whitefish (Prosopium williamsoni) spawn in the autumn, and burbot (Lota lota) spawn in February (ibid.). Spawning takes place near lakeshores or in steams (ibid.).

Mule deer (Odocoileus hemionus hemionus) and black bear (Ursus americanus) were omnipresent in the regional study area (Cowan and Guiguet 1975; Teit 1900, 1906, 1909). Elk (Cervus canadensis) was especially common in Shuswap and Upper Thompson territories (ibid.), but its presence in Upper Lillooet territory is problematic. Teit (1906: 225) claims no elk inhabited the area, whereas Kennedy and Bouchard (1978: 41) state that the Fraser River Lillooet hunted elk. However, elk virtually disappeared from the regional study area during the 19th century (Teit 1900, 1909). Moose (Alces alces) have since spread extensively into the area from the northeast (Cowan and Guiguet 1975: 378).

TABLE 2-5

FRESHWATER FISH SPECIES IN THE SOUTHERN INTERIOR
(cf. Carl, Clemens and Lindsey)

FRESHWATER FISH SPECIES	SPAWNING					
	HABITAT		SEASON			
	Lakeshore	Stream	Spring	Summer	Autumn	Winter
white sturgeon *Acipenser transmontanus*	?	?	x			
Pacific Lamprey *Entosphenus tridentatus*		x	?	?		
rainbow or steelhead trout *Salmo gairdneri*		x	x	x		x
coastal cutthroat trout *Salmo clarki clarki*		x	x			x
sucker *Catostomus* sp.		x	x			
sculpin *Cottus* sp.		x	x			
squawfish *Ptychocheilus oregonensis*	x			x		
Dolly Varden *Salvelinus malma*		x			x	
kokanee *Oncorhynchus nerka*	x	x			x	
mountain whitefish *Prosopium williamsoni*		x			x	
burbot *Lota lota*	x	x				x

Mountain goats (Oreamnos americanus) are currently restricted in the regional study area to the west side of the Fraser River north of Lytton and to the Cascade Mountains south of the Nicola River (Environment Canada 1974; Cowan and Guiguet 1975). Bighorn sheep (Ovis canadensis) can be found west of the Fraser River north of Lillooet, in the Marble Range and in the Cornwall Hills (ibid.). Table 2-6 lists small mammals of ethnographic importance; Table 2-7, birds of enthnographic importance.

(c) A Reconstruction of Pre-contact Cultural Systems

It should be noted that all the ethnographies mentioned in Section 2.3(a) are based on fieldwork among native peoples after the disruption of their aboriginal lifeways by the influx of Europeans into the southern interior plateau. Substantial change among the Lillooet is noted as early as 1859 by Judge Begbie (1861: 242-243) as quoted by Kennedy and Bouchard (1978: 52). The Shuswap were pulled into the European economic sphere even earlier with the establishment of a Northwest Company trading post in Carrier territory in 1806 and the Alexandria post in northern Shuswap territory in 1821 (Teit 1909: 535). The Thompson Indians, however, were acculturated at a slower rate than the Shuswap (Teit 1909: 495-496).

Factors altering the aboriginal cultural systems are listed by Pokotylo (1978: 89-90):

> a drastic population decline due to introduced diseases such as smallpox; the destruction or restriction of natural environmental resources, due to the introduction of mining, lumbering, ranching, and farming operations as well as native participation in these industries; and the largely sedentary nature of the band structure due to establishment of reserves.

TABLE 2-6

SMALL MAMMALS OF ETHNOGRAPHIC IMPORTANCE
IN THE SOUTHERN INTERIOR
(cf. Teit 1900, 1906, 1909; Steedman 1930;
Kennedy and Bouchard 1978; Turner 1978)

Common Name	Scientific Name
beaver	Castor canadensis
marmot	Marmota sp.
porcupine	Erethizon dorsatum nigrescens
hare	Lepus americanus
rabbit (?)	Sylvilagus nuttalli nuttalli (?)
rock rabbit	Ochotona sp.
squirrel	Tamiasciurus hudsonicus
coyote	Canis latrans
lynx	Lynx canadensis canadensis

(?) Rabbits, though listed by Teit (1900, 1906) as a food source, are not known to inhabit the regional study area (Cowan and Guiguet 1975).

TABLE 2-7

BIRD SPECIES OF POTENTIAL ETHNOGRAPHIC IMPORTANCE
IN THE SOUTHERN INTERIOR

BIRD SPECIES	COMMENTS
Canada goose Branta canadensis	migrates through and nests in southern B.C.
mallard Anas platyrhynchos	winters in southern B.C.
gadwall Anas strepera	breeds at 150 Mile House, Cariboo
pintail Anas acuta	breeds in some areas of B.C. interior
green-winged teal Anas carolinensis	nests in B.C. interior; some winter in southern interior
blue-winged teal Anas discors	some nest in southern interior, north to Atlin and Peace Rivers
cinnamon teal Anas cyanoptera	some nest in southern interior, north to Williams Lake
shoveller Spatula clypeata	breeds in southern interior

TABLE 2-7 - (Cont'd)

BIRD SPECIES	COMMENTS
redhead Aythya americana	breeds from Vanderhoof, Cariboo, south to Canada-US border
canvasback Aythya valisineria	abundant in Cariboo parklands during the summer; few nest in southern interior
ring-necked duck Aytha collaris	breeds in Cariboo
lesser scaup Aythya affinis	breeds in Cariboo and particularly in southern interior
common goldeneye Bucephula clangula	occasionally nests in Cariboo
Barrow's goldeneye Bucephula islandica	nests in southern interior and particularly in Cariboo
bufflehead Bucephula albeola	nests throughout B.C. interior
harlequin duck Histrionicus histrionicus	nests throughout B.C. interior; but more plentiful in southern interior
white-winged scoter Melanitta deglandi	nests in Cariboo and Nicola Valley
ruddy duck Oxyura jamaicensis	nests throughout B.C. interior, but more plentiful in southern interior

TABLE 2-7 - (Cont'd)

BIRD SPECIES	COMMENTS
hooded merganser Lophodytes cucullatus	breeds in interior B.C.
common merganser Mergus merganser	occasionally migrates through Cariboo
common loon Gavia immer	common throughout B.C. interior
red-necked grebe Podiceps grisegana	" "
horned grebe Podiceps auritus	" "
eared grebe Podiceps caspicus	" "
pied-billed grebe Podilymbus podiceps	common throughout B.C. interior
American bittern Botaurus lentiginosus	" "
American widgeon Mareca americana	many nest in Cariboo during summer
sandhill crane Grus canadensis	found in Cariboo and Okanagan during summer

TABLE 2-7 - (Cont'd)

BIRD SPECIES	COMMENTS
Virginia rail Rallus limicola	breeds in southern B.C.
sora Porzana carolina	breeds in southern and central B.C.
American coot Fulica americana	" "
blue grouse Dendragapus obscurus	throughout interior B.C. except between Fraser and Thompson Rivers north of 70 Mile House
spruce grouse Canachites canadensis	throughout interior B.C., but limited to higher elevations
ruffed grouse Bonasa umbellus	throughout interior B.C. but partial to deciduous and mixed woods, wood edges and riparian habitats
robin Turdus migratorius	
white-tailed ptarmigan Lagopus leucurus	
whistling swan Olor columbianus	

To this list, the imposition of European social mores and laws could be added.

Similarities outweigh differences among native groups in the regional study area. On the basis of shared cultural traits, Jorgenson (1969: 65) groups Shuswap and Thompson cultures into the "Thompson Culture Cluster", and joins Lillooet culture to this cluster to form the "Northwestern Interior Salish Culture Group". He also suggests that Thompson and Shuswap are dialects of the same language (ibid.: 18) and that this language is closely related to Lillooet (ibid.: 21). This marked similarity of language and culture has been noted by other ethnographers as well (see Ray 1942; Teit 1900, 1906, 1909).

Many of these similarities may be attributed to constraints inherent in band-level organization,* hunter-gatherer-fisher economy and existence in a semi-arid environment. Within this context, however, the Upper Thompson, the Shuswap and the Upper Lillooet cultural systems differ perceptably from each other. Their differences are alterations of the basic socio-economic organization, which tailor each cultural system's adaptation to the specific environmental features in its territory. Therefore, a generalized account of the three cultural systems will be presented; and the differences among the systems, noted.

According to the ethnographies (Teit 1900, 1906, 1909; Steedman 1930; Ray 1939; Palmer 1975b; Kennedy and Bouchard 1978), the general subsistence schedule guiding native peoples in the regional study area can be outlined as seen in Table 2-8. In addition to seasonal considerations, native peoples had to co-ordinate their economic activities with geographic variations

---

* Band-level organization stresses egalitarianism and flexibility in social relationships (cf. Service 1966; Fried 1967).

TABLE 2-8

GENERALIZED SUBSISTENCE SCHEDULE FOR UPPER THOMPSON, SHUSWAP AND UPPER LILLOOET

	SUBSISTENCE ACTIVITIES		
SEASON	Hunting	Fishing	Gathering
Early Spring	deer, elk, goat±	non-anadramous fish*	green shoots, roots
Late Spring	deer, elk, marmot+ waterfowl+	non-anadramous fish*	green shoots, roots, cambium
Early Summer	deer, elk, marmot+ waterfowl+	salmon, non-anadramous fish	roots,* berries
Late Summer		salmon*	berries,* seeds*
Early Autumn	deer, elk, waterfowl+	salmon, non-anadramous fish	berries,* nutlets,* nuts, roots
Late Autumn	deer,* elk,* bear, beaver, sheep°	non-anadramous fish	roots
Winter	deer, elk, goat,± small mammals	non-anadramous fish (ice-fishing)	

* = intensive exploitation
\+ = available at this time and not in conflict with salmon fishing (season of exploitation not specified in ethnographies)
o = ethnographies indicate sheep were hunted during mating season (Teit 1909: 521)
± = goats are driven into small pastures at lower elevations by deep snows and may be more accessible during the winter and early spring

in resource availability (i.e. they had to be in the right place at the right time to ensure their material well-being). Yet another scheduling problem is raised by the sexual division of labour. In general, men hunted and fished while women gathered plants and processed caught fish.* Thus, the right number of men and/or women had to be present as well for an economic activity to be successful.

In early spring, after the snow and ice had melted, native people moved to lakeshores, lake outlets and lake inlets to catch spring-spawning fish as well as migrating salmon fry (Teit 1900: 251-252, 254, 1909: 526-530). Besides fishing, men may have also hunted deer, elk, goats and small mammals. Women gathered green shoots and roots (Teit 1900, 1906, 1909). During the spring, the Fraser River Lillooet burned hillsides to promote the summer berry crop (Kennedy and Bouchard 1978: 42). Teit (1900: 230) remarks that the Thompson burn woods "to secure a greater abundance of roots," but does not specify the season.**

Fishing and hunting would continue through late spring and into the summer. Tree cambium, especially lodgepole pine, would be harvested in the late spring (Turner 1978). Root-gathering would increase in intensity as people moved from the lowlands to the highlands, following the root crop (Teit 1900: 230). Hunters accompanied women to their gathering spots (ibid.).

Usually, roots were not eaten raw, but were dried, boiled, steamed and/or roasted (Teit 1900: 235-237, 1906: 223,

---

* An exception was the Shuswap women who fished from canoes on the lakes (Teit 1909: 526).

** Fireweed, a widely eaten vegetable, tends to pioneer old burns (Hitchcock and Cronquist 1974: 306) and would also be encouraged by these hillside burnings.

1909: 516-517; Steedman 1930: 477). Roots were processed near the gathering areas (Dawson 1891: 9); and both men and women constructed the earth ovens used to roast or steam roots (ibid.). These ovens were generally rather small: 10 feet (3 m) square (Dawson 1891: 21) and 18 to 30 inches (46 to 16 cm) deep (Dawson 1891: 21; Teit 1900: 236; Ray 1942: 138). In general, they were constructed by digging a circular hole into the ground and placing rocks in the hole, which were then heated by a fire (Teit 1900: 236). The roots were placed in between layers of brush, which often included conifer branches and needles (Teit 1900: 236; Ray 1942: 138). Occasionally, berries, meat or flowers were placed in the ovens to flavour the roots (Teit 1900: 237; Ray 1942: 137-138; Steedman 1930: 478).

As summer progressed, berry-gathering supplanted root-gathering (Teit 1900, 1906, 1909). Men continued to hunt, though the Upper Lillooet may have fished for spring salmon (Teit 1906: 224; Kennedy and Bouchard 1978: 39) and some Shuswap may have fished for lake trout (Teit 1909: 518). Waterfowl nesting near lakes in the Cariboo parklands (Guiguet 1954; Godfrey 1966) may have been exploited by Shuswap fishermen, but no specific reference to waterfowl procurement exists in the ethnographies, other than Ray's (1942: 120) mention of duck nets used by the Shuswap.

By late summer, the major salmon runs would have begun and people would congregate at favourite fishing spots: 1) the mouth of the Fountain River (Teit 1900: 259); 2) the Fraser River between the present town of Lillooet and the Fountain River (Teit 1906: 227-228) and; 3) the Fraser River between the Fountain River and Pavilion (Teit 1909: 524). Salmon were processed and stored in underground cachepits or elevated box caches near fishing sites (Teit 1900: 234; Kennedy and Bouchard 1978: 40, 43). Both hunting and gathering (berries, balsamroot seeds) may have persisted through late summer, especially in areas or in years with poor salmon runs.

Subsistence activities in the early autumn would have been characterized by the slackening of salmon-fishing and the intensification of large mammal hunting (Teit 1900, 1906, 1909). Berry and root-gathering would have resumed or increased at this time as well (ibid.). Hazelnuts and pine nutlets, especially from the high-elevation white-bark pine,* would be collected in large numbers by the women (Teit 1900, 1906, 1909; Dawson 1891). The Upper Thompson often roasted the nutlets (Steedman 1930: 491). In addition, trout and autumn-spawning fish were caught in the lakes and streams (Teit 1900: 231).

Late autumn was devoted to hunting and trapping (Teit 1900, 1906, 1909). Deer and elk, on their seasonal migration from uplands to lowlands, were ensnared and killed with the aid of fences and corrals (Teit 1900: 245-246; 1909: 521-522). Because of their increased body fat, bear and beaver may have also been hunted in the autumn. Bighorn sheep may have been hunted during rutting season, since native hunters attracted them by imitating the sound of rams fighting (Teit 1909: 521).

Most of the winter diet came from stored provisions, though some fresh food was obtained through occasional hunting, trapping and ice-fishing (Teit 1900, 1906, 1909). Mountain goat may have been most accessible at this time of year: deep snows drive the goats well below the timberline (Cowan and Guiguet 1975). Burbot may have been the most outstanding potential source of fresh fish. While other fish remain in deep water, burbot swarms into the shallows under the ice to spawn in February (Carl,

---

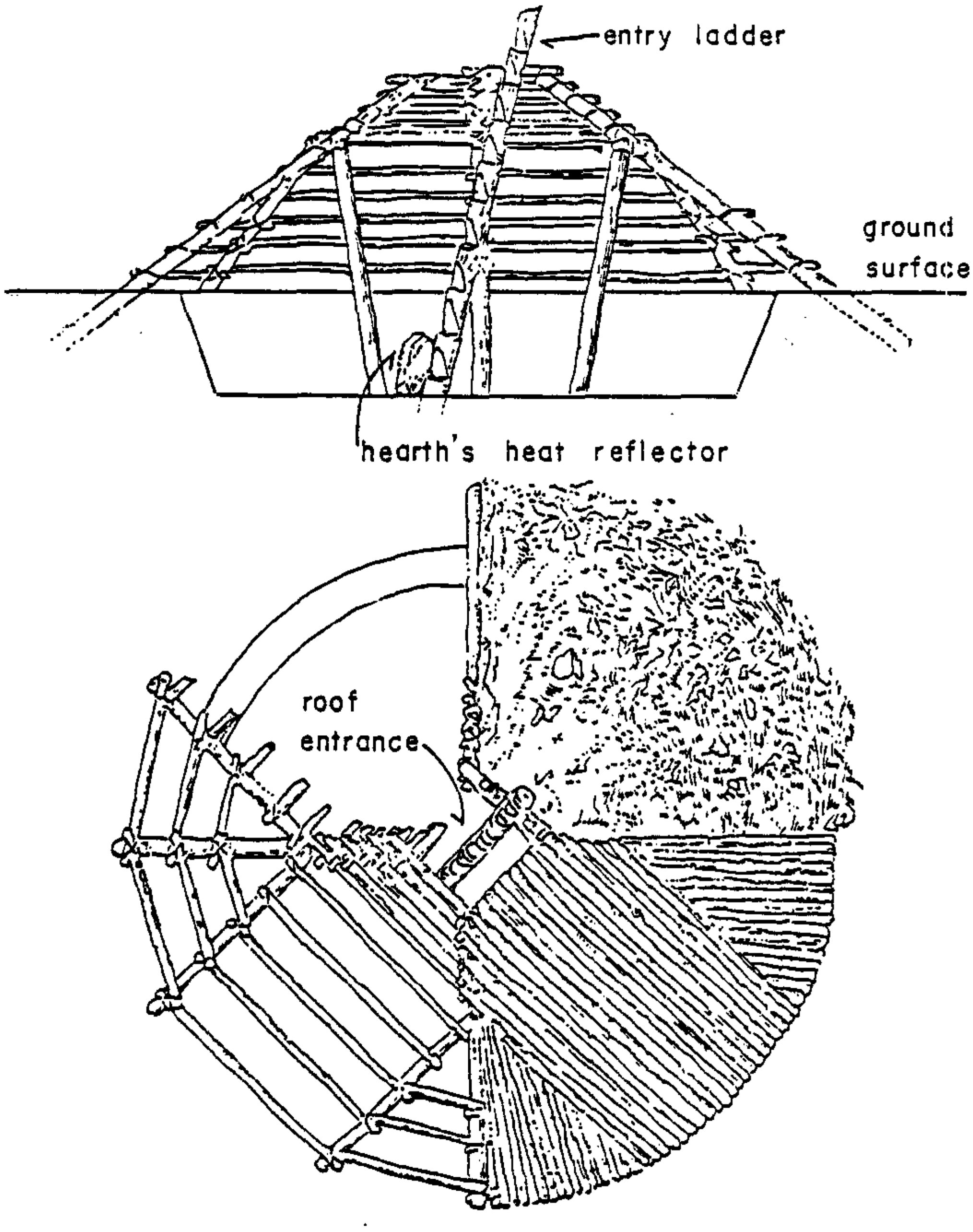
* The Shuswap-speaking Bonaparte and Pavilion bands utilized ponderosa pine nutlets extensively (Teit 1909: 515).

Clemens and Lindsey 1973: 142). Another source of fish would have been the dead kokanee which wash up along the shores of Seton Lake in early winter (Kennedy and Bouchard 1978: 40).

This subsistence schedule was linked to a semi-nomadic settlement system. While exploiting various plant and animal resources, the native people lived in a succession of temporary camps (Teit 1900, 1906, 1909). Shelters in these camps consisted to tule mats, brushes, bark or skins placed over a wood frame (15 to 20 ft or 4.6 to 6.0 m in diameter) (Dawson 1891: 8; Teit 1900: 195-197, 1909: 493). Sturdier structures with log foundations (9 to 18 m long x 7 to 11 m wide) were built at camps revisited annually (e.g. Fountain and Pavilion valleys) (Teit 1900: 196, 1906: 215, 1909: 493; Kennedy and Bouchard 1978: 38). Favourite root-gathering places (e.g. Botanie valley, "100-Mile Flats" near Ashcroft) and fishing resorts (e.g. Fountain River, Green Lake) attracted large numbers of people and encouraged trading (Teit 1909: 493, 536-537; Turner 1978). Large mat lodges (15 x 60 ft or 4.6 x 18.3 m) were often erected to accommodate these crowds (Teit 1900: 196).

In the winter, most people moved into semi-subterranean pithouses (see Fig. 2-3).* The average housepit diameter was 22 feet (6.7 m) for the Thompson, 26 feet (7.9 m) for the Shuswap, and 30 feet (9.1 m) for the Lillooet (Ray 1942: 177), though diameters ranged up to 40 to 50 feet (12 to 15 m) (Teit 1900: 192, 1906: 213). These winter dwellings were clustered into villages situated in major river valleys (Dawson 1891: 8; Teit 1900: 192). Generally, a village comprised less than four pithouses, but the number varied (Teit 1900: 192). Cachepits containing food to be

* The Lakes and Empire Valley Shuswap did not use pithouses, but remained nomadic throughout the winter (Teit 1909: 459-460, 492, 494).



SCHEMATIC SIDE AND PLAN VIEW OF
SEMI-SUBTERRANEAN PIT HOUSES
UTILIZED BY THE THOMPSON INDIANS

(after Teit 1900)

Figure 2-3

consumed during the winter were placed near the pithouses (Teit 1906: 223; Kennedy and Bouchard 1978: 43). Cachepits were about 4 feet (1.2 m) deep and varied in width (Teit 1900: 198-199).

Differences among the Upper Thompson, Shuswap and Upper Lillooet include the degree to which each group relied upon salmon fishing, hunting or plant-gathering to provide the staples of their diet. The Upper Lillooet depended upon salmon fishing more than any other interior group (Teit 1906: 227; Kennedy and Bouchard 1978: 39). Teit (1909: 513) characterizes the Shuswap "as a hunting and fishing tribe; the former occupation, on the whole, predominating." He adds that the Shuswap depended more upon small fish and game, and less upon salmon and roots than did the Thompson (Teit 1909: 513-514). Palmer (1975b: 217) also notes that plants were a minimal component of Shuswap diet. Finally, the staples of the Thompson diet include deer, salmon, roots and berries (Teit 1900: 230), but with the heaviest emphasis on deer, roots and berries (Teit 1900: 230; Steedman 1930: 477). Teit (1900, 1906, 1909) also implies that roots were more important to the Upper Thompson than to either the Upper Lillooet or the Shuswap.

Besides the more nomadic existence of the Shuswap, differences in settlement among the three groups are manifest in population densities. Pokotylo (1975) has calculated native populations circa 1835 (see Table 2-9). Lillooet territory was the most densely populated; and Shuswap territory, the least densely populated.

TABLE 2-9

POPULATION ESTIMATES FOR FRASER RIVER GROUPS
CIRCA 1935
(after Pokotylo 1975)

Group	Population	Area (sq. miles)	Density (per 10 sq. miles)
Lillooet	2,400	5,750	4.17
Thompson	4,000	11,425	3.50
Shuswap	4,500	35,175	1.28

2.3 ETHNOGRAPHIC BACKGROUND - (Cont'd)

As in most band societies, social organization among the Upper Thompson, southern Shuswap* and Upper Lillooet was based upon two principles: kinship and residence. Kin were defined as descendents of a common ancestor (Teit 1900: 290, 1906: 252, 1909: 570-571); and an individual could trace his relationships through both parents (ibid.). No formal kinship groups existed among either the Thompson or the Shuswap (Teit 1900: 290, 1909: 570), but the Lillooet had descent groups named after the common ancestor (e.g. Coyote people) (Kennedy and Bouchard 1978: 44).**

Residence groups, such as bands, villages and households, were defined by the individuals living in a specified locale. Membership in a residence group was determined by kin relationships (see Teit 1900: 192, 293, 1906: 252, 1909: 452, 457), and entitled an individual to certain property, rights and services (see Teit 1900: 293-295, 299, 300, 1906: 255-256, 1909: 571-574). Over time a group's membership varied. Individuals and families periodically moved between villages and between bands (Teit 1900: 290, 1909: 570; Kennedy and Bouchard 1978:46).

Land and resources were not owned per se, but residence groups held communal property rights over these essential commodities (Teit 1900: 293, 1906: 256, 1909: 572). These rights entitled the group's members to utilize the resources and to regulate the use of the resources by non-group members (Teit 1900: 293-294, 1906: 256, 1909: 572-573). Other groups had the right to share in harvesting abundant resources as long as they abided by the regulations stipulated by the "owners" (ibid.). Facilities

* Teit (1909: 569) submits that the social organization of the northern and western Shuswap had been transformed from the aboriginal system by contact with, and influence by, the Carrier and the Chilcotin. However, he believed that the southern Shuswap retained the aboriginal system of social organization.

** Teit (1906: 252) calls the Lillooet descent groups "clans".

manufactured by residence groups (e.g. fish weirs) were considered communal property as well (Teit 1906: 256, 1909: 572). Communal property rights were substantiated and perpetuated by a group's continued and frequent use of the resources (ibid.).

Personal property was restricted to those items and facilities manufactured by an individual (e.g. arrows, baskets, clothing, deer fences) and could be inherited by an individual's kin (Teit 1900: 293, 1906: 255, 1909: 571). Among the Thompson, an individual could own a developed facility and its location (Teit 1900: 293-294); whereas among the Shuswap, fishing locations were shared and deer fence locations were owned only while in continuous use (Teit 1909: 572-573). Spouses did not own any property jointly (Teit 1900: 293, 1906: 269, 1909: 571).

Sharing food and giving gifts were customs which secured provisions for the less fortunate members of society. Meat was shared among all members of a hunting party and among a hunter's neighbours (Teit 1900: 294-195, 1906: 256, 1909: 573). Relatives and friends invariably shared food in times of scarcity (Teit 1900: 299, 1909: 574). Prestigious individuals were reputed to be generous, and therefore, often gave gifts to the needy (Teit 1900: 289, 1909: 569).

Decisions in a residence group were made by a consensus of adult males, but no individual was bound to the group's decision: dissidents left the group (Teit 1900: 289-290, 292, 1906: 257; Kennedy and Bouchard 1978: 44). In general, leaders were men who had achieved fame for their sound advice or their skills (Teit 1900: 289, 1906: 255, 1909: 569). The Shuswap band chief served as a co-ordinator of resource utilization, advisor and agent to strangers (ibid.), while the Lillooet chief supervised the berry crop harvest (Teit 1906: 256).* In all cases, leaders functioned by persuasion rather than by coersion (Teit 1900:289, 1906: 255, 257, 1909: 569-570; Kennedy and Bouchard 1978: 44).

2.4 HISTORIC BACKGROUND

The earliest entry and settlement by Europeans in British Columbia occurred in the interior: the initial arrival was marked by the overland journey of Alexander Mackenzie to the Pacific in 1793. Nevertheless, the interior remained vacant until the early 19th century when small, dispersed white settlements associated with the fur trade were established in the area of the north-central interior known as New Caledonia (Robinson and Hardwick 1973: 11). This settlement gradually expanded southward as new transportation routes and fur trade areas were established.

The first actual European entry into the southern interior was an expedition led by Simon Fraser in 1808, down the river that now bears his name, in order to discover potential supply routes for the fur trade. Relative to the northern interior, fur resources of the plateau were not nearly as productive and thus not as intensively utilized by the fur trade. The major settlement in the Thompson-Fraser plateau region was Fort Kamloops, established in 1812 (Balf 1969: 6-13).

These settlements were mainly occupied by people associated with the fur trade. The colonization of any additional land by immigrants was discouraged by the fur trade enterprises, which were the main authority in the area of British Columbia at that time. It has been suggested that the Hudson's Bay Company was aware of gold in the

---

* Lillooet chiefs could be either men or women (Teit 1906: 254), while Shuswap chiefs were invariably men (Teit 1909: 569).

2.4 HISTORIC BACKGROUND - (Cont'd)

mid-Fraser area as early as 1852, but were unwilling to make this knowledge public for fear that mining activities would severely damage the fur trade economy (Balf 1969: 13).

European settlement throughout the interior continued to be light until the start of the gold rush to the mid-Fraser area in 1958. The area between Lytton and Lillooet was the focus of considerable mining activity by 1860, although interest then shifted north to the Cariboo (Siemens 1972: 19-20). The gold rush period (1858 to 1866) represents the first substantial European settlement and utilization of the B.C. interior. While the initial population was attracted by news of gold, this was soon augmented by agricultural and ranching interests. This shift in economy away from gold-mining continued throughout the post-gold period. Eventually, forestry interests rivalled those of agriculture and ranching. Increased population and intensified land use created the need for easily accessible transportation routes from the lower mainland to the interior. The two major routes established, the Harrison Lake-Lillooet route and the Cariboo Road through the Fraser, Thompson and Bonaparte River valleys, ran northwest and east, respectively, of upper Hat Creek valley.

Specific relationships of upper Hat Creek valley to the history of the B.C. interior are not, however, well documented in the regional literature. These data have been supplemented by detailed information on the local valley history, primarily based on a compilation of oral history and archival sources (Graham 1977). In some instances, the oral history and archival information has been corroborated by historic archaeological data (Donahue 1979).

An early reference to the Hat Creek watershed is made in the diary of A.C. Anderson for 17 May 1846 during his explorations for a route to Fort Langley from the interior (Graham 1977: 2). Anderson refers to the drainage as the "Rivers au Chapeaux" (sic), implying that the area may have played some role in the fur trade when French was the dominant fur-trade language. The first documented settlement in the Hat Creek watershed was established by Donald McLean, the former chief trader for the Hudson's Bay Company at Kamloops. McLean took up land at the confluence of Hat Creek and the Bonaparte River in 1860 (Balf 1969: 13).

During the 1860s, the upper Hat Creek valley was occupied, for at least part of the year, by cattle drovers and packers who ran a few hundred head of cattle. This information is contained in an application for a grazing lease by the Cornwall brothers in 1865, who required additional rangeland for their ranch at Ashcroft (see Johnson 1970: 16). This lease was not granted upon the first application, though the Cornwalls later obtained the rights to 6000 acres of grazing land in the valley (ibid.: 17). In 1865 Philip Houghton applied for and was granted a lease on land that now comprises the main hay fields of the Gordon Parke Ranch.

Further references to the upper Hat Creek valley are not present in the regional literature. Nevertheless, oral history and archival research by Graham (1977) provides a chronological view of the local valley settlement. This is briefly outlined below.

No further applications for leases are recorded until the 1880s. Between 1880 and 1900 a number of both European and native homesteaders and squatters arrived in the upper Hat Creek valley. Some families, such as the Pococks, remained in the valley till present day, but many stayed only a few years.

Farming, rather than cattle ranching, was the predominant occupation of the early valley residents. Since most heavy farm work utilized horses, much of the cultivated land was devoted to hay fields to insure sufficient winter feed for horses. In the valley, a sawmill and a coal mine were operated by George Finney during the 1890s. In

2.4 HISTORIC BACKGROUND - (Cont'd)

1884 the CPR railroad was completed to Ashcroft, providing rail service to Vancouver from this area.

The 1900s ushered in the beginning of large cattle ranches. Previously, the Cornwalls and Philip Parke had run several hundred head of cattle in the valley, but both ranches had the majority of their holdings near Cache Creek. Both used the upper Hat Creek valley property mostly for winter feeding and to grow hay.

Tong Sing, a Cache Creek store owner, bought out several small property owners in the early 1900s to become the first large rancher within the upper Hat Creek valley. Between 600 and 1000 head of cattle were maintained at times on the "China Ranch". Root crops and hay grown on the ranch were sold in his Cache Creek store and shipped to Vancouver. This land was later acquired by Alan Cameron in 1949.

By 1920 all the land which had been available for homesteading had been taken. Despite this lack of new land, the post-1920 period is characterized by shifts in land ownership; various properties were sold, traded, inherited, split up or combined. Bottom land was preferred for agriculture as it provided a rich soil and access to water, and was generally easier to clear for fields. The east side of the valley had more naturally open land than the west. Early land clearing relied on man and horse power and was confined mostly to level ground. As earth-moving equipment became more common, gullies were cleared and evened out to make fields.

Sawmills utilizing wood from the upper Hat Creek valley continued to produce lumber for local consumption well into the 1900s. Locally-produced lumber was used in houses, irrigation flumes and the coal mine. These mills had several different owners. Large-scale logging did not begin operations in the valley until the 1950s.

2.4 HISTORIC BACKGROUND - (Cont'd)

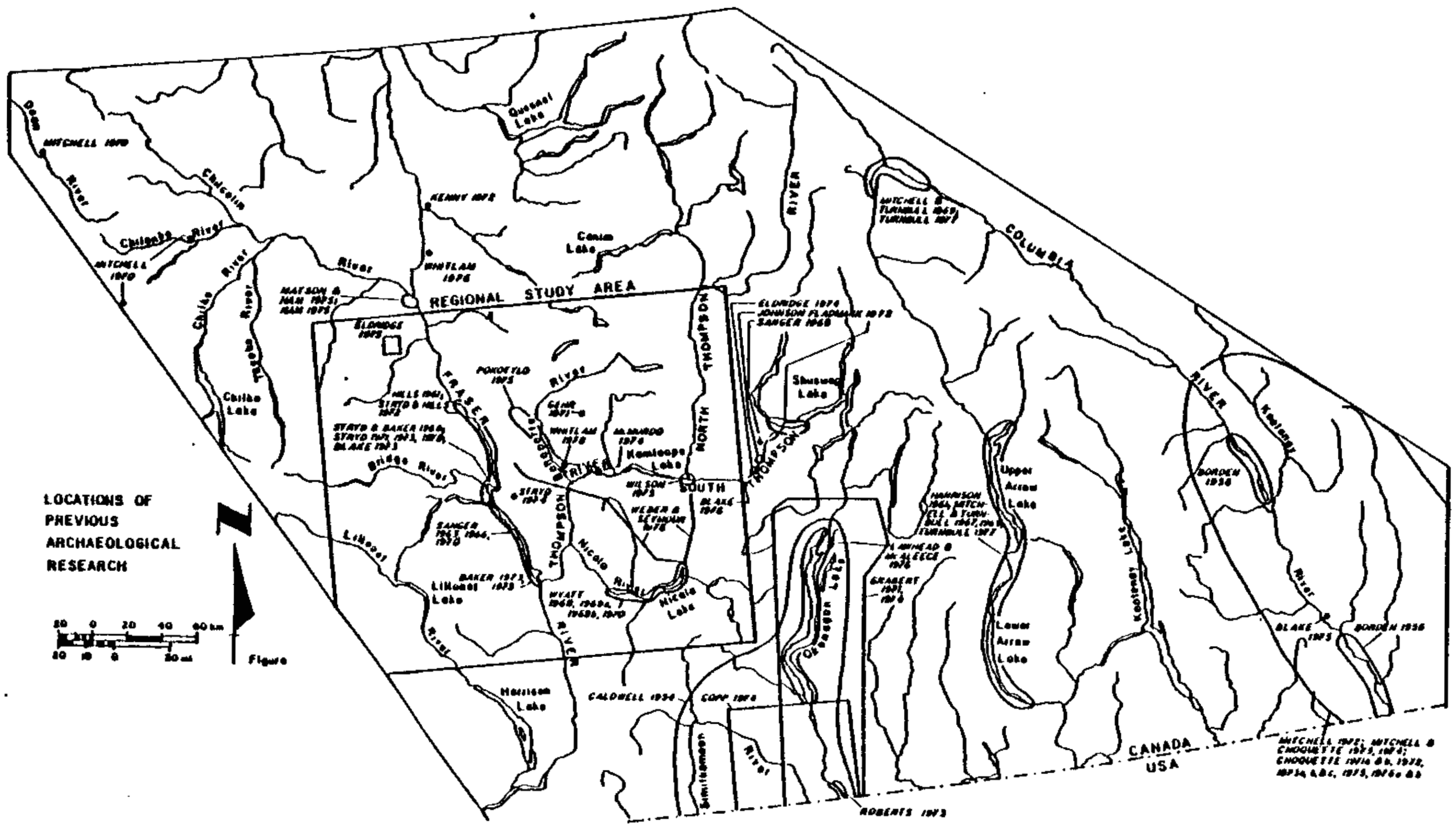
Historic archaeological data collected during the Phase II study tends to corroborate the above local history. Historic artifacts recorded represent a range of items generally associated with both native and non-native homestead/farmstead occupations from ca. 1880 to the mid-1900s (Donahue 1979). The archaeological data also provided information of a type not usually available from oral history and archival sources - the nature of early historic native homestead/ farmstead settlements in the valley.

2.5 PREVIOUS ARCHAEOLOGICAL RESEARCH IN THE SOUTHERN INTERIOR PLATEAU

(a) Early Research

Harlan I. Smith conducted the first archaeological research in the southern interior plateau for the Jesup Northern Pacific Expedition from 1897 to 1899. Smith's work included a brief survey of the Nicola valley and the excavation of burials located near Lytton, Spences Bridge and Kamloops (Smith 1899, 1900). Similarities between archaeological and ethnographic material items were noted by Smith (1900: 432-433). Previously, George M. Dawson had observed and recorded several archaeological sites in the regional study area while employed by the Geological Survey of Canada (Dawson 1891: 7-12).

Archaeological research in the regional study area was not resumed until C.E. Borden excavated a burial site near Cache Creek in 1954 and 1956 (see Sanger 1969: 140). Interest in pre-historic burials continued into the 1960s. David Sanger (1963: 131) surveyed the Fraser River valley between Lytton and Lillooet for burial sites and later assisted Borden in excavating two burial sites in the Lytton-Lillooet area (Sanger 1969: 141, 1970: 13). The Chase burial site, lying to the east of the regional study area, was the focus of further archaeological research during the early 1960s (Sanger 1969). (See Fig. 2-4 for the locations of this and the following research projects.)



Locations of Past Archaeological Research in the Southern Interior Plateau

Figure 2-4

(b) Fraser-Thompson Area

Sanger's excavations in the Fraser River valley near Lochnore and Nesikep creeks from 1961 to 1965 established a sequence of archaeological periods reflecting cultural adaptations for the area's prehistory (see Sanger 1963, 1966, 1969, 1970). The earliest period may be representative of the Old Cordilleran Culture, a generalized hunting-fishing-gathering lifeway that existed in early post-glacial times. This was followed by the Nesikep Tradition which represents a salmon-oriented lifeway similar to that documented in the ethnographies, and extends to the historic period.

Archaeological research in the vicinity of Lillooet commenced with L.V. Hills' surveys in 1957, 1958 and 1960 (Hills 1961; Stryd and Hills 1972). Combined with surveys by Arnoud Stryd and James Baker in 1968 and by Stryd and Art Charlton in 1969, this research represents an intensive inventory of land adjacent to the Fraser River between Lillooet and Big Bar (ibid.). The eastern half of Seton Lake and sections of the Bridge River were also inspected (ibid.). Additional work in the area includes a salvage program conducted by Stryd and Baker (1968) and by Stryd (1971).

Stryd has continued archaeological research in the Lillooet area through the 1970s. Most investigations have focused upon refining knowledge of the Late Nesikep period (800 B.C. to A.D. 1858) (Stryd 1973: 3-4, 1978: 9). Consequently, most of Stryd's research has concentrated on housepit sites. An exception relevant to this report is his recording of EeRk 17, a small lithic scatter located at the headwaters of Gibbs Creek, 90 m below the divide between the Hat Creek and Fraser River drainages (Stryd 1974).

Under the auspices of Stryd's Lillooet Archaeological Project, T. Michael Blake excavated a portion of EeRk 9, the Ollie site (Blake 1974). Blake compared various sampling strategies' efficiency in determining the nature of this historic housepit site. Other research along the Fraser River includes Baker's site survey of the Fraser River's west bank between Kwolek Creek and Laluwisson Creek, and excavation of EbRj 17, a lithic scatter, at the confluence of the Stein and Fraser rivers (Baker 1973). Subsequently, in 1974 Baker (1975) surveyed a transect from the Fraser River to Botanie valley.

In 1975, David L. Pokotylo supervised a survey for the proposed Ashcroft-Clinton rail connection (Pokotylo 1977). Investigations focused on Semlin valley and the Bonaparte valley between Cache Creek and Clinton. Also in the Cache Creek vicinity are the excavations at EeRh 3, directed by Robert Whitlam (1978) in 1977 and by Stephen Lawhead in 1978. Test excavations at EeRg 4A near Hihuim Lake were conducted in 1971 by an amateur who subsequently reported his results (Gehr 1976).

G. Henning von Krogh directed excavations at three sites near Spences Bridge in 1976: EcRh 11, EcRh 12 and EdRh 2. Also in 1976, Charles Weber and Brian Seymour (1976) surveyed a proposed B.C. Hydro transmission line through several previously uninvestigated localities in the Fraser-Thompson area. Finally, a number of archaeological sites were recorded along the Thompson River by Douglas Elmore (1974) in 1974.

(c) Nicola Area

Most of the current information regarding cultural heritage resources in the Nicola valley result from David Wyatt's work in the area (Wyatt 1968, 1969a, 1969b, 1972). During 1968, a brief reconnaissance of the valley near Merritt ascertained the potential for cultural heritage resources in the area (Wyatt 1968). An intensive survey of the valley from 9 miles (14.4 km) upstream of Spences Bridge to Douglas Lake was completed the following year (Wyatt 1969a, 1969b). Test excavations were conducted at most sites to supplement data garnered from surface artifacts and features (ibid.).

(d) South Thompson-Shuswap Lake Area

Five archaeological sites near Kamloops were excavated in 1971 under the direction of Robert L. Wilson (1973). This fieldwork comprised a salvage programme for endangered sites on the Kamloops Indian Reserve. Two pithouse village sites (EeRb 3 and EeRb 10) on the Kamloops Reserve received the most attention. Limited investigations were also carried out for a burial site (EeRc 8) in north Kamloops, a cachepit site (EdRa 11) 14 miles (22.4 km) east of Kamloops and a lithic scatter site (EfRh 3) 5 miles (8.0 km) east of Cache Creek.

Following a partial survey of Adams Lake and Shuswap Lake by the British Columbia Provincial Museum and Knut Fladmark (1969), Sharon Johnson Fladmark in 1972 directed excavations at seven archaeological sites in the area (Johnson Fladmark 1973). During that same year, Morley Eldridge and a small crew surveyed 3 mi^2 (7.7 km^2) along the South Thompson River near Chase (Eldridge 1974). After completing the survey, Eldridge's crew test excavated two sites: EeQx 14 and EdQx 5 (ibid.). In 1974, salvage excavations under the direction of Blake were carried out at the Rocky Point site, EdQx 20 (Blake 1976) on the South Thompson River, approximately 8 km (5.0 miles) downstream of EdQx 5 (ibid.). Previously, in 1969, Blake and Eldridge (1971) conducted test excavations at a housepit on the north bank of the

South Thompson River. This site, EeQx 2, is located near Pritchard, not far from Pemberton Creek (ibid.). Remnants of three housepits at the Juniper Beach site, EeRg 13, situated by the South Thompson River 11.8 miles (18.9 km) east of Cache Creek were the focus of salvage excavations directed by John McMurdo in 1974 (McMurdo 1974).

(e) Upper and Lower Arrow Lakes Area

In 1961, Peter Harrison (1961) surveyed the proposed High Arrow Dam reservoir. Excavation began in 1966, but most of the salvage efforts were completed under the direction of Christopher J. Turnbull in 1967 (Mitchell and Turnbull 1968). These included an extensive excavation at a large pithouse village site, DiQm 1; and test excavations and/or surface collections at nine sites on the Lower Arrow Lake (ibid.). The west shore of the Upper Arrow Lake was surveyed along with recent cleared areas. Test excavations for the Upper Arrow Lake were limited to EdQl 1 (ibid.).

Salvage for the High Arrow Dam reservoir's cultural heritage resources was finished in 1968 (Mitchell and Turnbull 1969). Survey for the Mica Creek reservoir was initiated in 1968 and completed in 1969 under the direction of Turnbull. A synthesis of these two projects' results was published by Turnbull (1977).

(f) Okanagan-Similkameen Area

In 1952, Warren Caldwell surveyed the Okanagan and Similkameen valleys for archaeological resources. He found "seemingly late prehistoric" sites in these valleys which lie to the southeast of the regional study area (Caldwell 1954: 22). During 1966 and 1967, Grabert (1971, 1974) conducted an areal study in the Okanagan valley, which included both survey and excavation. G. Roberts (1973, 1974) surveyed and excavated sites, including housepits, on the eastern shores of Osoyoos Lake. Stan Copp (1974) surveyed portions of the Okanagan valley bottomlands which lay outside previous surveys and directed excavations at DhQv 48. Most recently, S. Lawhead and K. McAleese (1976) inspected the shoreline of Okanagan Lake for archaeological sites.

(g) Kootenay Area

Borden's surveys of the Kootenay River valley from Bull River to the Canada-U.S. border and of Columbia and Windermere lakes (Borden 1956) constitute the earliest archaeological research in this area. Research resumed in the Kootenays during 1972 with the survey of Kootenay National Park (Mitchell 1972; Mitchell and Choquette 1973, 1974). Wayne Choquette continued archaeological survey and excavation in the area in connection with several assessment and mitigation projects (Choquette 1971a, 1971b, 1972, 1973, 1974a, 1974b, 1974c, 1975, 1976a, 1976b). In 1975, Blake (1975) directed salvage excavations at DjPv 14 on the Wild Horse River.

(h) Cariboo-Chilcotin Area

Following up his survey of park reserves on the Chilcotin plateau in 1965, Donald H. Mitchell conducted test excavations at FaRx 1, EkSe 1 and FdSk 2 in 1968 (Mitchell 1970). Paul Sneed (1970) directed a reconnaissance of the Cariboo in 1970. Major rivers and their tributaries received the most intensive inspection (ibid.). In 1972, Grant Keddie directed a survey of the Chilcotin plateau (Keddie 1972). Also in 1972, Ray A. Kenny supervised salvage excavations at FbRn 13 which lies 20 miles (32 km) north of Williams Lake (Kenny 1972). This site contained several housepits, suspected cachepits and a midden (ibid.). Salvage work directed by Alan Carl at FaRn 3 in 1971 and a ElRn 3 in 1972, along with that directed by Jean Williams and Bill Brown at FaRm 8 in 1974 is summarized by Robert Whitlam (1976) in a study of archaeology in the vicinity of Williams Lake. Further research on the southern Chilcotin plateau includes R.G. Matson's and L.C. Ham's Shuswap Settlement Pattern Project at the confluence of the Chilcotin and Fraser rivers (Matson and Ham 1975; Ham 1975) and Eldridge's survey near Gaspard Creek (Eldridge 1975). The former project conducted limited excavations along with a survey (Matson and Ham 1975; Ham 1975).

SECTION 3.0 - INVENTORY OF CULTURAL HERITAGE RESOURCES

3.1 GENERAL CATEGORIES OF CULTURAL HERITAGE RESOURCES

Five categories of cultural heritage resources are recognized by the Hat Creek Archaeological Project: 1) archaeological artifacts; 2) archaeological sites; 3) archaeological zones; 4) archaeological and/or historical records; and 5) oral history, folklore and traditions. These categories are defined below.

Archaeological sites, zones and artifacts are physical entities modified and discarded by past human activity. Thus, these cultural heritage resources may represent either the prehistory or the history of the study areas. Archaeological records, on the other hand, are records made during the scientific investigation of archaeological sites, zones or artifacts.

(a) Archaeological Artifacts

Artifacts can be defined as all portable items modified and discarded by humans sometime in the past.* Both products and by-products of human manufacture are considered artifacts. Sometimes artifacts with potential chronological or culture-historical information are labelled "diagnostic". This does not indicate that non-diagnostic artifacts are bereft of information.

A flintlock gun, a chert scraper, a piece of debitage and a fragment from a porcelain bowl found in an archaeological context are all artifacts. One or more artifacts removed from archaeological context constitute a collection.

---

* Non-portable items modified and discarded by humans sometime in the past are called "features". Examples include postholes and fish weirs.

3.1 GENERAL CATEGORIES OF CULTURAL HERITAGE RESOURCES - (Cont'd)

(b) Archaeological Sites

An archaeological site is a locale utilized by humans for a length of time sufficient to leave physical evidence of the utilization on and/or below the ground's surface. This physical evidence may include artifacts, features (e.g. hearths, house-pits), organic waste (e.g. charcoal, bones) and humanly deposited sediments (e.g. earthworks). In other words, an archaeological site is composed of the discarded physical components of human activity in the context of their spatial relationships with each other and the environment. If a site's contextual information is lost, then its cultural heritage value will be depreciated.

Archaeological sites vary in size and complexity, as well as in kind. Various kinds of archaeological sites include surface scatters of one or more lithic artifacts, an abandoned cabin and a defunct earth oven. During a systematic survey, all archaeological sites are recorded and assigned Borden numbers.* Recording an archaeological site does not imply significance: only an analysis of a site's components can reliably determine significance.

(c) Archaeological Zones

When an ecological zone coincides with a consistent pattern of archaeological sites, this area has been denoted by this report as an archaeological zone. All archaeological and environmental elements within a zone represent a coherent set of past interactions between social groups and environmental features

---

* Every archaeological site recorded with the Borden system receives a unique alphanumeric designation (e.g. EeRj 101). This designation locates the site within a 10′ (latitude) by 10′ (longitude) unit in a grid system covering all of Canada (see Borden 1952).

within the zone. As with archaeological sites, the spatial context of the zone's archaeological and environmental elements is an essential aspect of its value.

Archaeological zones may serve as units of comparison in evaluating the cultural heritage resources of the proposed development area with those of the local and regional study area. Archaeological zones summarize the resources' spatial relationships as well as their content. In addition, unsurveyed areas of the proposed development may be evaluated in terms of the expected nature of the archaeological-ecological relationships within archaeological zones. Examples of archaeological zones are a river, along which are several prehistoric fishing stations, and a squatter's camp in a historic gold-mining town.

(d) Archaeological and Historical Records

Survey records of an archaeological zone or site, and excavation records of a site are as much a cultural heritage resource as the zone, site or their artifacts. Without them, the scientific value of the site and artifacts is greatly diminished. Loss of historical records likewise diminish the value of historic archaeological sites and objects. However, historic records can exist without sites or artifacts and have an intrinsic value as cultural heritage resources.

(e) Oral History, Folklore and Traditions

To an extant community or social group, its oral history, folklore and/or traditions are a valuable cultural heritage resource: within these resources are preserved a cultural lifeway. If a community or a social group may be disrupted or dispersed, then the cultural heritage represented in its oral history, folklore and/or traditions ought to be preserved.

3.2 INVENTORY METHODOLOGY.

(a) Archaeological Survey

Since the upper Hat Creek valley had not previously been systematically surveyed for cultural heritage resources, archaeological surface survey was the primary means employed to inventory archaeological sites, zones and artifacts. This was supplemented by inspecting the B.C. Site Inventory files* and by confirming information provided by local residents.

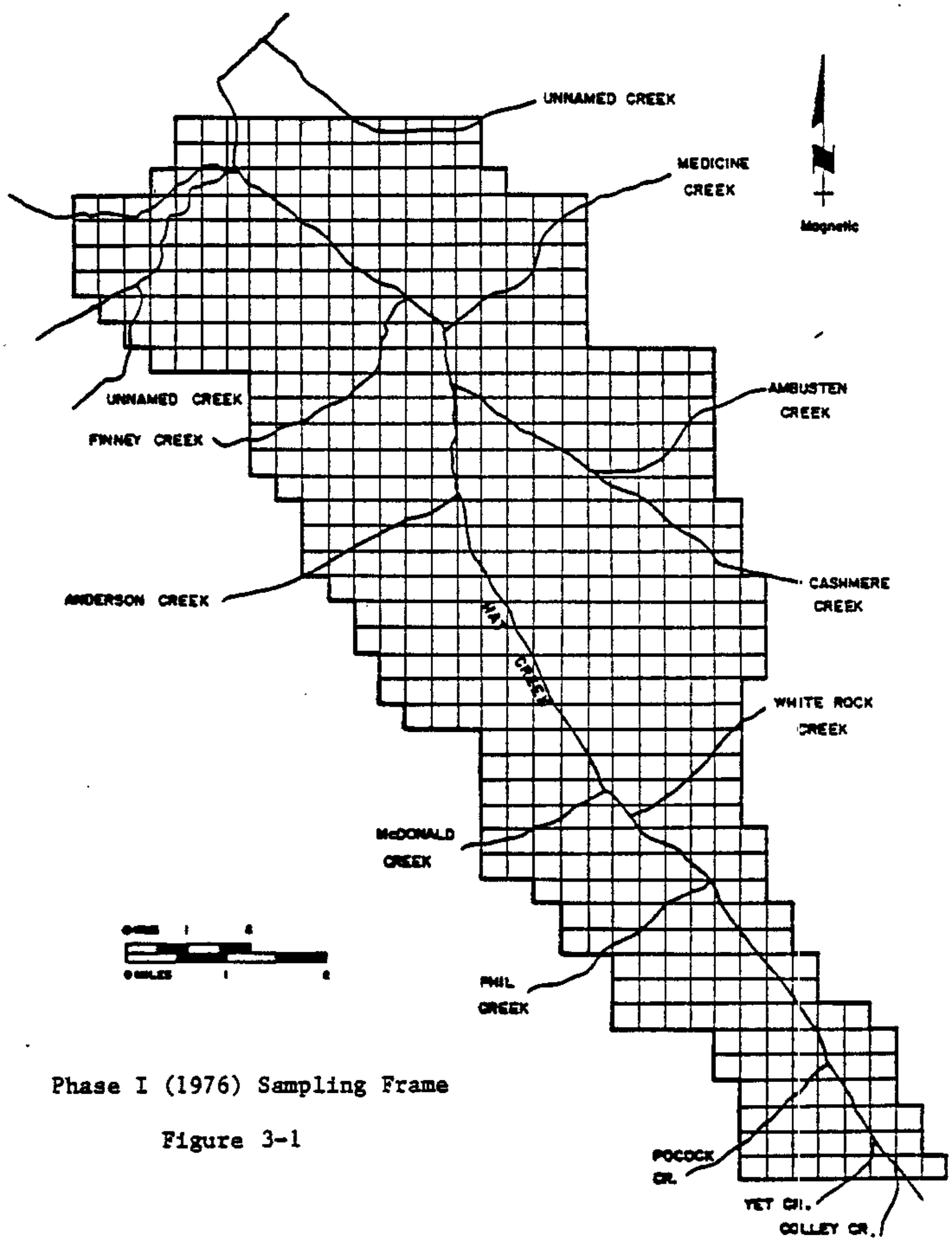
The main purpose of the Phase I study was to produce an overview of the cultural heritage resource base of the entire valley. Time and budget restrictions limited the study area to a 90.4 km^2 tract which contained the proposed development components as defined in April 1976 (see Fig. 3-1). Both valley bottomlands and low elevation (below 1370 m or 4500 ft asl) forested slopes were included in the study area so that a large proportion of the environmental variation within the upper Hat Creek valley was represented.

Probability sampling techniques were used, since a total survey of the study area was neither feasible nor necessary: these techniques enable one to make reliable generalizations from results obtained for a fraction of the total area. Stratified random sampling with replacement (Haggett 1965: 195) was the specific design used.

Sampling units were created by dividing the study area into 565 400 m x 400 m quadrats. These sampling units were then stratified according to predominant vegetation: grassland

---

* B.C. Site Inventory files contain basic archaeological, environmental and locational information for all sites reported to the Provincial Archaeologist's Office and assigned a Borden number.



Phase I (1976) Sampling Frame

Figure 3-1

(331 quadrats) vs. forest (234 quadrats). A total of 44 quadrats, 12 from the forest stratum and 32 from the grassland stratum were selected for survey by random sampling with replacement (see Fig. 3-2). These quadrats represent 7.8 percent (7.0 km^2) of the study area.

After a quadrat's boundaries had been located in the field with the aid of air photographs, 100 m chaining ropes and compasses, its land surface was inspected for archaeological artifacts and sites. Members of the survey crew spaced themselves 10 m apart while sweeping the quadrat for archaeological remains. Archaeological sites were defined in the field as clusters of six or more artifacts and/or one or more archaeological features.

All artifacts from both archaeological sites and isolated finds were collected after their locations within 2 m x 2 m units had been recorded according to a quadrat-wide grid system. Maps noting archaeological and geographic phenomena were drawn for quadrats, sites and features. Physiographic and vegetational data were noted systematically and photographic documentation was thorough. Any disturbance of the archaeological sites was recorded along with its probable cause.

Phase II's survey was designed to inventory the specific archaeological resources likely to be affected by the proposed development. In general, stratified random sampling without replacement was employed to select the survey units. As in Phase I, these units were 400 m x 400 m quadrats. In May 1977, strata A, B, C, D, E, H, I, J and K were defined by the areas expected to be disturbed by the proposed development's components (see Table 3-1 and Figs. 3-3 to 3-6).

3.2 INVENTORY METHODOLOGY - (Cont'd)

An additional stratum (H) was defined by the areas in the Medicine Creek-Harry Creek drainage not expected to be disturbed by the proposed development components (see Table 3-1 and Figs. 3-4 and 3-6). This extended the Phase I study area so as to provide an overview of the cultural heritage resources in the Medicine Creek-Harry Creek drainage, which was unbiased by the proposed development design.

Quadrats for survey were selected randomly from these strata until sample sizes noted in Table 3-1 were attained (see Figs. 3-7 and 3-8). However, all quadrats in stratum K, the proposed headworks reservoir, and in stratum C, the proposed powerplant, were surveyed (see Figs. 3-4, 3-5 and 3-8). One of the quadrats selected from stratum I (I26), the proposed open pit, was not surveyed as it was in the vicinity of the already excavated bulk sample trench No. 2. Two J stratum (Houth Meadows mine waste embankment) quadrats (J5 and J10) were unsurveyable due to their position on nearly vertical slopes.

Changes to the proposed powerplant's preliminary design in 1978 necessitated expanding stratum C and surveying additional quadrats (C7 to C10). To eliminate surveying of irrelevant areas, these quadrats were delineated so as to conform concisely with the expected disturbance area (see Fig. 3-9). Thus, not all these quadrats are 400 m x 400 m.

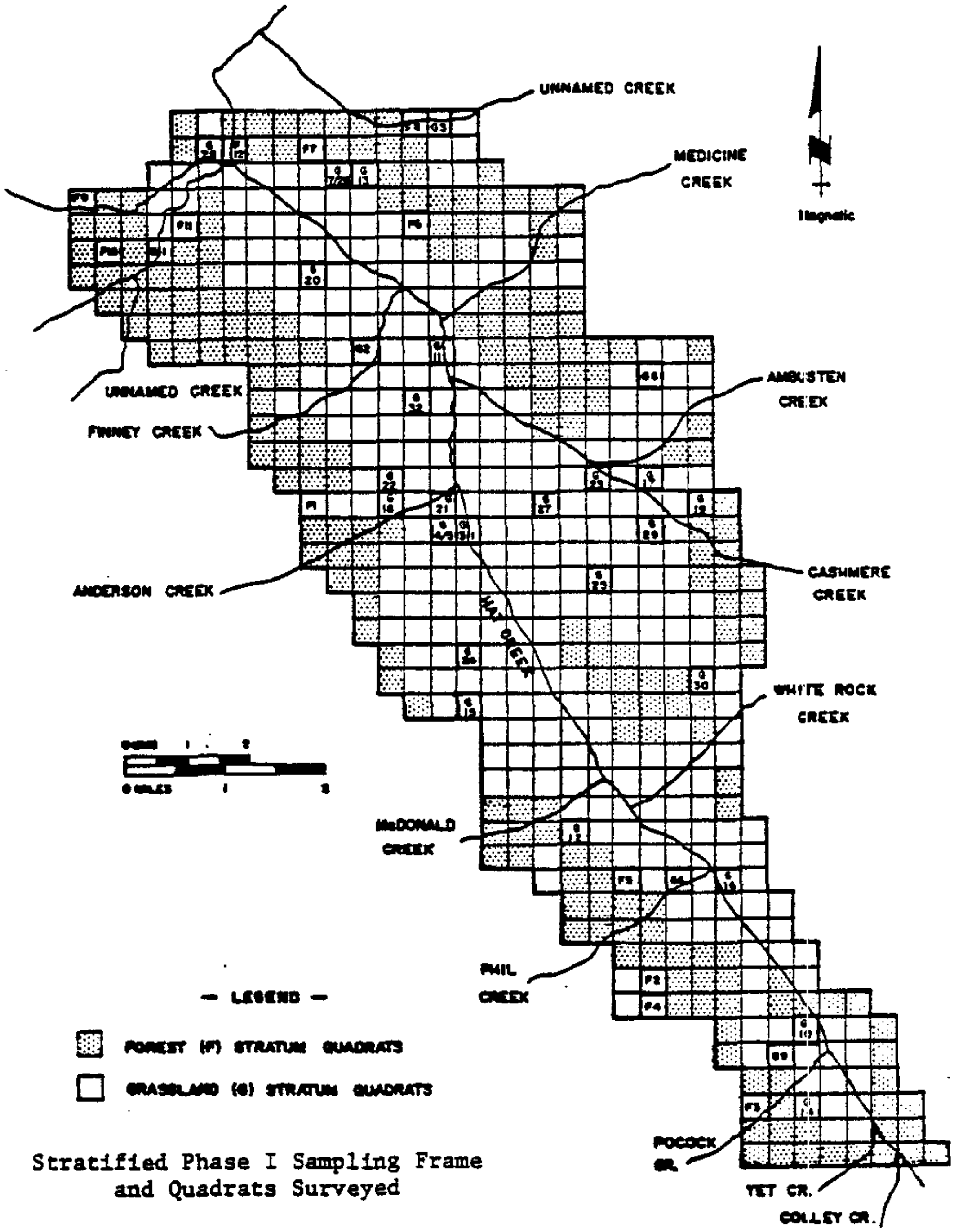
Stratum L was defined in May 1978, by the area subject to disturbance by the proposed mine surface facilities and Hat Creek holding pond (see Fig. 3-10 and Table 3-1). As in stratum C, stratum L's quadrats vary in dimensions and the entire stratum was surveyed.

TABLE 3-1

SAMPLING DESIGN STATISTICS FOR PHASE II INVENTORY

PROPOSED DEVELOPMENT ZONE	STRATUM DESIGNATION	# OF QUADS IN STRATUM	# OF SELECTED (SURVEYED)	AREA SAMPLED (km^2)	SAMPLING FRACTION
Medicine Creek Waste/Ash Embankment	A	18	4(4)	0.64	.22
Upper Medicine Creek Fly/Bottom Ash Dump	B	18	4(4)	0.64	.22
Harry Lake Power Plant	C	6	6(6)	0.96	1.00
Station Reservoir - 1977 Design	D	8	2(2)	0.32	.25
Upper Medicine Creek Wet Ash Dump - now Station Reservoir	E	46	10(10)	1.60	.22
Medicine Creek Offsite Areas	H	72	8(8)	1.28	.11
Open Pit Mine	I	77	25(24)*	4.00 (3.84)*	.33(.31)*
Houth Meadows Waste Embankment	J	41	18(16)*	2.88 (2.56)*	.44(.39)*
Headworks Reservoir	K	3	3(3)	0.48	1.00
Mine Surface Facilities	L	13	13(13)	2.04	1.00

* Bracketed figures are revised values based on actual number of quadrats inventoried.



Stratified Phase I Sampling Frame
and Quadrats Surveyed

Figure 3-2

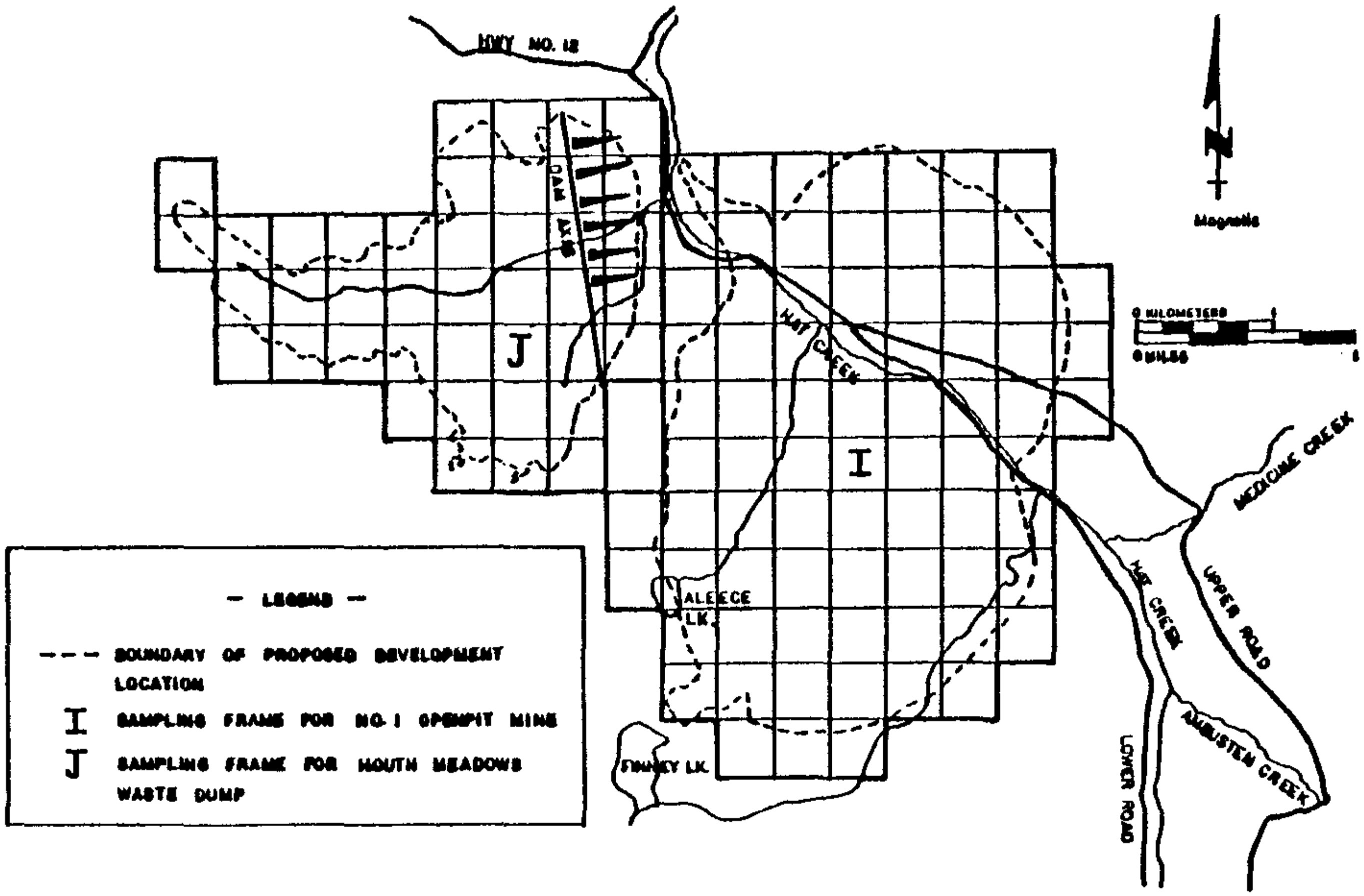
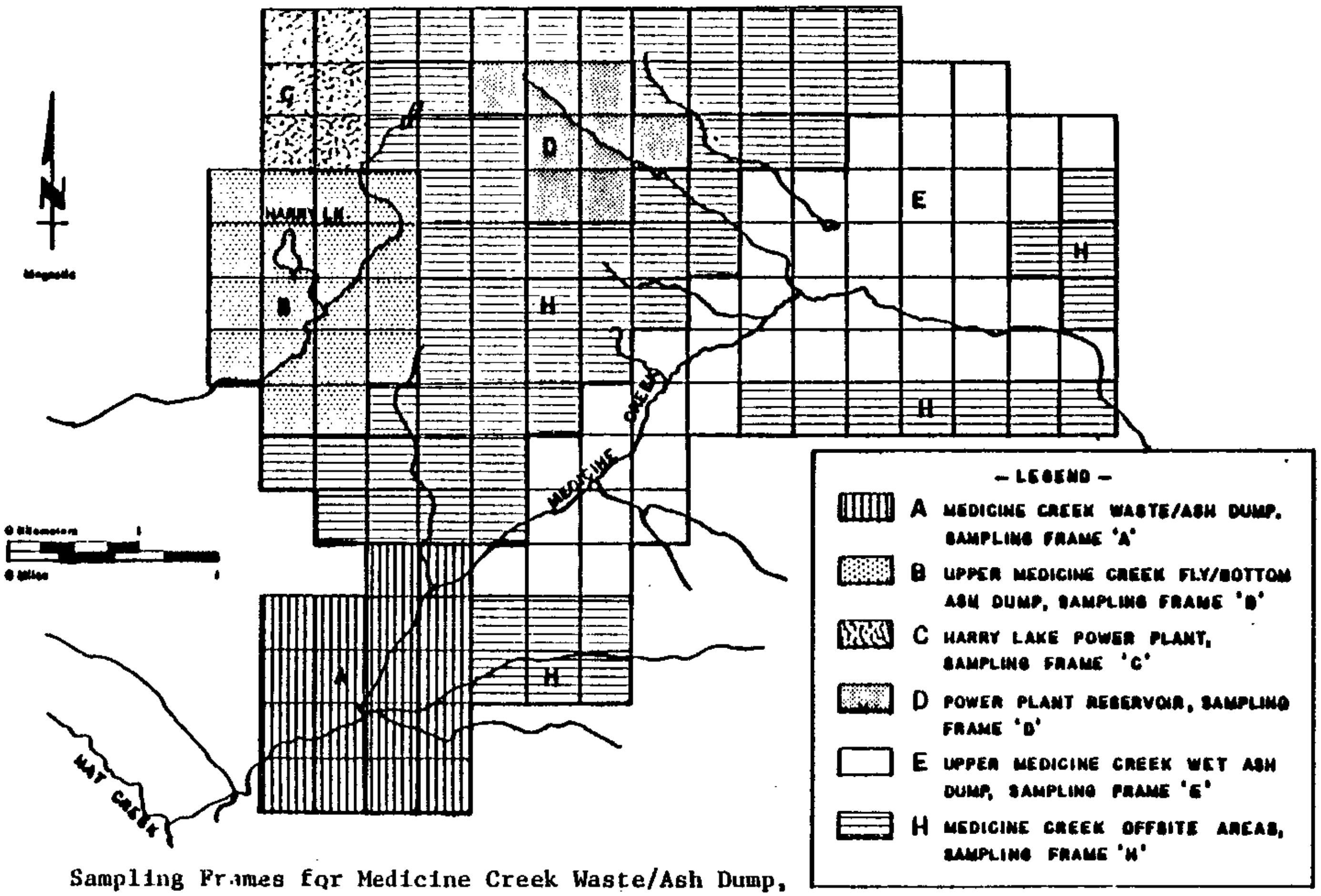


Figure 3-3

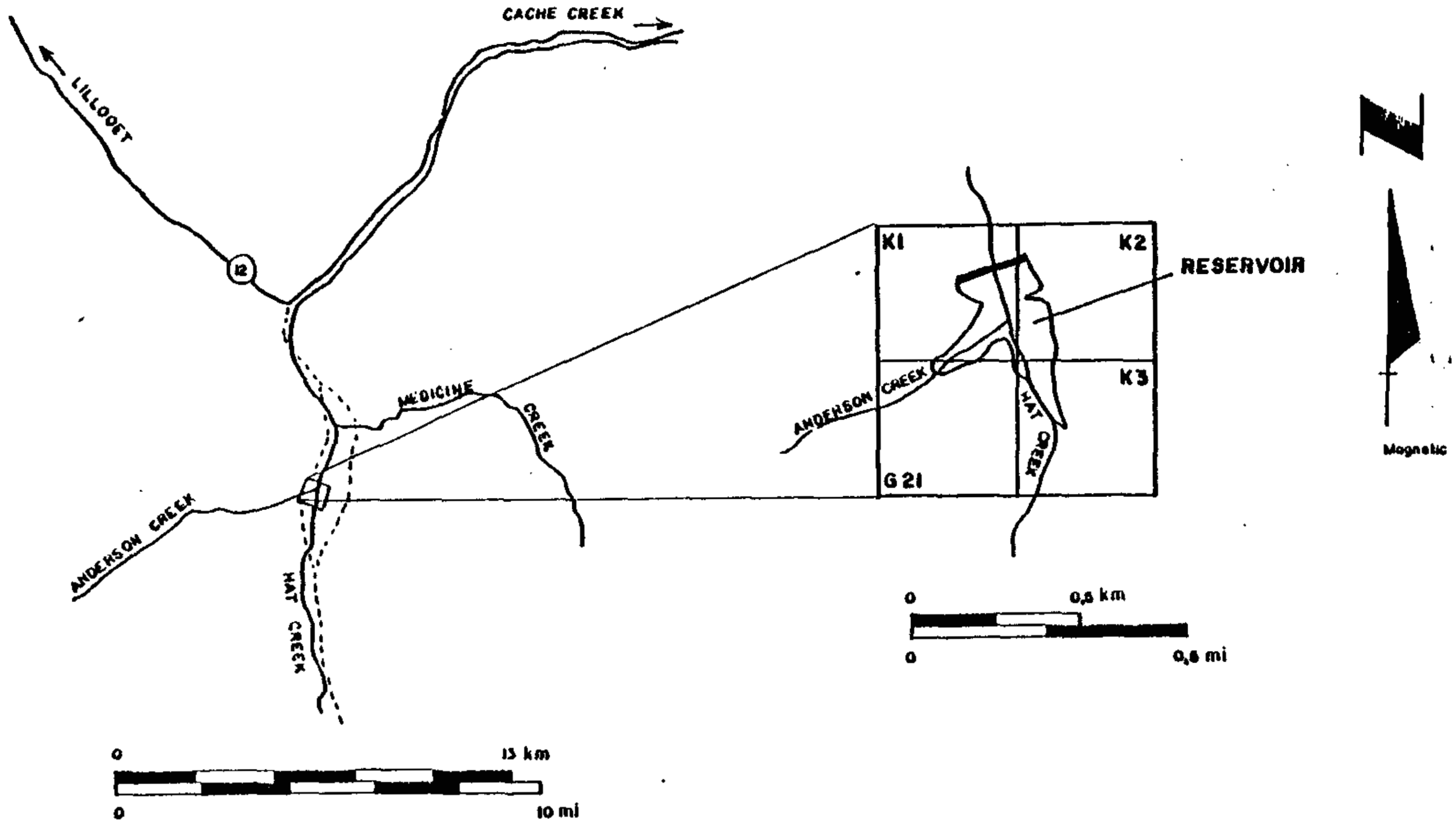
Sampling Frames for No. 1 Openpit Mine and
Houth Meadows Waste Dump

Figure 3-4



Sampling Frames for Medicine Creek Waste/Ash Dump, Upper Medicine Creek Ash Dumps, Harry Lake Powerplant, Powerplant Reservoir, Medicine Creek Offsite Area

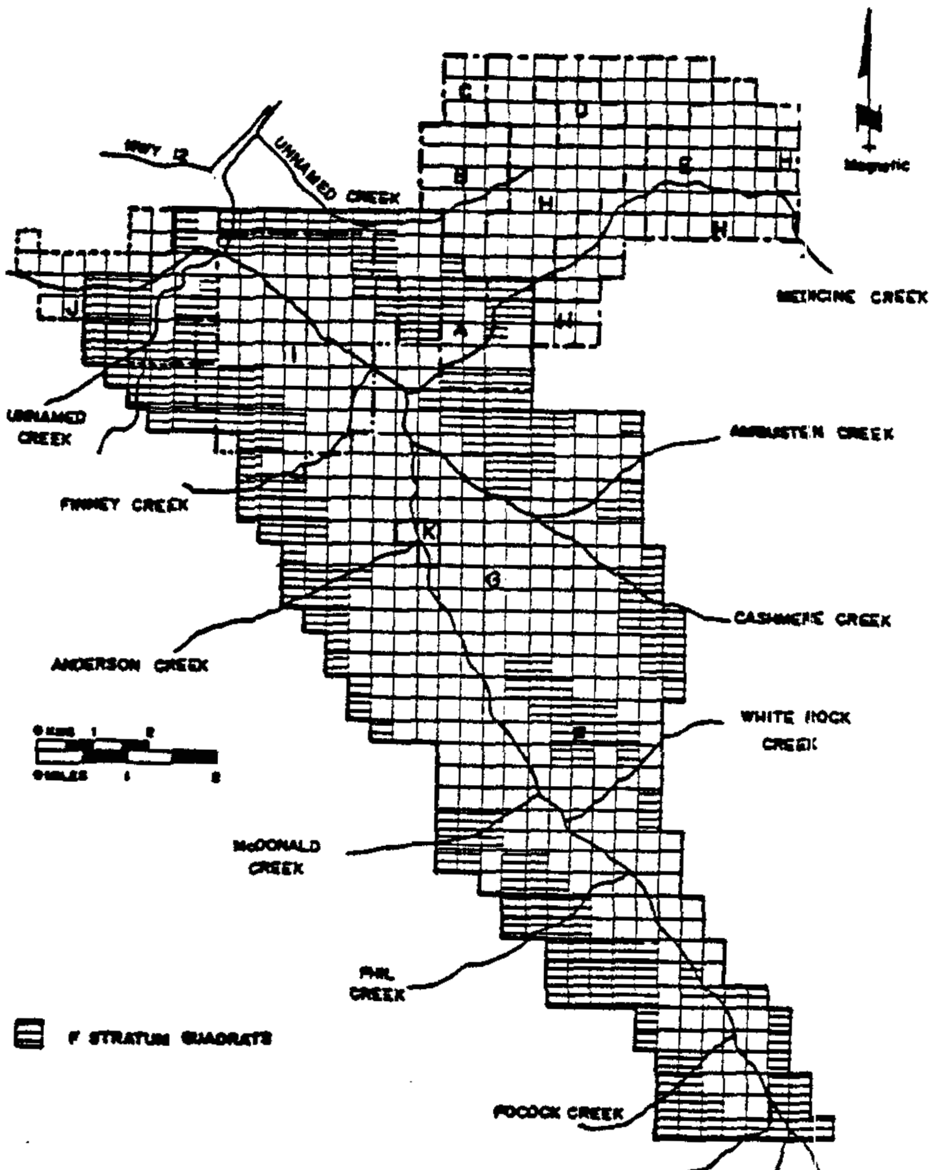
Figure 3-5



SAMPLING FRAMES FOR HAT CREEK DIVERSION RESERVOIR

(QUADRAT G 21 SURVEYED IN PHASE I INVENTORY)

(QUADRATS K1–K3 SURVEYED IN PHASE II INVENTORY)



Combined Study Area of Phase I
and Phase II Inventory

Figure 3-6

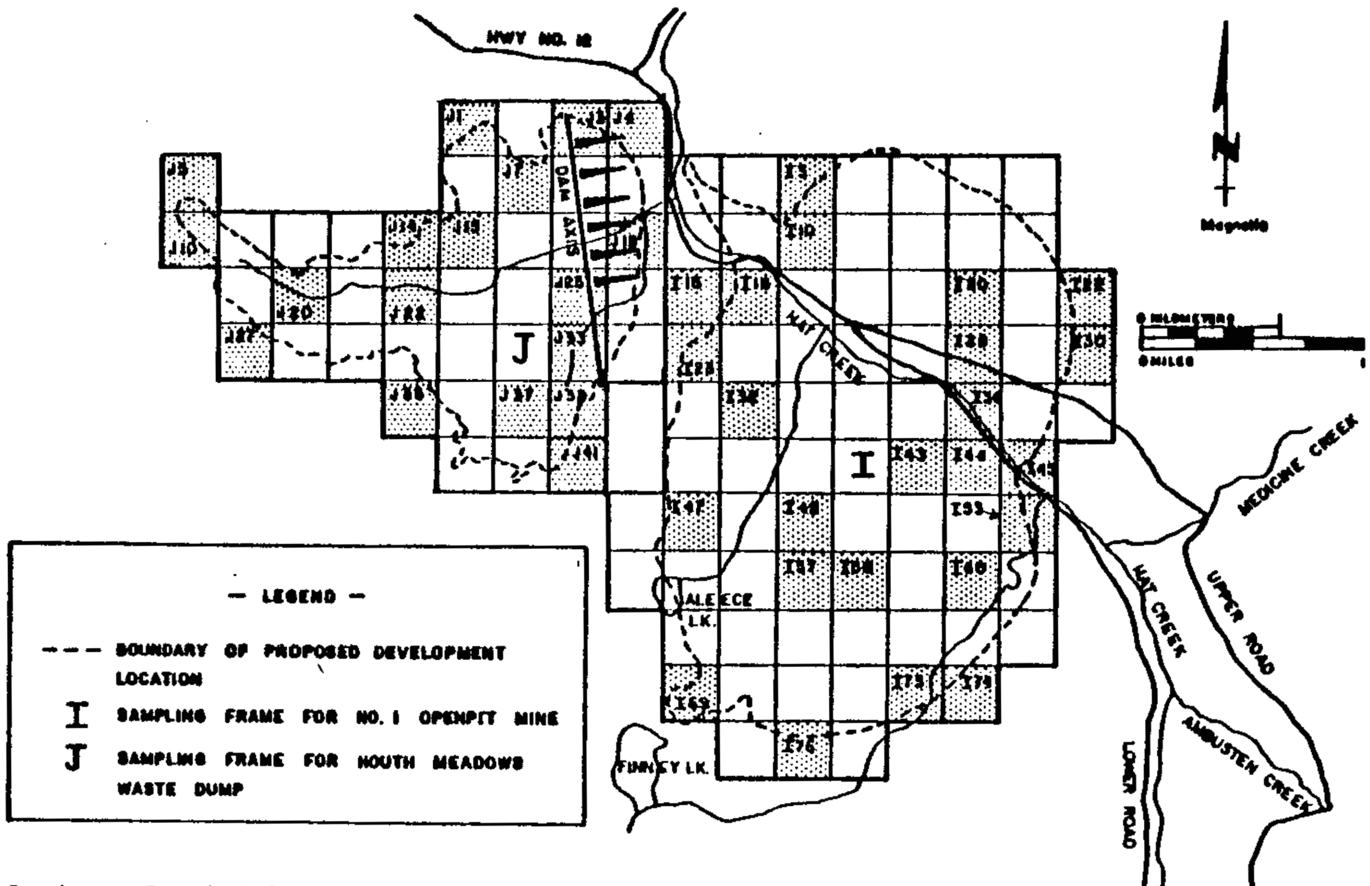
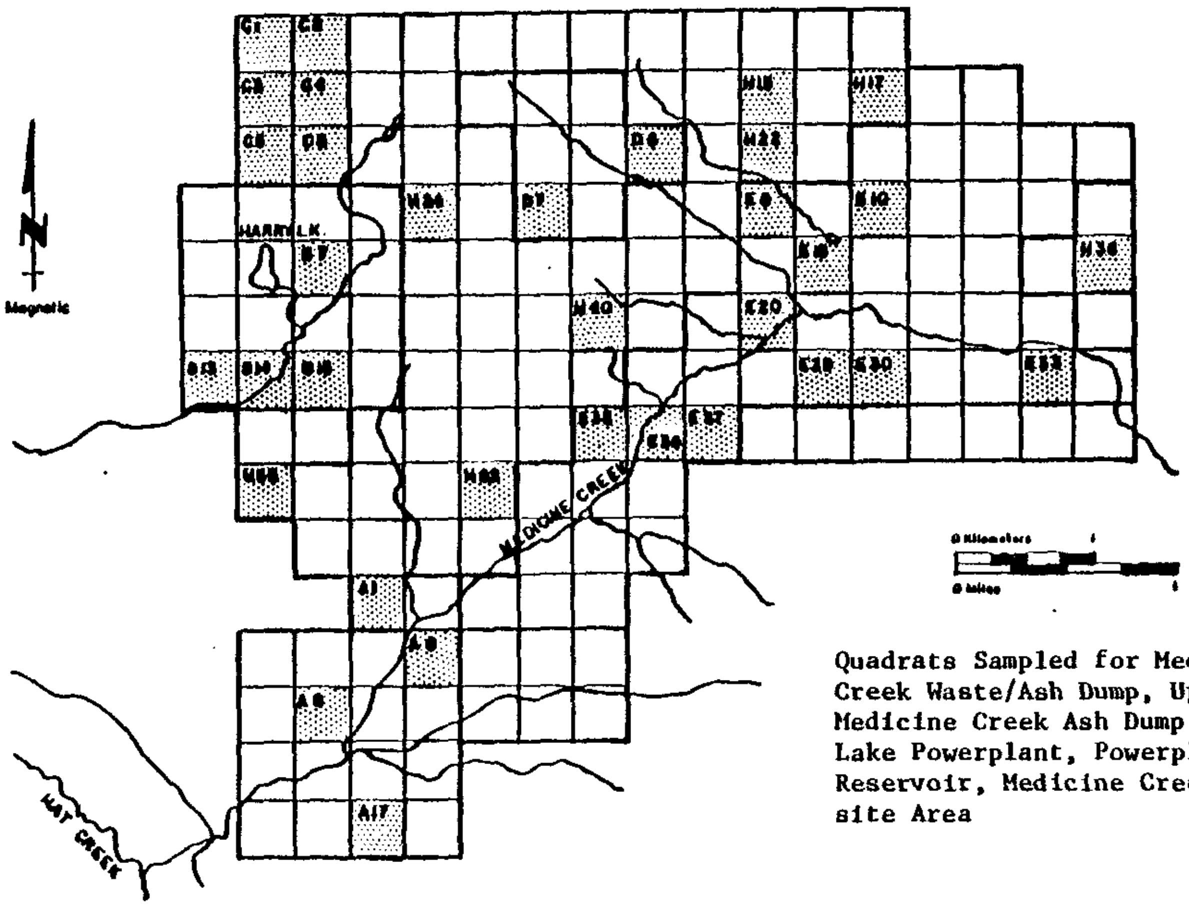


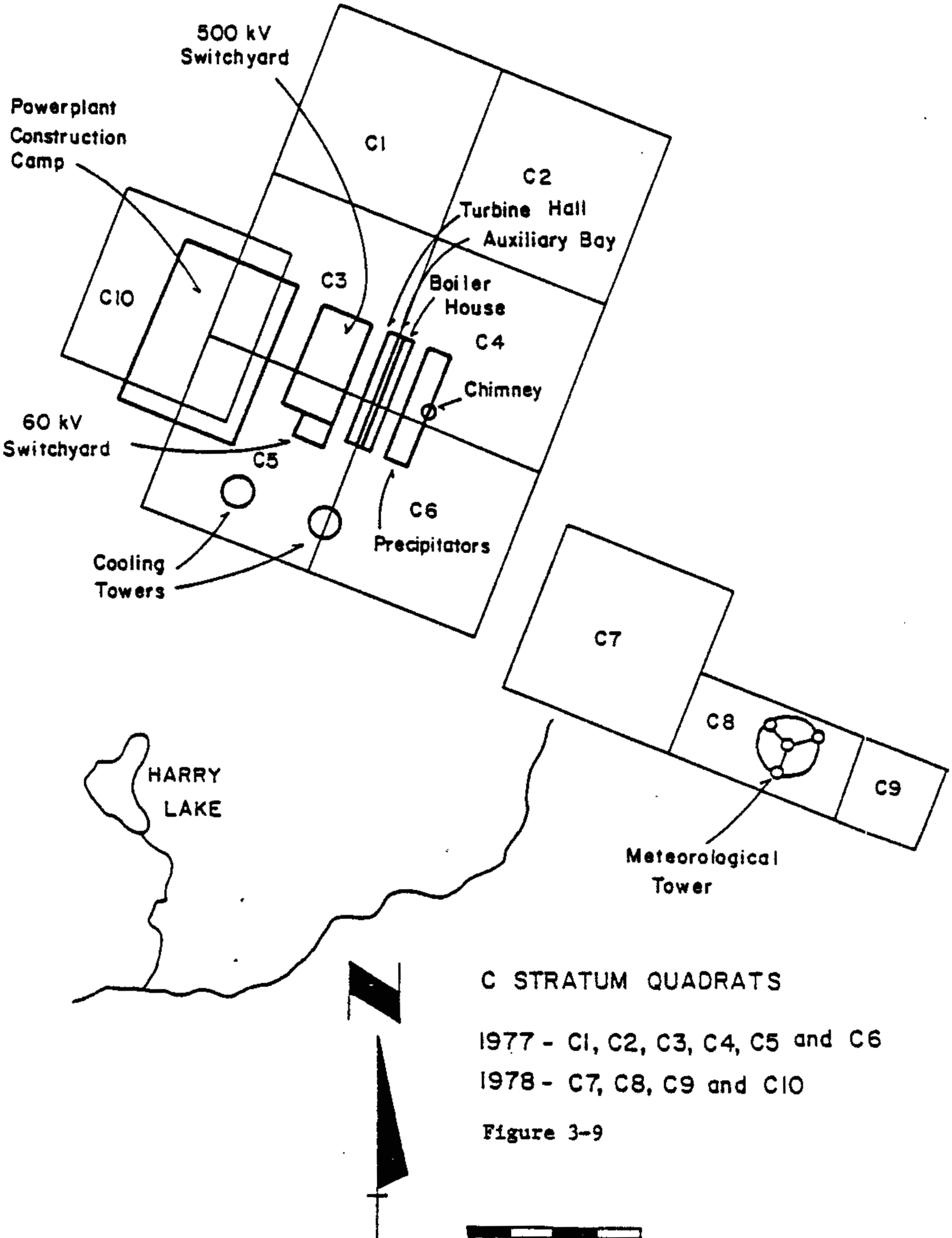
Figure 3-7

Quadrats Sampled for No. 1 Openpit Mine and Houth Meadows Waste Dump

Figure 3-8



Quadrats Sampled for Medicine Creek Waste/Ash Dump, Upper Medicine Creek Ash Dump, Harry Lake Powerplant, Powerplant Reservoir, Medicine Creek Off-site Area



C STRATUM QUADRATS

1977 - C1, C2, C3, C4, C5 and C6
1978 - C7, C8, C9 and C10

Figure 3-9

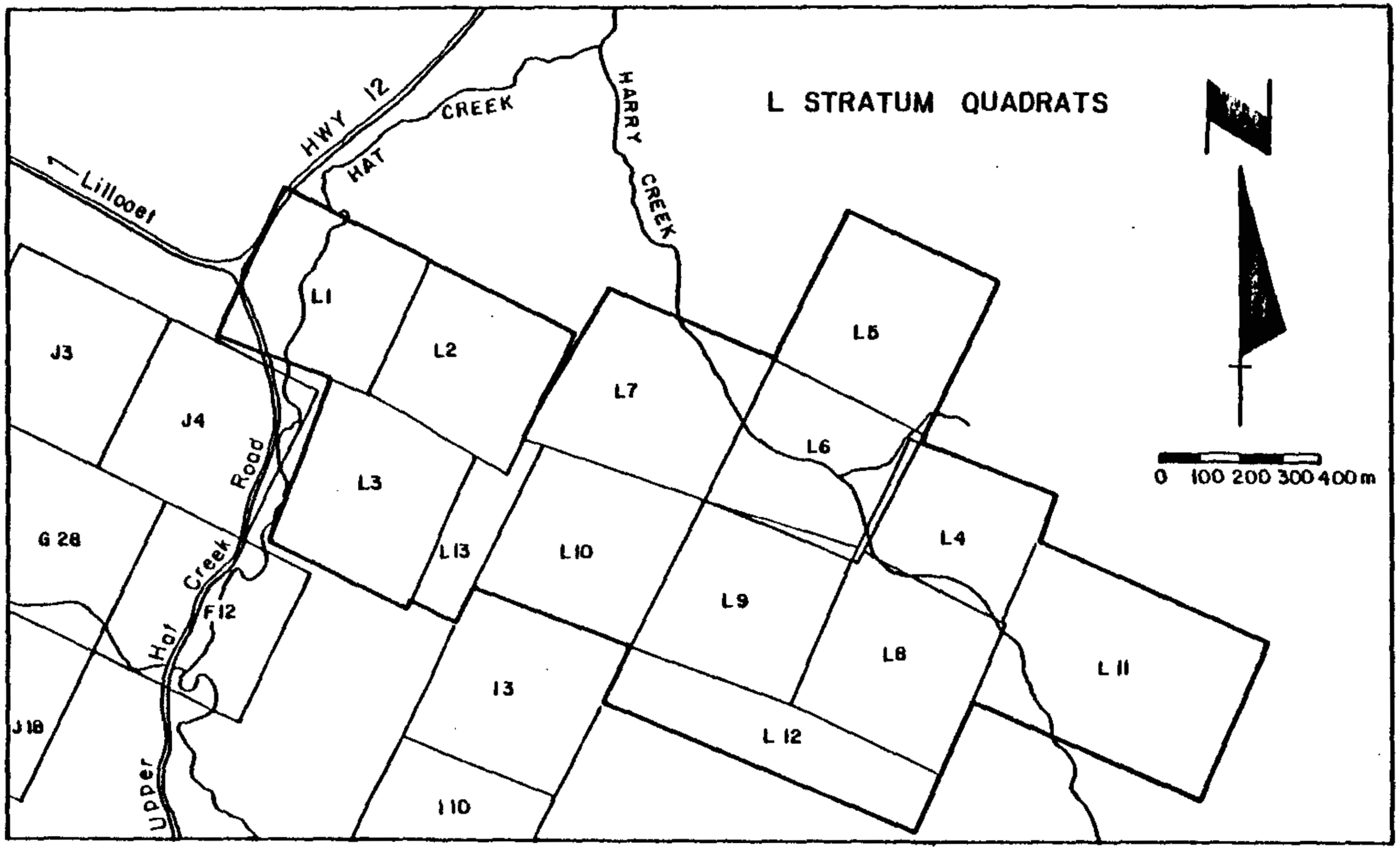

L STRATUM QUADRATS
HWY 12
HAT CREEK
HARRY CREEK
Lillooet
Upper Hat Creek Road
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
J3
J4
G 28
F12
J18
I3
I10
0 100 200 300 400 m

Figure 3-10

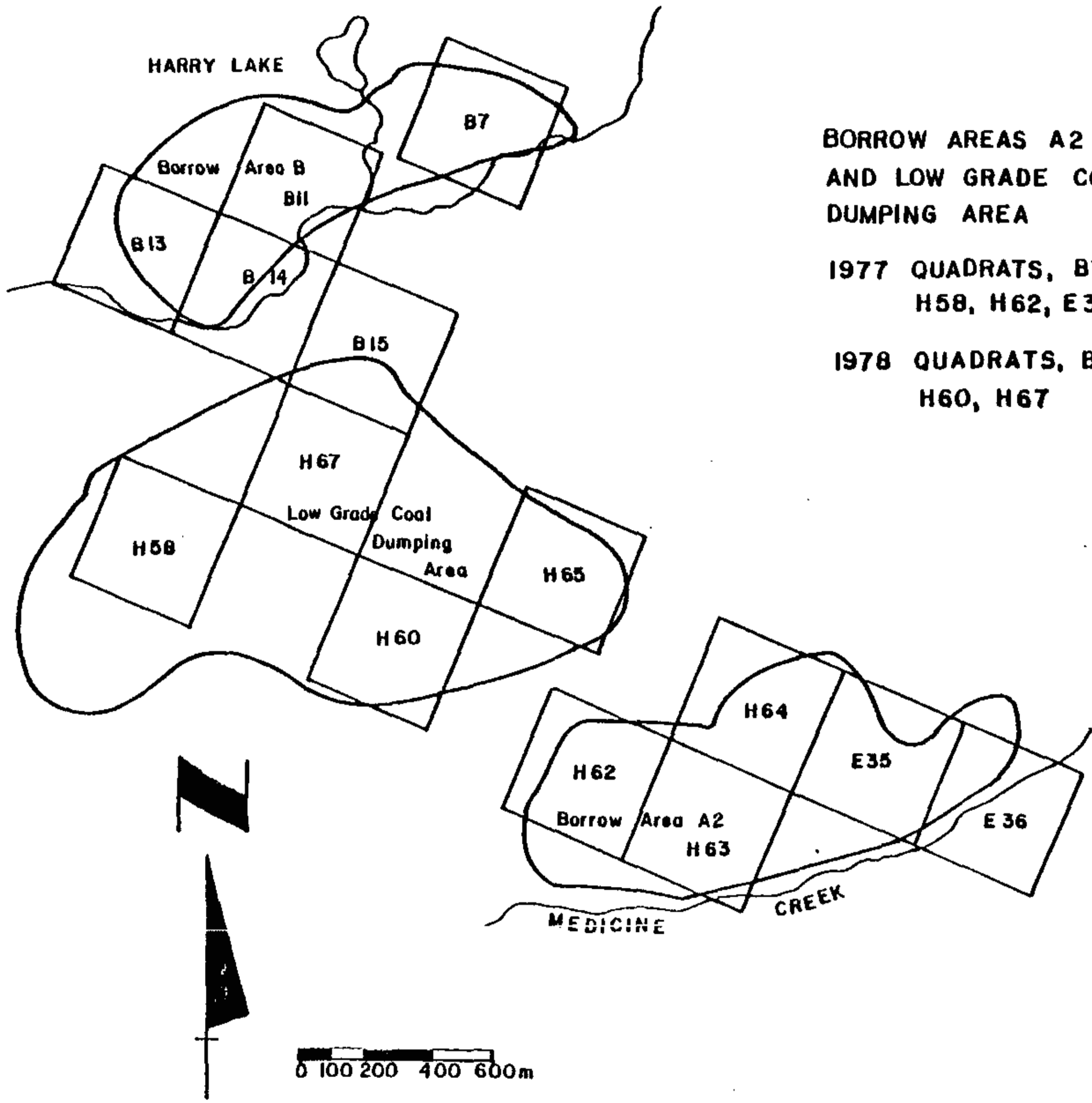
Six more 400 m x 400 m quadrats were selected and surveyed from the B and H strata in 1979 to obtain a sufficient sample for the proposed low grade coal dumping area and borrow areas A2 and B in Medicine Creek (see Table 3-1). Fig. 3-11 shows the locations of these quadrats plus those surveyed in 1978 with respect to the expected disturbed areas.

Archaeological and environmental data were recorded for Phase II quadrats and archaeological sites in a similar but more detailed manner than was done in Phase I. However, archaeological sites recorded in Phase I were revisited and detailed environmental forms were filled out for them as well. Quadrats were located and inspected with exactly the same methods in both phases.

However, artifact collection procedures for archaeological sites differed. Phase I's collection methodology was employed for strata A, B, C, D, E and H, as these strata lie in previously unsurveyed areas. Archaeological sites found in the remaining strata (I, J, K and L) were sampled using transects composed of 2 m x 2 m collection units. These transects were selected judgementally in 1977 (for strata I, J and K) and randomly in 1978 (for stratum L),* after an efficient random selection method had been established. Fig. 3-12 illustrates a typical placement of collection transects in an archaeological site. Potentially diagnostic artifacts lying outside collection transects were recorded, sketched and left in situ.

---

* Artifacts from archaeological sites EeRj 198 and EeRj 199, which are located in stratum H, were collected in the same manner as those found in the L stratum because these sites were surveyed in 1978.



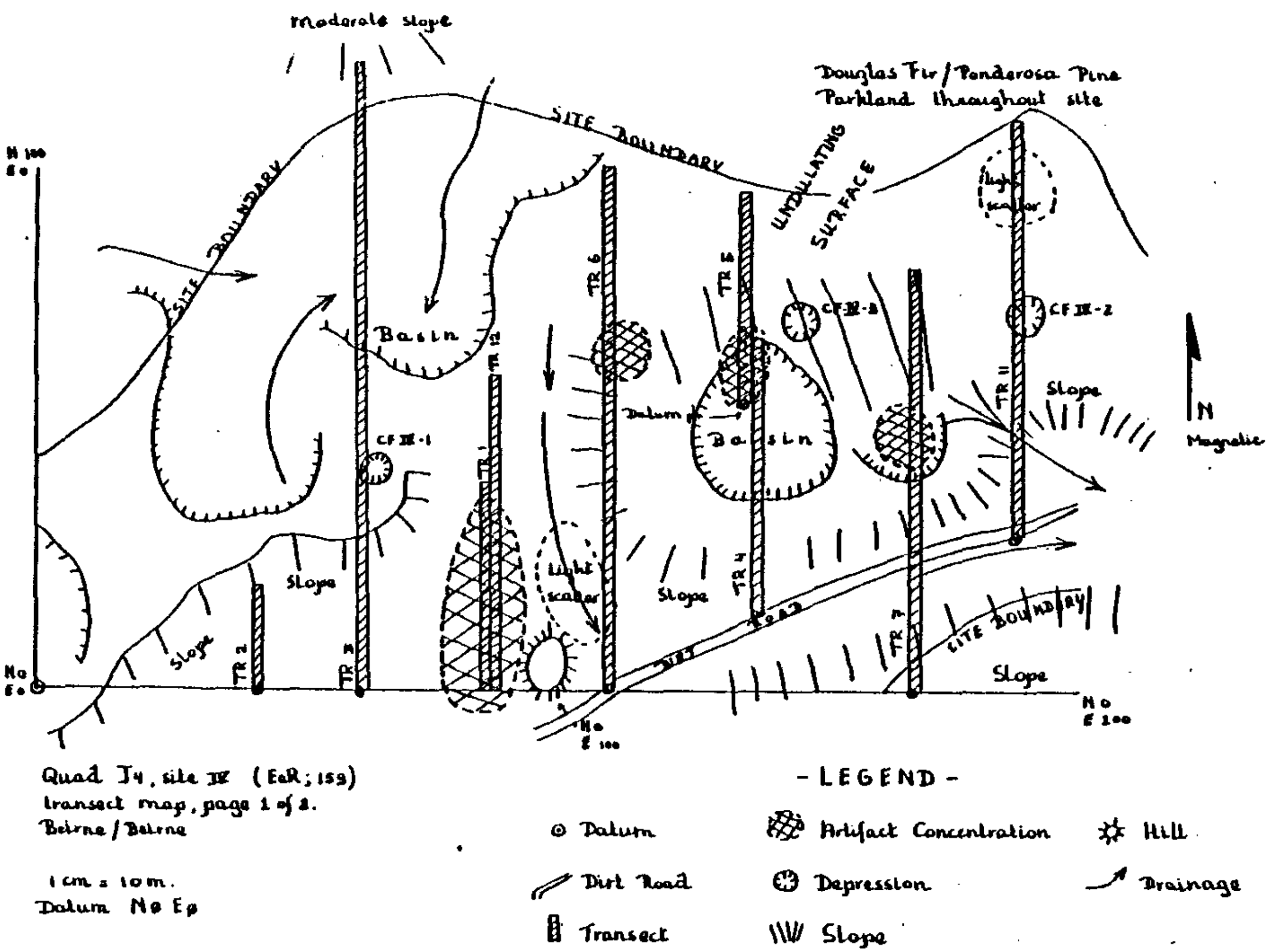
BORROW AREAS A2 AND B
AND LOW GRADE COAL
DUMPING AREA

1977 QUADRATS, B7, B13 - B15,
H58, H62, E35 - E37

1978 QUADRATS, B11, H63 - H65
H60, H67

Figure 3-11

Figure 3-12



Transect Surface Collection Site Map

3.2 INVENTORY METHODOLOGY - (Cont'd)

Reconnaissance surveys were made of the following linear offsite facilities: 1) the proposed water cooling pipeline route from the proposed station reservoir to the Trans-Canada Highway (see Sandwell 1977); 2) the proposed access road between the Highway 12-upper Hat Creek road junction and the proposed powerplant and; 3) the 60 kV transmission line-conveyor belt-water line corridor between the proposed powerplant and mine maintenance area. Archaeological sites found along these routes were recorded, but no artifacts were collected.

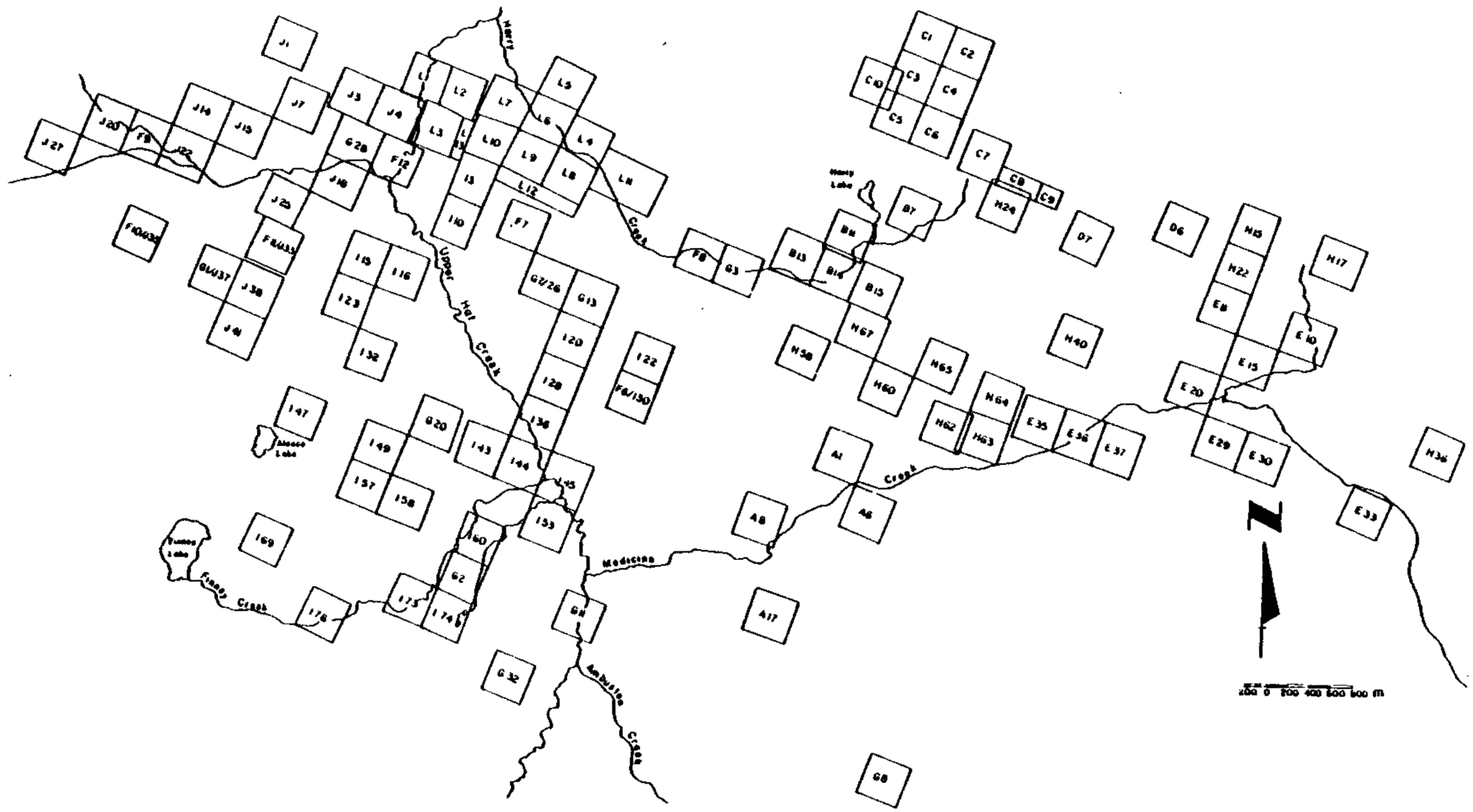
Several alterations of the proposed development's preliminary design were received after Phase II's survey had been completed. These alterations affect the sample for inventorying archaeological resources as follows: 1) quadrats associated with the upper Medicine Creek fly/bottom ash dump were deleted from the identification of direct impacts; 2) the upper Medicine Creek wet ash dump was replaced by the smaller, relocated station reservoir thereby deleting some quadrats from the identification of direct impacts; 3) the perimeter of the proposed open pit was reduced, elminating several quadrats from the identification of direct impacts and; 4) the Sandwell Preliminary Design for the proposed cooling water pipeline route was rejected, making nearly half of reconnaissance survey irrelevant.

Fig. 3-13 shows all quadrats surveyed in the north end of the upper Hat Creek valley. Figs. 3-14 and 3-5 show all the areas surveyed within the proposed development components and the headworks reservoir.

(b) Archaeological Excavation

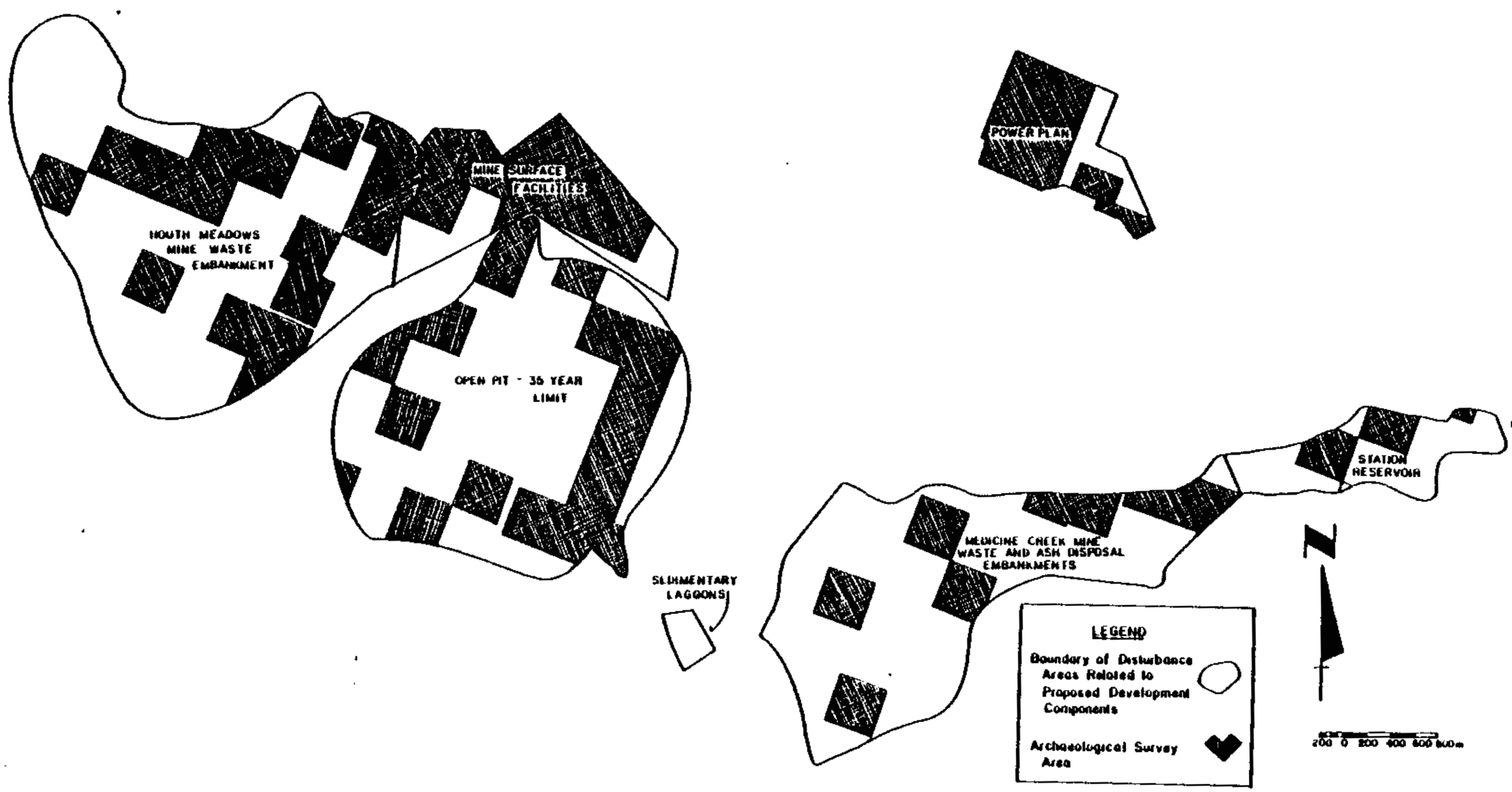
Three main objectives shaped the design of the excavation programme: 1) to determine the relationship between surface and subsurface archaeological remains; 2) to determine the nature

Figure 3-13



Archaeological Survey Quadrats in the North End
of Upper Hat Creek Valley

Figure 3-14



Archaeological Survey Areas Within Proposed
Development Components

of the subsurface archaeological remains; and 3) to recover samples for the physical-chemical dating of archaeological sites. Satisfying these objectives permits more reliable generalizations to be made about the nature of the cultural heritage resources and thus aid assessment procedures.

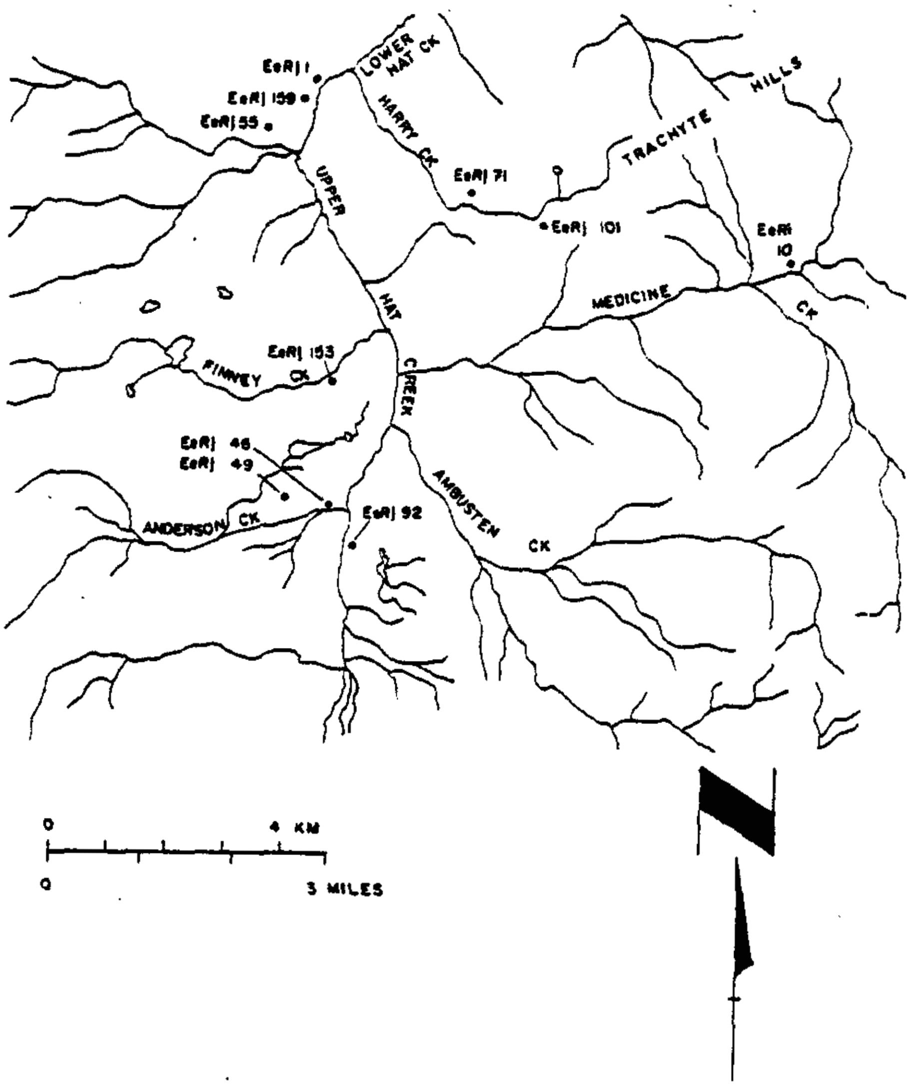
In Phase I, excavations focused on cultural depressions.* A sample was drawn by first dividing the cultural depressions into two strata on the basis of their exterior edge to exterior edge diameters (less than or equal to 6.7 m and more than 6.7 m), and then randomly selecting three depressions from each stratum.

EeRj 46, cultural feature No. 1; EeRj 71, cultural feature No. 1; and EeRj 55, cultural feature No. 12 (hereafter called EeRj 55, A), comprised the sample for large cultural depressions (see Fig. 3-15). Excavations were initiated for EeRj 46 and EeRj 71 during Phase I. EeRj 71 was completed at that time, though EeRj 46 was not completed until Phase II. EeRj 55, A was begun and finished during Phase II.

Originally, the sample for small depressions included EeRj 33, cultural feature No. 1; EeRj 55, cultural feature No. 8 (hereafter called EeRj 55, C); and EeRj 58, cultural feature No. 3. EeRj 101, cultural feature No. 1 was added to the sample early in Phase II because at that time it was the only known cultural depression in the Medicine Creek-Harry Creek drainage. In 1978, EeRj 58, cultural feature No. 3, was replaced by EeRj 55,

---

* Cultural depressions are non-natural depressions of varying depth and often exhibiting a mounded rim. These archaeological features are explained more fully in Section 3.5(a) of this report and in the glossary.



Excavated Archaeological Sites in Upper Hat Creek Valley

Figure 3-15

cultural feature No. 20 (hereafter called EeRj 55, D) at the discretion of supervisory field personnel. Lack of time precluded a test excavation at EeRj 33, cultural feature No. 1. In summary, test excavations were actually carried out at the following small depressions: EeRj 55, areas C and D, and EeRj 101, cultural feature No. 1 (see Fig. 3-15).

Test excavations were also implemented for two cultural depressions at EeRj 1: cultural features No. 9 and No. 10 (see Fig. 3-15). They were selected for excavation from a set of cultural depressions surveyed in 1978, whose surficial characteristics indicate that they might be housepits.

Besides continuing the test excavation programme for cultural depressions, Phase II initiated a programme for lithic scatter sites. Types of lithic scatter sites were defined judgementally on the basis of their artifactual content and their geographic location. These types were altered throughout Phase II as more information about the nature of archaeological sites became available from the on-going survey. Sites were selected for excavation to comprise a representative sample of these types.

Lithic scatter sites from which one or more microblades had been collected and lithic scatter sites associated with cultural depressions formed the first two site types defined in Phase II. Only sites recorded during Phase I were considered, because analysis of survey materials from Phase II had just begun when this component of the excavation progamme had commenced. EeRj 49 was chosen to represent the sites with microblades; EeRj 55, to represent lithic scatters associated with cultural depressions (see Fig. 3-15). Those excavation units in the lithic scatter portion of EeRj 55 were labelled "Area B" to differentiate them from units excavated in the associated cultural depressions (areas A, C and D).

3.2 INVENTORY METHODOLOGY - (Cont'd)

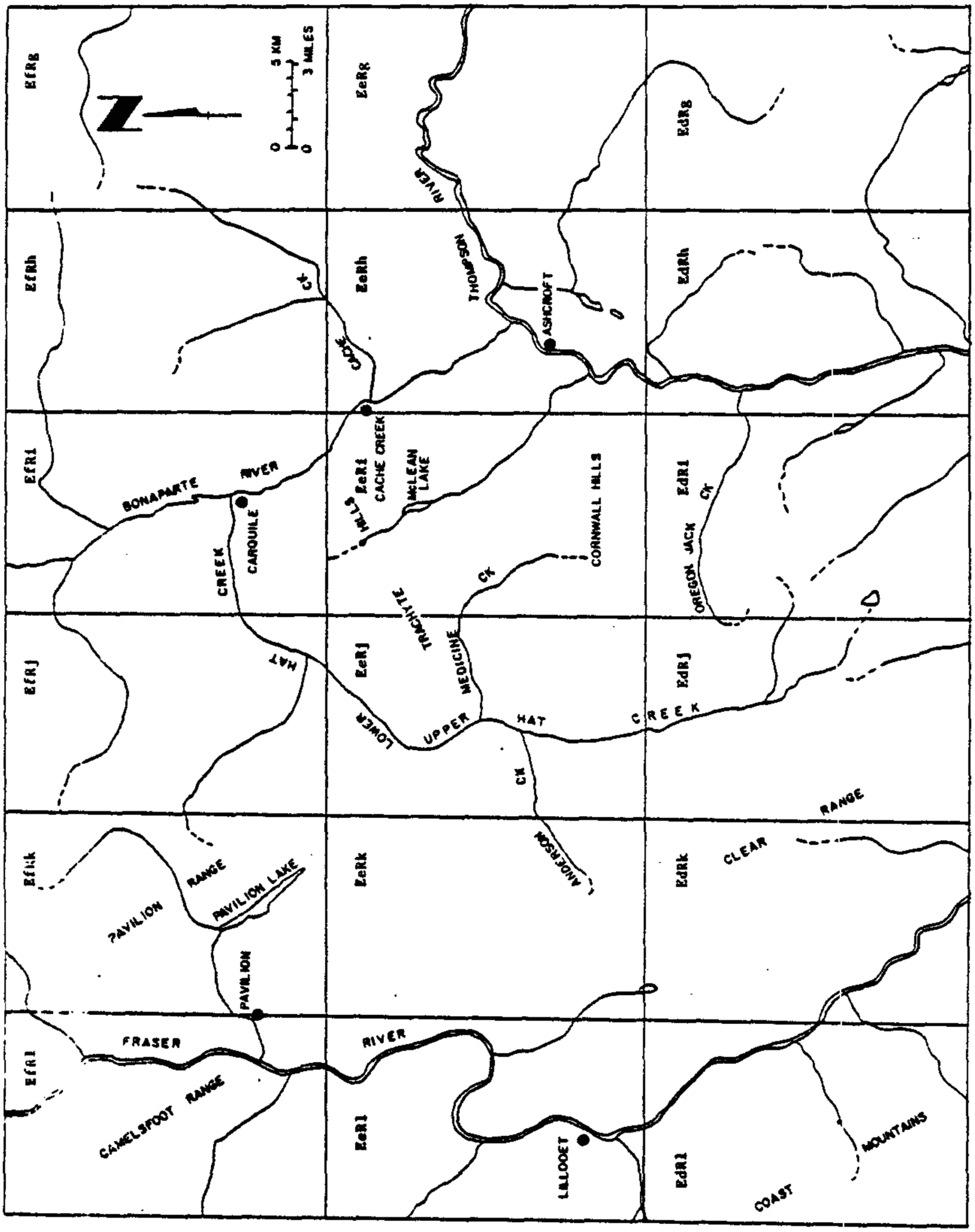
EeRj 159 and EeRj 92 were included in the excavation programme as typical large (in area and number of artifacts) lithic scatter sites with a diversity of artifact types (see Fig. 3-15). Two geographic areas are represented by these sites: Houth Meadows (EeRj 159) and the upper Hat Creek terraces (EeRj 92). In addition, artifacts collected from EeRj 159 are predominantly vitreous basalt and those collected from EeRj 92 are predominantly cherts. Finally, cursory inspection of EeRj 92's geology indicated that archaeological materials might be buried by sediments. Such a situation would aid the establishment of a local chronology.

Many lithic scatter sites recorded in the upper Hat Creek valley can be characterized as being small in area and in number of artifacts, and having few, if any, retouched tools or blades. EeRj 153, located near the former Finney Creek channel in the upper Hat Creek bottomlands, was selected from this site type for test excavations (see Fig. 3-15).

EeRi 10 is located in the Medicine Creek drainage (see Fig. 3-15). Its inclusion in the excavation programme represents small lithic scatters whose artifacts (e.g. scrapers, gravers) may indicate past productive and procurement activities, rather than maintenance activities.

(c) Library, Archival and Ethnographic Research

As mentioned in Section 3.2(a), the B.C. Site Inventory files were examined for data regarding archaeological sites in the upper Hat Creek valley. In addition, all sites recorded in the local study area were plotted on a 1:125 000 scale topographic map and their archaeological and environmental data compiled (see Melcombe 1979). Fig. 3-16 shows the Borden grids relevant to the local study area.



Borden Grid Designations Applicable to the Local Study Area

Figure 3-16

3.2 INVENTORY METHODOLOGY - (Cont'd)

In-depth information for archaeological sites in the local and regional study areas was obtained from both published and unpublished sources. Reports filed with the Provincial Archaeologist's Office in compliance with archaeological fieldwork permit requirements were the greatest source of information.

Preliminary library and archival research indicated the extent of available historical records for the local study area; and oral history, folklore and traditions were compiled mainly through informant interviews. Sporadic observation of, and participation in, the local society gleaned additional information about traditional cultural lifeways.

3.3 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE REGIONAL STUDY AREA AND OTHER RELEVANT AREAS OF THE SOUTHERN INTERIOR PLATEAU

As noted in Section 2.5, Sanger's work along the Fraser River between Lytton and Lillooet, especially at Lochnore and Nesikep creeks, provides the framework for interpreting the regional study area's prehistory (Sanger 1963, 1966, 1969, 1970). Excavations at seven archaeological sites yielded the following major artifact classes: projectile points, microblades (677), microblade cores (39), hafted scrapers, bifaces, formed unifaces, non-formed unifaces, burins, gravers, macroblades, macroblade cores, debitage, cobble tools, spall tools, hammerstones, nephrite celts, spindle whorls, steatite pipes, other ground and abraded stones, bone points and awls, bone needles, bone beads, antler wedges, antler points, tooth artifacts, shell artifacts, copper beads and pendants, birch-bark rolls and a birch-bark container. Vitreous basalt is the predominant chipped stone material (Sanger 1970: 117). Sanger's proposed chronology is summarized in Table 3-2 (Sanger 1970). In this chronology, Sanger suggests that a microblade technology may be indicative of the Middle Nesikep period (5000 to 2000 years B.P.) (Sanger 1970: 105, 108-109) and that triangular, side-notched projectile points may be indicative of the Late

Nesikep period (2000 to 100 years B.P.) (see Plates 3-1 and 3-2) (ibid.: 42-44, 105).

In their surveys of the Lillooet-Big Bar stretch of the Fraser River, Stryd and Hills (1972) recorded 32 housepit sites, three cachepit sites, four burials, two pictographs, 13 lithic scatters and three sites of indeterminate nature. Site density ranged from 0.6 to 2.13 sites per river mile or 0.4 to 1.3/km. The number of housepits per housepit site is as follows:

	Number of Housepits			
Number of Sites	1	2 to 19	20 to 40	more than 40
	8	17	2	5

(Stryd and Hills 1972).

A number of housepit sites have cachepits associated with the housepits. While a few housepits are as much as 22.0 m (72.2 ft) in diameter* and 2.0 m (6.6 ft) in depth, most range from 8.0 m to 13.0 m (26.2 to 42.7 ft) in diameter and 0.8 m to 1.5 m (2.6 to 4.9 ft) in depth (ibid.: 193).

Most (78.9 percent) of the collected 883 chipped stone artifacts are vitreous basalt (Stryd and Hills 1972: 196). One-third of the 108 projectile points are too fragmentary to classify; however, all but 14 of the remaining points bear resemblance to those in Sanger's (1970) typology (Stryd and Hills 1972: 198). Seven points are small,

---

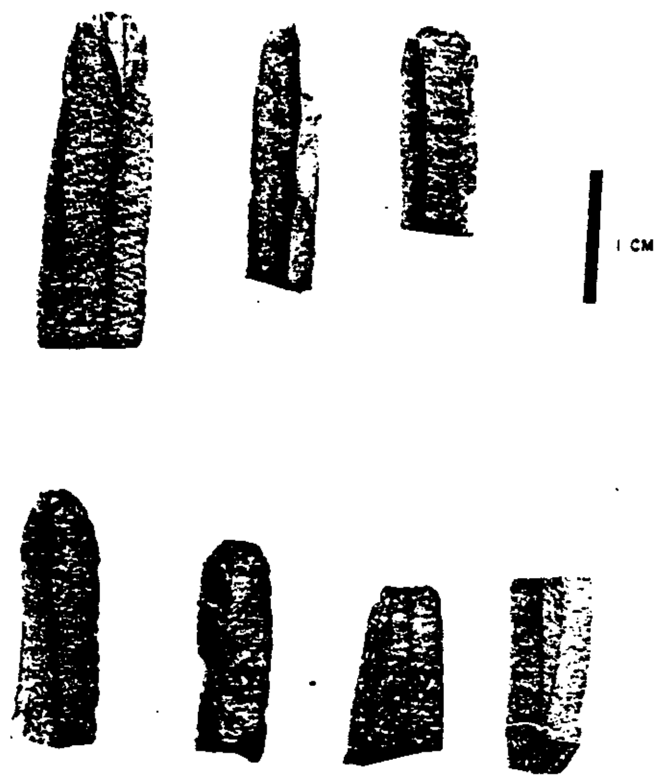
* The diameter was measured from the "middle of rim to middle of rim" (Stryd and Hills 1972: 193).

TABLE 3-2

A SUMMARY OF SANGER'S PROPOSED CHRONOLOGY

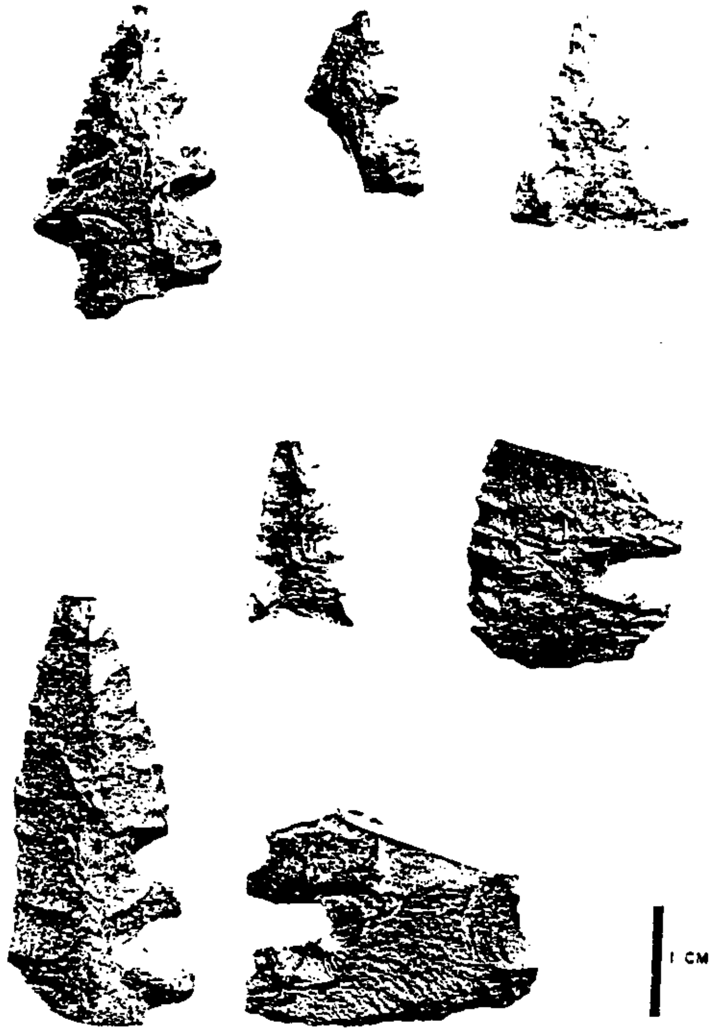
Period	Dates	Associated Artifact Classes
Late Nesikep	100-2000 B.P.	triangular, side-notched projectile points; no microblades; ground stone
Upper Middle Nesikep	2000-3500 B.P.	microblades; large projectile points; ground stone
Lower Middle Nesikep	3500-5000 B.P.	microblades; large, expanding-stem projectile points; formed unifaces
Early Nesikep	5000-7000 B.P.	formed unifaces; few microblades; gravers; macroblades (?); leaf-shaped points (?)
Lochnore Complex	?-7000 B.P.	

* Sanger (1969: 146-149) also defines a Kamloops phase (A.D. 1250 - A.D. 1800), which is characterized by small, triangular, side-notched projectile points.



Microblades from Upper
Hat Creek Valley Sites

Plate 3-1



Kamloops Phase Side-Notched
Projectile Points from Upper
Hat Creek Valley Sites

Plate 3-2

triangular and side-notched (i.e. Kamloops phase points) (ibid.). Only three sites yielded either microblades or microblade cores (ibid.: 203). Other collected tool classes include bifaces, unifaces, gravers, macroblades, bipolar shatter, cobble tools, retouched and/or utilized flakes, debitage, spall tools, drills, ground and abraded stone, nephrite celts, shall artifacts, antler wedges, birch-bark rolls and birch-bark containers (ibid.: 199).

As mentioned in Section 2.5, most of the fieldwork directed by Stryd in the Lillooet area between 1970 and 1976 focused upon housepit sites. During 1974, 67 housepit sites, including 40 previously unrecorded sites, were mapped and described in detail (Stryd 1978: 17). Between 1970 and 1976, test excavations were carried out at 19 housepit sites (Stryd 1978). On the basis of excavation results from six sites, Stryd (1973) divides the Nesikep Tradition into an Early (5000 to 800 B.C.) and a Late (800 B.C. to A.D. 1858) period. The presence of microblades distinguish the Early Nesikep from the Late Nesikep period (ibid.). He further divides the Late Nesikep as follows: 1) Nicola phase (800 B.C. to A.D. 200); 2) Lillooet phase (A.D. 200 to 800); 3) Kamloops phase (A.D. 800 to 1750) and 4) protohistoric (A.D. 1750 to 1858) (ibid.).

Few microblades were excavated from these last six sites (Stryd 1973: 43). Projectile points from these sites suggest the continued use of spears throughout the Nesikep Tradition and the replacement of atlatls and darts by bows and arrows, beginning in the Lillooet phase (ibid.: 49-51). Neck width appears to be the most important criterion for distinguishing dart heads from arrowheads (ibid.). A hideworking technology is inferred from the presence of scrapers, spall tools, needles, awls and perforators (ibid.: 54-55); a woodworking technology, from the presence of adze blades, splitting wedges, mauls, gravers, spokeshaves and drills (ibid.: 55). Historic artifacts include nails, glass shards, glass beads, a horseshoe, a rifle cartridge, iron fragments, porcelain shards, brass bells and a metal-tipped flaker (ibid.: 408-409). Of special note is a "sheet iron projectile point with a contractin (sic.) stem, sharp acute shoulders, a rounded base and convex blade margins 2.74 x 1.08 x 0.28 cm" (ibid.: 408). Teit (1909: 475) notes that while iron was probably introduced into the area in the middle of the 18th century, it was "very scarce until 1810 or later".

Mule deer is the most common species of the 21 land mammals identified from faunal remains (Stryd 1973: 62). Beaver is also well-represented in the remains (ibid.: 63). Domesticated species include dog (<u>Canis familiaris</u>), horse (<u>Equus cabellus</u>) and cattle (<u>Bos</u> sp), the latter two recovered from a proto-historic component at EeRl 22 (ibid.: 64, 311). Also, many thousands of unidentified fish vertebrae were excavated from these sites (ibid.: 66). Indications of consumed plant species are limited to a concentration of berry seeds, charred white-bark pine cones, a chokecherry seed, several sapscrapers and digging stick handles (ibid.: 68-69).

Most of the excavated hearths consisted of a deposit of fine ash with very little charcoal lying in a shallow depression in the pithouse floor (Stryd 1973: 417). Stryd (ibid.: 418) believes that sagebrush was the most commonly used fuel because of all the local wood sources, it is the only one which burns down into ash with no charcoal. Rock-lined hearths occur, but are uncommon, and it appears that woods other than sagebrush were utilized in these hearths (ibid.: 417-419).

Blake's total excavation of a housepit at EeRk 9 has provided a detailed description of a protohistoric/historic occupation (Blake 1974). The assemblage contains corner-notched and multi-side-notched*

---

* Multi-side-notched projectile points are rare at Lillooet sites, but more common at sites along the South Thompson River (Blake 1974).

projectile points; atlatl points; bifaces; unifaces; drills; gravers; two blades; spall tools; cobble tools; ground stone; steatite pipes; shell beads; bone and antler tools; beaver tooth dice and bark containers (ibid.). Mother-of-pearl and wood buttons, beads, glass, metal and leather fragments comprise the items derived from European technology (ibid.).

Besides those of numerous small mammals, bones from deer, bear, elk, dog, beaver, horse, spring salmon and sockeye salmon were excavated from EeRk 9 (Blake 1974). Butchering marks were found on the horse bones. (Horses were used as food by native peoples until the 1840s or 1850s according to Teit (1909: 533).) The hearth consisted of a white ash concentration, on a natural cobble floor, surrounded by burnt earth, but without a rock structure (ibid.). Other features include cachepits and postholes (ibid.).

Baker's (1973) fieldwork in the vicinity of Lytton is the only other major archaeological project on the Fraser River within the regional study area. A survey along the river's west bank discovered 122 sites (housepits, cachepits, rock art, burials and lithic scatters) (ibid.). Most (91) sites occurred on the river terraces; 12 sites, in the river gorge; and 19 sites, above the river terraces (ibid.). In addition, excavations at EbRj 17, a lithic scatter at the confluence of the Fraser and Stein rivers, produced projectile points similar to those found by Stryd at Lilloeet (ibid.).

Further up the Fraser River, Eldridge (1975) recorded 35 sites near Gaspard Lake and Creek. He computed the expected number of sites for the 100 km^2 survey area to be 140 (Eldridge 1975), which yields a site density of .014 sites per hectare. Sites were found either in natural meadows or disturbed areas, within 100 m of water (ibid.). Only two sites contained microblades and no sites had any Kamloops projectile points (ibid.). Most collected projectile points are large with wide necks (ibid.), which may imply that they were used to head darts or spears, rather than arrows.

Forty-one sites were mapped and recorded at the confluence of the Fraser and Chilcotin rivers by the Shuswap Settlement Pattern Project, under the direction of Matson and Ham (Ham 1975). Site densities projected from the survey sample are 0.188 housepits and 0.313 cachepits per hectare (see Matson and Ham 1975: 3). The number of housepits per site range from one to seven, with an average of three (Ham 1975: 117). Housepit diameters range from 4.5 m (14.8 ft) to 16.0 m (52.5 ft) and average 6.9 m (22.6 ft) (ibid.).

Most of the projectile points collected by the Shuswap Settlement Project are basalt, Kamloops phase projectile points; many of the remaining points are similar to point types found at Lochnore-Nesikep and Lillooet (Ham 1975: 129). None of the formed unifaces are as well-made as those collected by Sanger (ibid.: 143). Other artifact classes from the Chilcotin and Fraser rivers' confluence are bifaces, unformed unifaces, bipolar shatter, spall tools, cobble tools, hammerstones, retouched and/or utilized flakes and debitage (Ham 1975). Heat-cracked rock was noted at 15 sites (ibid.: 179). Historic artifacts (glass and nails) date one housepit to the historic period; and radiocarbon samples date two other sites as follows:

Site	Sample No.	Date
EkRo 18	GaK-5325	1290 ± 80 B.P. (A.D. 660)
EkRo 48	GaK-5326	870 ± 80 B.P. (A.D. 1080)
EkRo 48	GaK-5327	1450 ± 75 B.P. (A.D. 500)

Little is known about cultural heritage resources in upland areas between the Fraser and Thompson rivers. Baker's (1975) transect survey recorded four mat lodge sites, two earth oven sites and

3.3 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE REGIONAL STUDY AREA AND OTHER RELEVANT AREAS OF THE SOUTHERN INTERIOR PLATEAU - (Cont'd)

11 lithic scatters near Botanie Lake; and two cachepit sites, one burial and 11 lithic scatters on the west slope of the Clear Range between 170 m (558 ft) and 600 m (1969 ft) asl. Intensive surface collections and test excavations were completed (ibid.), but results have not yet been reported. Weber and Seymour (1976) mapped three lithic scatters near the south end of McLean Lake and one lithic scatter near the end of a small lake due east of McLean Lake. EeRi 2, near McLean Lake, appears to have subsurface cultural deposits (ibid.). They also recorded two lithic scatters and two lithic scatters with large cultural depressions in the lower Hat Creek valley (ibid.). EeRk 17, located at the headwaters of Gibbs Creek in the Clear Range, is a small (18 m (60 ft) by 45 m (150 ft)) lithic scatter composed mostly of retouched and/or utilized flakes (62) and debitage (46) (Stryd 1974). Five bifaces, five scrapers and one broken projectile point complete the assemblage (ibid.). Basalt is the predominant raw material (ibid.).

Numerous sites exist in the Ashcroft-Cache Creek-Clinton area as evidenced by several archaeological surveys (see Elmore 1974; Weber and Seymour 1976; Pokotylo 1977). Sixteen lithic scatter sites were recorded along a proposed transmission line through Semlin valley (Weber and Seymour 1976). Fifty-eight additional sites were recorded in a sample survey of the Semlin valley and the Bonaparte valley south of Clinton (Pokotylo 1977). Besides these sites, 582 single artifact finds were noted on the same survey (ibid.). On the basis of these data, 1065 prehistoric archaeological sites are estimated to exist in this survey area (ibid.). Site density is .129 /ha (cf. Pokotylo 1977). The 58 recorded sites may be classified as follows:

3.3 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE REGIONAL STUDY AREA AND OTHER RELEVANT AREAS OF THE SOUTHERN INTERIOR PLATEAU - (Cont'd)

	Environmental Zone	
Site Class	Ponderosa Pine-Bunchgrass	Interior Douglas-Fir
lithic scatter	32	17
housepit(s)	3	1
cachepit(s)	1	3
burial(s)	0	1
TOTAL	36	22

(Pokotylo 1977)

The lithic scatters range from 4 m^2 (43.1 ft^2) to 20 000 m^2 (215,278.2 ft^2) in area. Housepit depressions range from 6.5 m (21.3 ft) to 26.0 m (85.3 ft); cachepit depressions average 2.0 m (6.6 ft) in diameter (Pokotylo 1977).

Investigations at EeRh 3 collected 115 513 artifacts from 17 632 m^2 (189,789.3 ft^2) on the site's surface and from 13 2 m x 2 m excavation units (the latter yielding 48 percent of the total assemblage) (Whitlam 1978). Most (98.7 percent) of these artifacts are debitage; the remainder are projectile points (Kamloops phase and corner-notched), microblades (226), microblade cores (13), bifaces, unifaces and retouched and/or utilized flakes (ibid.). As in previously mentioned sites, vitreous basalt is the predominant raw material (ibid.). Heat-cracked rock and faunal remains were also obtained in the excavations (ibid.).

EeRh 3's complex stratigraphy includes a volcanic tephra which has been identified as Bridge River tephra (Whitlam 1978). Similar tephras at Blue Lake have a maximum radiocarbon date of 3750 ± 210 years B.P. (ibid.). A radiocarbon date of 3920 ± 65 years B.P. was obtained for a sample from another sedimentary layer in EeRh 3 (ibid.). These dates suggest that the occupation represented at EeRh 3 may be one of the oldest in the Cache Creek vicinity (ibid.).

EgRg 4A near Hihuim Lake also has a layer of volcanic ash, tentatively identified as Bridge River, 5 cm (2 in) below the present surface (Gehr 1976). Nearly all the artifacts from this site lie below the ash. Over 4000 pieces of debitage were collected during excavations (horizontal area equals approximately 11 m^2 or 118 ft^2, maximum depth equals 30.5 cm or 12 in) (ibid.). Other excavated artifacts are projectile points (leaf-shaped; Kamloops phase; large, side-notched); hafted scrapers (?), bifaces, unifaces, drills, gravers, bone tools, microblade cores and flake cores (ibid.).* Besides artifacts, 13 hearths and a number of bones (large mammal, bird, rodent, fish) were found (ibid.).

Sanger's study of the Chase burial site EeQw 1 proposed and defined the Kamloops phase on the basis of several late prehistoric burials and other excavations (Sanger 1969). Artifacts from EeQw 1 include projectile points (including Kamloops phase points); bifaces, scrapers; drills; hammerstones; hand mauls; mortars; abrading stones; adze blades; steatite pipes; ground stone; ochre; beads; carved figures; digging stick handles; unilaterally-barbed, antler harpoon heads; antler wedges and other tools; bone awls, needles and other tools; shell artifacts; a birch-bark container; a wood mask; copper ornaments and worked animal teeth (ibid.).

In 1971 Wilson's salvage excavations at EeRc 8, a burial site near north Kamloops, yielded shell beads, tooth pendants, a bilaterally-barbed, antler harpoon fragment; unilaterally-barbed bone points; abrading stones; stone fish net weights; a mortar; orange ochre; and retouched and/or utilized flakes (Wilson 1973). Salvage excavations at two housepit sites EeRb 10 and EeRb 3, near Kamloops,

---

* The absence of microblades may be attributable to screening the matrix with a large (1/2-inch) mesh.

recovered numerous projectile points (no Kamloops phase points), bifaces, drills, whetstones, a scraper, a spall tool, ground stone, hammerstones, retouched and/or utilized flakes, bone points, antler points and wedges, a shell artifact and a tooth artifact (ibid.). EeRb 10's eight housepits ranged in diameter from 6 m (19.7 ft) to 16 m (52.5 ft) (ibid.). EeRb 3 was the largest pithouse site near Kamloops until 90 percent of the site was bulldozed for a parking lot; 31 small housepits remain (ibid.). Forty-five cachepits comprised EdRa 11, on the north shore of the South Thompson River (ibid.). Few (84) artifacts were found during limited excavations at EdRa 11, but birch-bark rolls, land mammal bone fragments and fish vertebrae were recovered from the cachepits' fill (ibid.). Surface collection and excavation at EfRh 3, a lithic scatter along the Cache Creek, yielded bifaces, hammerstones, retouched and/or utilized flakes, cores, debitage and abraders (ibid.). Nearby EeRg 13, a buried housepit site, produced debitage, corner-notched projectile points, cores, retouched and/or utilized flakes, a hammerstone, a shell disc bead, rolled birch-bark and rolled cherry bark (McMurdo 1974). Minimally, three housepits exist at EeRg 13 (ibid.).

Between 1958 and 1964 Fladmark (1969) recorded 45 sites on the beaches and shores of Shuswap Lake, Adams Lake, Adams River and the South Thompson River. Artifacts observed and/or collected from these sites suggest a mixture of plains and plateau influences (ibid.). Neither microblades nor microblade cores were found at any of the sites (ibid.). Most of the sites are located near the Shuswap Lake-South Thompson River juncture, though smaller clusters of sites were reported along Salmon Arm (ibid.).

Excavations conducted by Johnson Fladmark (1973) at Shuswap Lake tested four large housepit-cachepit sites, one cachepit fishing site, one lithic scatter and one burial. The burial (EfQw 1) was that of a small child with no grave goods except a basalt flake (ibid.).

Only eight artifacts were recovered from the lithic scatter (EeQw 22); and only 64, from the fishing station portion of EfQv 4 (ibid.). EfQv 4's artifacts consist of projectile points, bifaces, scrapers, core and retouched and/or utilized flakes (ibid.). Few bones were found: mostly unidentifiable, but no fish (ibid.). Excavations at the housepit-cachepit sites (EeQw 6, EeQw 15, EfQv 5, EfQv 19) produced both corner-notched and Kamloops phase projectile points; bifaces, scrapers, spall tools; gravers, drills; antler wedges; bone awls, fish hooks, beads and other artifacts, hammerstones; retouched and/or utilized flakes, abrading stones, nails; glass beads, ground stone; steatite pipes; digging stick handles and heat-cracked rock (ibid.). EeQw 6 yielded remains of deer, moose or elk, fish and river mussel (ibid.).

Eldridge's (1974) survey along the South Thompson River recorded 118 habitations, both housepits and mat lodge depressions, distributed among 15 sites. In general, the housepits are smaller than those recorded at Lillooet (ibid.: 16-17). Excavations at EeQx 14 revealed two distinct deposits of cultural material (Eldridge 1974). Corner-notched and Kamloops phase projectile points were excavated from only one of the deposits; while bifaces, unifaces, retouched and/or utilized flakes, drills, ground stone and debitage comprised most of the assemblage from both deposits (ibid.). Faunal remains include deer, Canada goose, dog, duck, salmon and freshwater mussel (ibid.). Similar artifacts were excavated from EdQx 5, with the addition of worked bone and antler (ibid.). The inventory of faunal remains for EdQx 5 is the same as for EeQx 14 except for the addition of beaver, bear and sucker (ibid.).

Artifacts excavated from EdQx 20, along the south Thompson River, most closely resemble those from the Lillooet and Kamloops phases in Lillooet area sites (Blake 1976: 71). The assemblage consists of projectile points (including Kamloops phase points), bifaces, scrapers, gravers, drills, cores, ground stone, fish net weights, debitage, abraders, bone and teeth (ibid.). Historic items in the assemblage include nails, glass and metal fragments (ibid.).

Test excavations at EeQx 2, also along the south Thompson, revealed a housepit which probably dates to the Kamloops phase of the Late Nesikep (Blake and Eldridge 1971). Multi-side-notched points were found along with leaf-shaped points and triangular points (ibid.). Other artifacts include scrapers, drills, awls, a hand axe, ground stone, antler wedges, bone needles, bone points and a bone tube (ibid.). Faunal remains were plentiful, however, most of the bone was splintered into unidentifiable fragments (ibid.). Deer, elk (?), beaver, mice, fish and freshwater shellfish were recognized among the remains (ibid.). The hearth(s) consisted of concentrations of heat-cracked-rock and charcoal near the centre of the housepit (ibid.).

Grabert's (1974) investigations in the Okanagan valley have documented differences between archaeological site assemblages from the north end and from the south end of the valley. Moreover, assemblages from the north Okanagan valley are more similar to assemblages from the Fraser-Thompson area than are those from the south (ibid.). Yet, even in the north Okanagan sites, similarities between the Fraser-Thompson area and the Okanagan valley are more pronounced in later sites than in earlier sites (ibid.). Caldwell (1954), however, considered the ties between the Thompson River valley and the Similkameen-south Okanagan valleys to be stronger than those between the Thompson River valley and the north Okanagan valley. Roberts' (1974) survey and excavations near Osoyoos Lake produced results compatible with Grabert's results.

In his survey of the Okanagan valley, Copp (1974) notes that cultural depressions tend to occur in groups of between two and five depressions, and that their diameters measure between 2 m (6.6 ft) and 3.5 m (11.1 ft). He suggests that they may be remnants of tipis or mat lodges (ibid.). Lawhead and McAleese (1976), in a subsequent survey, remarked that the cultural depressions were of indefinite and problematic form. They also record the presence of rock-lined pits, which may be remnants of cachepits (ibid.). Given a site density along the beaches of three to four sites per lakeshore mile (1.9 to 2.5/km), Lawhead and McAleese (1976) predict 750 to 1000 lakeshore sites in the Okanagan valley.

Archaeological sites surveyed and excavated by Wyatt (1970) in the Nicola valley appear to span the time period between 500 B.C. and A.D. 1900. Stylistically, the artifact assemblages resemble those from the Fraser-Thompson area (ibid.). However, there are few Kamloops phase sites: older sites predominate (ibid.). Four or more housepits occur in most older sites, whereas single housepits are more common in the Kamloops phase (ibid.). No site had more than 10 housepits (ibid.). Wyatt notes some differences in settlement pattern between upriver and downriver portions of Nicola valley.

Assemblages from housepit sites in the Arrow Lakes area have a general stylistic affinity to assemblages from the Kootenay area and the plains (Mitchell and Turnbull 1968, 1969). In contrast, resemblances between Arrow Lakes' artifacts and Fraser-Thompson rivers' artifacts are minimal (ibid.). The relationship of archaeological sites in the Kootenay area to those on the plains and to those on the interior plateau has been a research question posited as early as 1956 by Borden (1956). Both Borden (1956) and Choquette (1973) suggest that the archaeological evidence favours a more intense relationship with plains cultures, at least for late prehistoric sites in the Kootenay area.

While stylistically resembling plains archaeology, Kootenay area sites seem to have some likeness to interior plateau settlement systems. A careful examination of Borden's (1956) description of "housepits" at Windermere and Columbia lakes indicates that these depressions may actually be earth ovens. These small depressions (12 to 25 ft or 3.7 to 7.6 m) usually occur singly or in pairs, and a test excavation revealed "no artifacts, but much ash, fire-cracked rocks, and numerous splintered mammal bones and the deposit was approximately a foot in depth" (Borden 1956: 81). Photographs (Borden 1956, Plate II) of these impressions are reminiscent of earth oven sites in the upper Hat Creek valley.

Both Mitchell's (1970) excavations at three sites on the Chilcotin plateau and Whitlam's (1976) summary of excavations at three sites near Williams Lake indicate stylistic similarities between these areas and the Fraser-Thompson area. The presence of Kamloops projectile points at FdSi 2 implies a date within the Late Nesikep period, while microblades imply that EkSe 1 dates to the Early Nesikep period (Mitchell 1970). FaRx 1 may be an even earlier site (ibid.). FaRn 3, ElRn 3 and FaRm 8 all appear to be contemporaneous with Late Nesikep sites in the Fraser-Thompson area, on the basis of the following evidence: 1) scarcity of microblades, 2) absence of microblade cores and 3) average radiocarbon dates of 1180 ± 58 years B.P. and 1762 ± years B.P.

Finally, Kenny's (1972) detailed mapping of FbRn 13, north of Williams Lake, revealed 12 to 13 housepits (6 to 16 m or 19.7 to 52.5 ft in diameter, 0.5 to 1.5 m or 1.6 to 4.9 ft in depth), 3 to 4 small cultural depressions (2.5 to 3.5 m or 8.2 to 11.5 ft in diameter, 0.25 to 0.5 m or 0.8 to 1.6 ft in depth) and a midden. Ninety-four artifacts were excavated including leaf-shaped points, projectile points, scrapers, bifaces, cobble tools, cores, a hand maul, ochre and a split beaver incisor (ibid.). No antler items were found, but animals represented in the faunal remains are large mammals, salmon, birds and freshwater shellfish (ibid.).

3.4 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE LOCAL STUDY AREA

All prehistoric and historic archaeological sites recorded in B.C. are assigned Borden numbers and their pertinent data filed on B.C.

3.4 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE LOCAL STUDY AREA - (Cont'd)

Site Inventory Forms (formerly Site Survey Forms) with the Provincial Archaeologist's Office. These data have been used to ascertain the prehistoric resources in the local study area, to plot the resources on a 1:125 000 scale topographic map and to compile descriptive tabulations concerning the nature of the resources. Sites recorded by the Hat Creek Archaeological Project have been omitted from this summary for the purpose of comparison. The distribution of cultural heritage resources in the local study area is presented in Fig. B1, Addendum B, which is derived from the 1:125 000 scale map. A thorough analysis of the data is available in Melcombe (1979).

Lack of consistency in research objectives and designs through three decades of archaeological research in the southern interior plateau does not allow for strict comparisons between resources. Categories of recorded data vary from researcher to researcher, as does detail of description and objectivity. In addition, as can be seen from Section 2.5, research has concentrated upon major river valleys. Consequently, the B.C. Site Inventory ought not to be considered a representative sample of the local study area's resources. However, it does provide a good indication of what is currently known about the cultural heritage resources.

Site categories defined for this summary are: 1) lithic scatters - debitage only; 2) lithic scatters - tools and debitage; 3) cultural depressions - no artifacts; 4) cultural depressions - with debitage; 5) cultural depressions - with tools and debitage; 6) burials; 7) pictographs; 8) petroglyphs; 9) fishing stations and 10) fishing stations with petroglyphs. Categories 6, 7, 8, 9 and 10 are discussed briefly in the following paragraphs, as they are not represented in the recorded sites for upper Hat Creek valley. The distribution of categories 1 through 5 with respect to physiography, vegetation, availability of water and elevation is described in detail. Not all sites had this information recorded, so site totals vary from distribution to distribution. Further detailed description of the nature and distributions of the site categories was inhibited by the large number of forms which were incompletely filled out.

Most known burial sites in the local study area were discovered accidentally during the course of other activities. Twenty burials have been recorded: 11 on terraces overlooking creeks or rivers; five on exposed flats or fields and four on talus slopes. Grave goods had been interred with 15 burials. This is in accord with ethnographic accounts which state that grave goods were often placed in burials (Dawson 1891: 11) and that terraces or low hills overlooking a river were preferred burial sites (ibid.: 10). Talus burials have been reported in Nicola valley (Smith 1900; Ray 1942).

Pictographs are paintings on rock faces; petroglyphs are pecked or carved designs on rock faces. Twelve pictograph sites have been recorded in the local study area and all have been painted with red ochre.* Six sites occur beneath a sheltered overhang. Only one site is associated with other cultural remains. While many petroglyph sites are known to exist in the local study area (see Lundy 1977), only four have been recorded in the B.C. Site Inventory. Lundy (1977) has noted numerous co-occurrences of petroglyphs with fishing stations and the emergence-submergence cycle of petroglyphs with the river low water-high water cycle. She hypothesizes that the petroglyphs may have regulated the commencement and termination of the salmon fishing season, and also served as ownership marks for fishing spots (ibid.).

Five fishing stations without petroglyphs have been reported and consist of fish drying racks on boulders. All are located along

---

* Dawson (1891: 17) reports three sources of red ochre, of which one "is on the Bonaparte, not far above the mouth of Hat Creek".

the Fraser River. One site is associated with a dip-net platform, a lithic scatter and a hearth. Three sites are still in use.

More than half (52 percent) of recorded sites in the local study area are lithic scatters without cultural depressions. About one-quarter (26 percent) are cultural depressions without artifacts; the remainder (22 percent), cultural depressions with artifacts. More than half (57 percent) of sites with artifacts have tools as well as debitage.

Table 3-3 summarizes the distribution of site categories 1 to 5 with respect to physiographic context. Low terraces are 15 m (49.2 ft) or less above a creek, river or lake; high terraces are 15 m or more above a creek, river or lake. Plains and/or gentle slopes are self-explanatory. All site categories, except lithic scatter with tools and debitage, are most often located on low terraces. Lithic scatters with tools and debitage are most often located on high terraces, the second most common location for the other four site categories. Together, low and high terraces are listed as the physiographic context for 79 percent of sites in these five categories. While relatively few sites are recorded on plains and/or gentle slopes, 29 percent of the lithic scatters with tools and debitage occur in this physiographic context.

Most (71 percent) sites recorded on the local study area occur in ponderosa pine parklands (see Table 3-4). Douglas-fir forests are the next most common setting for sites (23 percent). Very few sites occur in riverine vegetation (5 percent) or in Engelmann spruce forests (1 percent). Cultural depressions sites have not yet been recorded in Engelmann spruce forests.

The availability of water to a site's occupants is measured by distance: 1) far from water equals more than 1 km (.62 mi); and 2) near water equals less than 1 km. Sites near water were further

TABLE 3-3

DISTRIBUTION OF SITE CATEGORIES WITH RESPECT TO PHYSIOGRAPHIC CONTEXT IN THE LOCAL STUDY AREA: NUMBERS AND PERCENT OF TOTAL

Site Categories	PHYSIOGRAPHIC CONTEXT			
	Low terrace	high terrace	plains and/or gentle slopes	Total
lithic scatters - debitage only	37 / 10%	37 / 10%	16 / 4%	90 / 24%
lithic scatters- tools and debitage	28 / 8%	43 / 12%	30 / 8%	101 / 28%
cultural depressions no artifacts	46 / 13%	34 / 9%	15 / 4%	95 / 26%
cultural depressions debitage only	14 / 4%	6 / 2%	4 / 1%	24 / 7%
cultural depressions tools and debitage	22 / 6%	16 / 5%	15 / 4%	53 / 15%
Total	147 / 41%	136 / 38%	80 / 21%	363 / 100%

TABLE 3-4

DISTRIBUTION OF SITE CATEGORIES WITH RESPECT TO
VEGETATION IN THE LOCAL STUDY AREA:
NUMBERS AND PERCENT OF TOTAL

Site Categories	VEGETATION			
	ponderosa pine parklands	Douglas-fir forests	Engelmann spruce forest	riverine vegetation
lithic scatters-debitage only	68 19.7%	11 3.2%	2 0.6%	3 0.9%
lithic scatters-tools and debitage	67 19.4%	16 4.6%	3 0.9%	4 1.2%
cultural depressions no artifacts	68 19.6%	23 6.6%	0 0%	3 0.9%
cultural depressions debitage only	15 4.3%	8 2.3%	0 0%	2 0.6%
cultural depressions-tools and debitage	29 8.4%	20 5.8%	0 0%	4 1.2%
Total	247 71.4%	78 22.5%	5 1.4%	16 4.6%

divided by the type of water source: 1) lake; 2) primary river; 3) secondary river; and 4) tertiary stream. Table 3-5 shows the distribution of site categories with respect to the availability and source of water. The majority (78 percent) of sites in the local study area occur near either primary or secondary rivers. Very few sites occur near tertiary streams (5 percent) or lakes (3 percent).* However, 13 percent are far from water - a substantial minority. Lithic scatter sites are more likely to be found far from water, near lakes or near tertiary streams than are cultural depression sites.

Elevations are described by 500 feet asl intervals, as metric measurements have been used on B.C. Site Inventory forms for only the most recently recorded sites. Fig. 3-17 displays the distribution of site categories by elevation. Metric equivalents are given at approximately 1500 feet asl. In general, cultural depressions with no artifacts have the lowest range of elevation of all the site categories, whereas lithic scatters without cultural depressions have the highest. Most sites of all categories lie between 500 feet asl and 2000 feet asl. Less than 10 percent of sites recorded in the local study area lie between 2500 feet asl and 4500 feet asl, which is approximately equivalent to the range of elevations in the upper Hat Creek valley.

3.5 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA

(a) Prehistoric Archaeology Sites

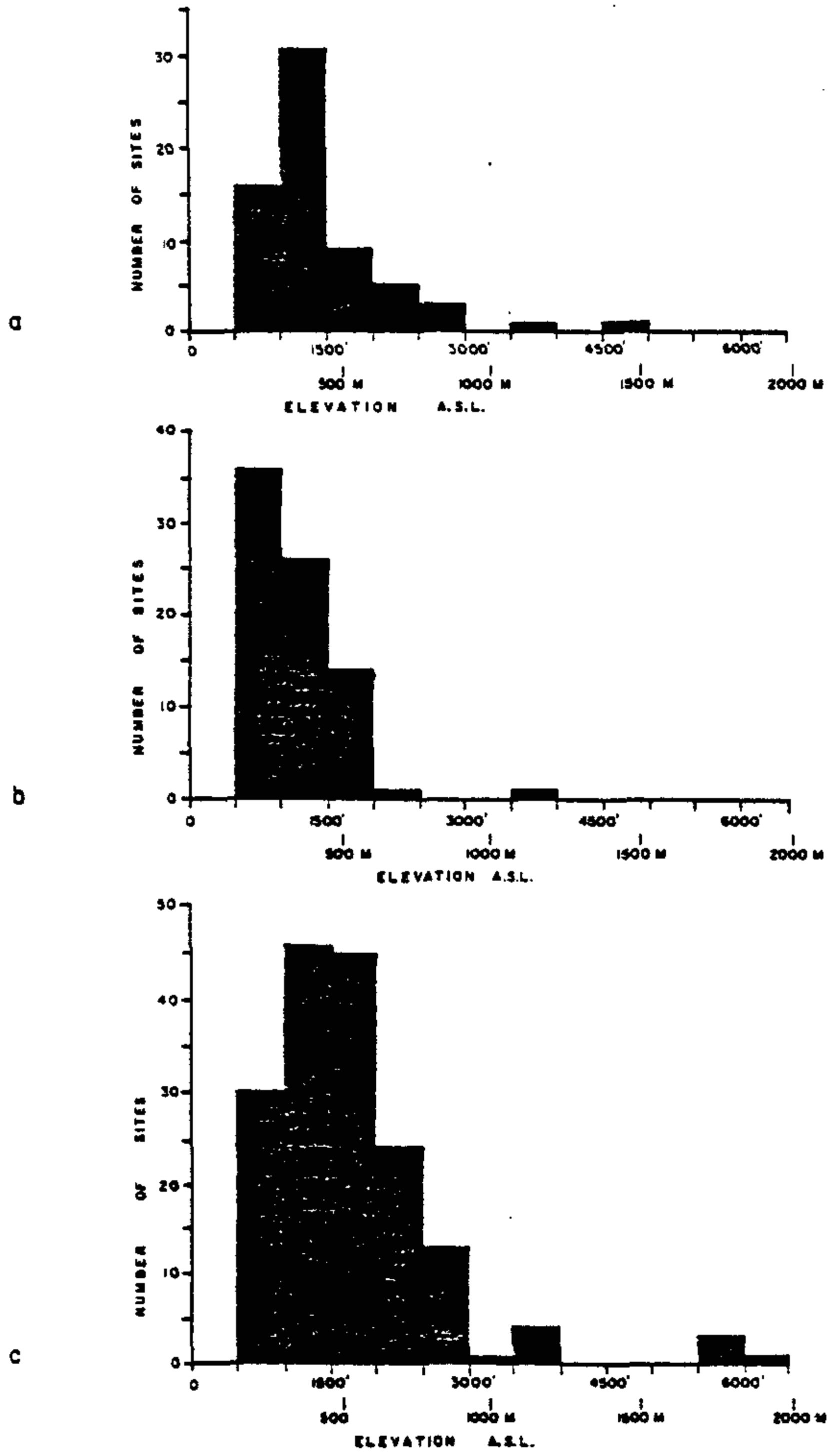
The Phase I survey recorded 85 prehistoric archaeological sites. These sites are listed in Tables 3-6 and 3-7,

* This may be the result of past research focusing on major river valleys, to the exclusion of other land areas.

TABLE 3-5

DISTRIBUTION OF SITE CATEGORIES WITH RESPECT TO WATER AVAILABILITY AND SOURCE IN THE LOCAL STUDY AREA: NUMBERS AND PERCENT OF TOTAL

Water availability and source	Site Categories		
	lithic scatters only	cultural depressions	Total
far from water	39 / 11%	6 / 2%	45 / 13%
near lakes	8 / 2%	4 / 1%	12 / 3%
near primary rivers	63 / 19%	84 / 23%	152 / 43%
near secondary rivers	64 / 18%	59 / 17%	123 / 35%
near tertiary streams	13 / 4%	4 / 1%	17 / 5%



Elevations of Sites in the Local Study Area:
a) Elevations of Cultural Depression Sites with Artifacts,
b) Elevations of Cultural Depression Sites without Artifacts,
c) Elevations of Lithic Scatters.

Figure 3-17

TABLE 3-6

PHASE I (1976) SURVEY - PREHISTORIC SITES

SURVEY NUMBER	BORDEN DESIGNATION	SITE SIZE (m^2)	BASALT DEBITAGE	CHERT DEBITAGE	TOTAL DEBITAGE	BASALT TOOLS	CHERT TOOLS	TOTAL TOOLS	TOTAL LITHIC ARTIFACTS	SITE TYPE
G2-I	EaRj 9	92	227	7	234	1	0	1	235	L.S.
G2-II	EaRj 10	932	422	1436	1858	17	9	26	1884	L.S.
G2-III	EaRj 11	88	104	3	107	3	1	4	111	L.S.
G2-IV	EaRj 12	16	141	3	144	3	1	4	148	L.S.
G2-V	EaRj 13	4	11	10	21	0	0	0	21	L.S.
G2-VI	EaRj 14	4	31	2	33	0	0	0	33	L.S.
G2-VII	EaRj 15	4	14	0	14	0	0	0	14	L.S.
G2-VIII	EaRj 16	8	42	0	42	0	0	0	42	L.S.
G2-IX	EaRj 17	168	155	1	156	5	0	5	161	L.S.
G2-X	EaRj 18	72	46	0	46	1	1	2	48	L.S.
G2-XI	EaRj 19	236	1161	620	1781	3	1	4	1785	L.S.
G2-XII	EaRj 20	244	237	42	279	5	2	7	286	L.S.
G2-XIII	EaRj 21	320	135	441	576	10	4	14	590	L.S.
G2-XIV	EaRj 22	4	6	74	80	2	0	2	82	L.S.
G2-XV	EaRj 23	56	105	1	106	2	0	2	108	L.S.
G2-XVI	EaRj 24	28	23	22	45	3	0	3	48	L.S.
G3-I	EaRj 25	24	14	0	14	1	0	1	15	L.S.
G3-II	EaRj 26	72	96	43	139	4	2	6	145	L.S.
G3-III	EaRj 27	244	260	28	288	3	1	4	292	L.S.
G6-I	EaRj 28	104	31	27	58	4	1	5	63	L.S.
G6-II	EaRj 82	64	63	4	67	5	1	6	73	L.S./C.D.
G7/26-I	EaRj 29	164	611	0	611	14	0	14	625	L.S.
G7/26-II	EaRj 30	28	216	0	216	0	0	0	216	L.S.
G7/26-III	EaRj 31	4	25	0	25	0	0	0	25	L.S.
G8-I	EaRj 32	72	0	103	103	0	0	0	103	L.S.
G11-I	EaRj 68	20	0	46	46	0	0	0	46	L.S.
G11-II	EaRj 69	696	1210	2110	3320	4	1	5	3325	L.S.
G11-III	EaRj 70	7975	560*	1580*	2140*	140*	180*	320*	2460*	L.S./C.D.
G11-IV	EaRj 75	16	1	41	42	0	0	0	42	L.S.
G11-V	EaRj 76	76	16	33	49	0	0	0	49	L.S.
G11-VI	EaRj 77	N/A	4	31	35	0	0	0	35	L.S.
G17-I	EaRj 78	32	0	0	0	0	0	0	0	C.D.
G18-I	EaRj 33	1260	778	21	799	30	2	32	831	L.S./C.D.
G19-I	EaRj 81	4	0	11	11	0	0	0	11	L.S.
G20-I	EaRj 34	56	1	46	47	0	0	0	47	L.S.
G21-I	EaRj 35	280	5	266	271	0	5	5	276	L.S.
G21-II	EaRj 36	104	7	55	62	3	1	4	66	L.S.
G21-III	EaRj 37	88	26	21	47	0	0	0	47	L.S.
G21-IV	EaRj 38	172	745	1	746	1	0	1	747	L.S.
G21-V	EaRj 39	124	61	0	61	9	0	9	70	L.S.
G21-VI	EaRj 40	208	147	152	299	2	1	3	302	L.S.
G21-VIII	EaRj 41	116	48	7	55	0	0	0	55	L.S.
G21-IX	EaRj 42	2252	4369	1326	5695	14	10	24	5719	L.S.
G21-X	EaRj 43	224	140	22	162	3	1	4	166	L.S.
G21-XI	EaRj 44	180	254	26	280	0	0	0	280	L.S.
G21-XIII	EaRj 45	376	376	174	550	3	3	6	556	L.S.
G21-XIV	EaRj 46	56	9	33	42	1	0	1	43	L.S./C.D.
G22-I	EaRj 47	248	254	24	278	4	0	4	282	L.S.
G22-II	EaRj 48	8	0	12	12	0	0	0	12	L.S.
G22-III	EaRj 49	84	43	108	151	0	3	3	154	L.S.
G22-IV	EaRj 50	68	20	28	48	8	1	9	57	L.S.
G22-V	EaRj 51	56	54	1	55	2	0	2	57	L.S.
G23-I	EaRj 52	288	156	251	407	4	2	6	413	L.S./R.C.
G23-II	EaRj 83	45	0	0	0	0	0	0	0	C.D.
G23-III	EaRj 84	33	0	0	0	0	0	0	0	C.D.
G23-IV	EaRj 85	53	0	0	0	0	0	0	0	C.D.
G27-I	EaRj 53	248	707	92	799	8	0	8	807	L.S.
G27-II	EaRj 54	128	0	64	64	0	0	0	64	L.S.
G28-I	EaRj 55	104	145	20	165	2	1	3	168	L.S./C.D.
G28-II	EaRj 56	892	3127	73	3200	19	3	22	3222	L.S./C.D.
G28-III	EaRj 57	72	25	1	26	1	0	1	27	L.S./C.D.
G28-IV	EaRj 58a	9404	64741	9932	74673	115	9	124	74797	L.S./C.D.
G28-V	EaRj 59	252	483	2	485	0	0	0	485	L.S.
G28-VI	EaRj 60	1448	2355	923	3278	27	0	27	3305	L.S.
G28-VII	EaRj 61	52	33	3	36	2	0	2	38	L.S.
G28-VIII	EaRj 62	416	699	67	766	43	2	45	811	L.S.
G28-IX	EaRj 79	4	49	0	49	0	0	0	49	L.S.
G28-X	EaRj 80	4	14	5	19	1	0	1	20	L.S.
G30-I	EaRj 63	476	361	85	446	14	3	17	463	L.S.
G31-I	EaRj 64	372	103	219	322	18	4	22	344	L.S.
G31-II	EaRj 65	180	118	129	247	0	0	0	247	L.S./C.D.
G32-I	EaRj 66	20	19	1	20	0	0	0	20	L.S.
G32-II	EaRj 67	8	0	20	20	0	0	0	20	L.S.
F8-I	EaRj 71	1668	4623	1498	6121	29	8	37	1798	L.S./C.D.
F8-II	EaRj 72	400	482	356	838	8	5	13	851	L.S.
F11-I	EaRj 73	8	0	17	17	0	0	0	17	L.S.
F11-II	EaRj 86	11	0	0	0	0	0	0	0	C.D.
F12-I	EaRj 5	64	1001	2	1003	28	0	28	1031	L.S.
F12-II	EaRj 6	292	430	206	636	2	2	4	640	L.S.
F12-III	EaRj 7	796	1725	321	2046	39	1	40	2086	L.S.
F12-IV	EaRj 58b	6240	13821	2524	16345	141	5	146	16491	L.S./C.D.
F12-V	EaRj 8	88	486	0	486	5	0	5	491	L.S.

* Figures are extrapolations from 10% sample surface collection.

Survey number legend:
- G = grassland stratum
- F = forest stratum
- Arabic number = quadrat number
- Roman numeral = site number

Site type legend:
- L.S. = lithic scatter present
- C.D. = cultural depression(s) present
- R.C. = rock cairn(s) present

TABLE 3-7

PHASE I (1976) SURVEY - SITE TOOL ASSEMBLAGES

Borden Site Designation	Quadrat - Site Designation	Basalt Projectile Points	Chert Projectile Points	Basalt Projectile Point Bases	Chert Projectile Point Bases	Basalt Point Biface Tips	Chert Point Biface Tips	Basalt Biface Fragments	Chert Biface Fragments	Basalt Biface Ends	Chert Biface Ends	Basalt Bifaces	Chert Bifaces	Basalt Steep Angle Marginal Unifacial Retouch Flakes	Chert Steep Angle Marginal Unifacial Retouch Flakes	Basalt Narrow Angle Marginal Unifacial Retouch Flakes	Chert Narrow Angle Marginal Unifacial Retouch Flakes	Basalt Steep Angle Formed Unifaces	Chert Steep Angle Formed Unifaces	Basalt Steep Angle Marginal Bifacial Retouch Flakes	Chert Steep Angle Marginal Bifacial Retouch Flakes	Basalt Acute Angle Marginal Bifacial Retouch Flakes	Chert Acute Angle Marginal Bifacial Retouch Flakes	Basalt Gravers	Chert Gravers	Basalt Microblades	Chert Microblades	Basalt Bipolar Implements	Total Number of Tool Types
EeRj 9	G2-I											X																	1
10	G2-II	X		X		X		X	X					X	X	X	X		X	X	X					X	X		14
11	G2-III														X							X				X			3
12	G2-IV		X	X		X																	X						4
17	G2-IX													X						X									2
18	G2-X														X	X													2
19	G2-XI									X				X	X	X													4
20	G2-XII			X				X						X	X				X	X									6
21	G2-XIII	X							X	X				X	X	X	X									X			8
22	G2-XIV									X				X															2
23	G2-XV					X		X																					2
24	G2-XVI															X										X			2
25	G3-I															X													1
26	G3-II									X				X	X	X							X					X	6
27	G3 III													X	X														2
28	G6-I													X			X									X			3
62	G6-II	X						X						X	X														[illegible]
29	G7-I															X						X						X	3
69	G11-II			X					X	X																X			4
33	G18-I							X		X				X		X	X			X		X			X	X		X	10
35	G21-I														X		X												2
36	G21-II					X								X											X				3
38	G21-IV									X																			1
39	G21-V							X						X				X		X		X						X	6
40	G21-VI											X								X							X		3
42	G21-IX			X			X	X		X				X	X	X	X		X		X	X							11
43	G21-X																									X	X		2
45	G21-XIII					X	X	X		X					X														5
46	G21-XIV					X																							1
47	G22-I									X				X		X													3
49	G22-III																		X				X				X		3
50	G22-IV															X										X	X		3
51	G22-V													X															1
52	G23-I					X				X				X	X		X												5
53	G27-I					X		X		X				X		X													5
55	G28-I														X	X				X									3
56	G28-II	X		X	X	X		X		X				X	X				X							X			10
57	G28-III													X															1
58a	G28-IV	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X			X			X			19
60	G28-VI	X		X				X		X				X						X		X				X			8
61	G28-VII													X															1
62	G28-VIII			X				X		X				X	X	X	X			X						X			9
80	G28-X																									X			1
63	G30-I					X		X							X	X									X	X			6
64	G31-I	X						X	X			X		X	X	X		X	X	X									10
71	F8-I	X				X	X	X	X	X	X	X		X	X				X						X			X	13
72	F8-II			X		X				X	X		X	X	X														7
5	F12-I							X						X		X				X								X	5
6	F12-II			X				X																			X		3
7	F12-III			X				X		X				X						X						X	X		7
58b	F12-IV	X		X		X		X		X		X			X	X						X				X	X		11
8	F12-V	X								X				X		X													4

along with data regarding artifacts collected from the ground surface. Only nine archaeological sites were discovered while surveying the 12 forest stratum quadrats, whereas 76 sites were discovered while surveying the 32 grassland stratum quadrats. Thus, in forested areas of the upper Hat Creek valley, an average of .047 prehistoric archaeological sites can be expected per hectare of land surveyed and .148 prehistoric archaeological sites can be expected per hectare of grassland surveyed. Table 3-8 lists the total area and expected number of prehistoric archaeological sites for each stratum and for the entire Phase I study area.

TABLE 3-8

EXPECTED NUMBER OF PREHISTORIC SITES IN THE PHASE I STUDY AREA

	Grassland	Forest	Phase I Study Area
Area	5300 ha	3740 ha	9040
Expected number of prehistoric sites	786.5	175.4	961.9

Site area ranges from 8 m^2 to 6240 m^2 in the forest stratum and from 4 m^2 to 9404 m^2 in the grassland stratum. Average area is 1062 m^2 and 433 m^2 for prehistoric archaeological sites located in the forest stratum and grassland stratum, respectively. However, most sites recorded in the Phase I study area are small: 50 percent or more of the sites recorded in each of the two strata are less than 100 m^2.

An average of 3085 artifacts was collected from the surface of each prehistoric archaeological site in the forest stratum; an average of 1420 artifacts from the surface of each prehistoric archaeological site in the grassland stratum. The number of surface artifacts per site ranges from 0 to 16 491 in the forest stratum, and from 0 to 74 800 in the grassland stratum. Half of the sites have less than 151 artifacts.

All artifacts collected from the surface of prehistoric sites recorded during Phase I are of chipped stone, except for one ground nephrite adze fragment from EeRj 56 (G28:II). Vitreous basalt and cherts are the predominant materials. At one-half of the sites, more than 84 percent of the artifacts are made from vitreous basalt. At the remaining sites, basalt artifacts comprise a smaller percentage of the total number of artifacts. Nine percent of the sites had only chert artifacts.

Most of the artifacts are debitage, or waste flakes produced during the manufacture of tools. Tool types may be categorized as follows: 1) amorphous flakes which have been utilized, but not modified intentionally; 2) amorphous flakes which have been modified along their edges (e.g. retouched flakes), either on one side of an edge (e.g. unifacial retouch) or on both sides of an edge (e.g. bifacial retouch); 3) flakes or nodules that have been extensively modified on one side (e.g. uniface) or on both sides (e.g. biface); 4) long, thin, parallel-sided flakes which have been made using a specified manufacturing technique (e.g. blades); 5) unifacially retouched points or spurs (e.g. gravers); 6) bifaces which may have been hafted onto spears, darts or arrows (e.g. projectile points); and 7) flakes or chunks which have been made by shattering a nodule between a hammerstone and an anvilstone (e.g. bipolar implements). Tools may also be categorized on the basis of their retouched edge's angle: acute - less than 45°; steep - equal to or greater than 45°.

Only 52 (61 percent) prehistoric archaeological sites recorded in the Phase I area contained intentionally modified tools: the remainder either had no artifacts at all (five sites) or only utilized flakes and/or debitage (28 sites). Twenty-six sites (50 percent) have three or less tool types; 26 sites (50 percent) have four or more tool types. No site has more than 19 tool types present. Twenty-eight sites (54 percent) have five or less tools; 15 sites (29 percent) have between six and 24 tools and nine sites (17 percent) have 25 or more tools.

Artifacts are not disturbed evenly on the land surface of archaeological sites. Artifact density ranges from close to zero to about 17 artifacts per square mile for sites recorded during Phase I. Approximately one-half of the sites have an artifact density of 2 or less per square mile.

Prehistoric archaeological sites in the upper Hat Creek valley can be divided into general classes depending upon the presence or absence of artifacts, cultural depressions and rock cairns. Five sites recorded during Phase I contain cultural depressions without artifacts: all other cultural depressions are found in association with artifacts (10 sites). One site has a rock cairn associated with artifacts and the remaining sites located during Phase I (67) contain only artifacts.

Size classes for prehistoric archaeological sites in the upper Hat Creek valley are defined in Table 3-9. These are based on the distribution of values for site area, number of artifacts, number of debitage, number of tools and artifact density for Phase I sites. In general, divisions were made at approximately 33 percent and 67 percent of the total number of sites, except when natural breaks in the distribution occurred (e.g. number of tools has a natural break at six tools per site).

Select prehistoric sites have been grouped by the presence-absence of artifact types using a cluster analysis (see

TABLE 3-9

DEFINITIONS OF SIZE CLASSES FOR SITE AREA; NUMBER OF SURFACE ARTIFACTS, DEBITAGE, BLADES AND RETOUCHED/UTILIZED ARTIFACTS; AND DENSITY OF SURFACE ARTIFACTS FOR PREHISTORIC SITES

	Size Class		
	Small	Medium	Large
Site Area (sq.m) (Percentage)	$x < 34$ (49.4%)	$84 \leq x < 248$ (23.5%)	$248 \leq x$ (27.1%)
Number of Surface Artifacts (Percentage)	$x < 55$ (32.5%)	$55 \leq x < 343$ (33.8%)	$343 \leq x$ (33.8%)
Number of Surface Debitage	$x < 51$ (32.5%)	$51 \leq x < 319$ (33.8%)	$319 \leq x$ (33.8%)
Number of Surface Tools (Percentage)	$x < 1$ (30.0%)	$1 \leq x < 6$ (38.8%)	$6 \leq x$ (31.3%)

	Size Class	
	Low	High
Density of Surface Artifacts (per sq.m) (Percentage)	4 (77.2%)	4 (22.8%)

Fig. 3-18).* Group 1 is characterized by an average of 3.4 tool types and 7.7 tools per site. Unifacially retouched flakes predominate. The second-most frequent tool type in this group is steep-angled bifacially retouched flakes. Few of Group 1 sites contain either bifaces or projectile points. Three of the five sites recorded during Phase I which contain bipolar implements are in this group.

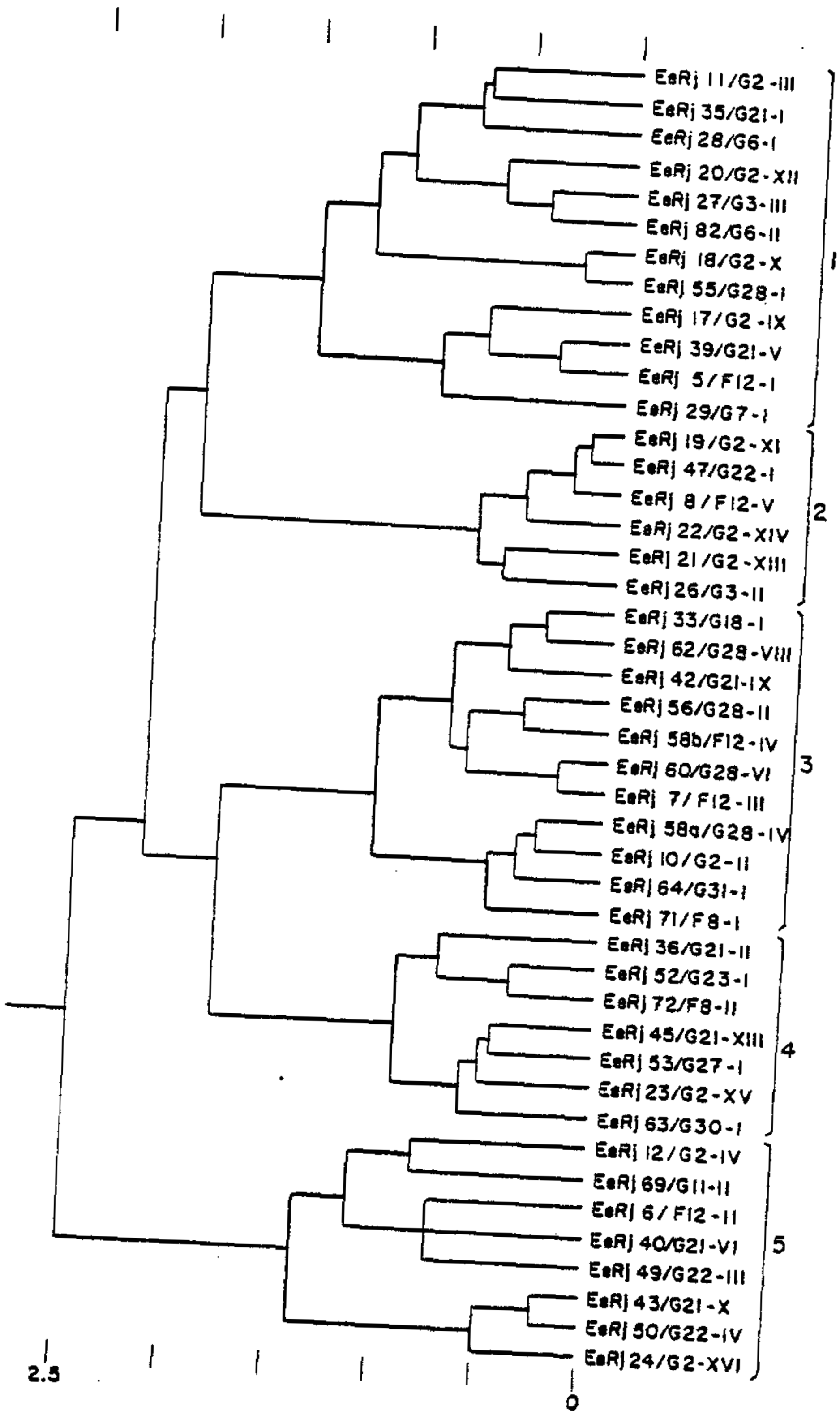
The six sites that constitute Group 2 have an average of 4.5 tool types and 5.8 tools. Biface end fragments and steep-angled unifacially retouched flakes are the most common tool types in Group 2. Microblades and bipolar implements occur sporadically. No projectile point fragments, formed unifaces, gravers or whole bifaces were found at any of the Group 2 sites.

With an average of 11.1 tool types and 49.5 tools, Group 3 sites tend to be both large and diverse in artifact composition. Projectile points, biface fragments, unifacially retouched and microblades are common tool types in this group.

Projectile point tips occur frequently at Group 4 sites, but whole projectile points are absent. Biface fragments and ends as well as unifacially retouched flakes are often found at these sites. Group 4 sites also lack formed unifaces, bifacially retouched flakes and bipolar implements. The average number of tool types is 4.7; the average number of tools is 8.0.

---

* Prehistoric sites having less than two tool types were omitted from the analysis. A matrix of Jaccard's association coefficients was calculated for the remaining 44 sites. Pseudo-distances were computed by subtracting each coefficient from 1. A Ward's Error Sum of Squares cluster analysis was employed to identify groups of sites.



Cluster Analysis of Phase I Site Tool Assemblages

Figure 3-18

All but one site (EeRj 12) in Group 5 contains one or more microblades. Few tool types occur in these sites (average number equals 3.0) as well as few tools (average number equals 4.4). Bifacially and unifacially retouched tools tend towards a mutually exclusive existence at Group 5's sites.

Group 6 consists of all the remaining lithic scatter and lithic scatter with cultural depression(s) sites, i.e. only debitage. Group 7 consists of all the cultural depressions without an associated lithic scatter.

Table 3-10 shows the distribution of prehistoric sites recorded in Phase I with respect to their associated vegetation (grassland vs. forest) and their components (lithic scatter, cultural depression, rock cairn). The distribution of grassland sites among the general site classes is similar to, but not exactly like, the distribution of forest sites. This discrepancy is most likely a result of the small number of forest sites. The distribution of sites with respect to their associated vegetation and their site group is outlined in Table 3-11. There are too few forest sites to make a meaningful comparison between their distribution and the grassland sites' distribution.

TABLE 3-10

DISTRIBUTION OF PHASE I PREHISTORIC SITES BY STRATA AND SITE CLASSES

	Lithic Scatter	Cultural Depression(s)	Cultural Depression(s) with Lithic Scatter	Rock Cairn with Lithic Scatter
Grassland	59	4	8	1
Forest	6	1	2	0

TABLE 3-11

DISTRIBUTION OF PHASE I PREHISTORIC SITES BY
STRATA AND SITE GROUPS

Site Group	Grassland	Forest
1	11	1
2	5	1
3	8	3
4	6	1
5	7	1
6	27	2
7	4	1

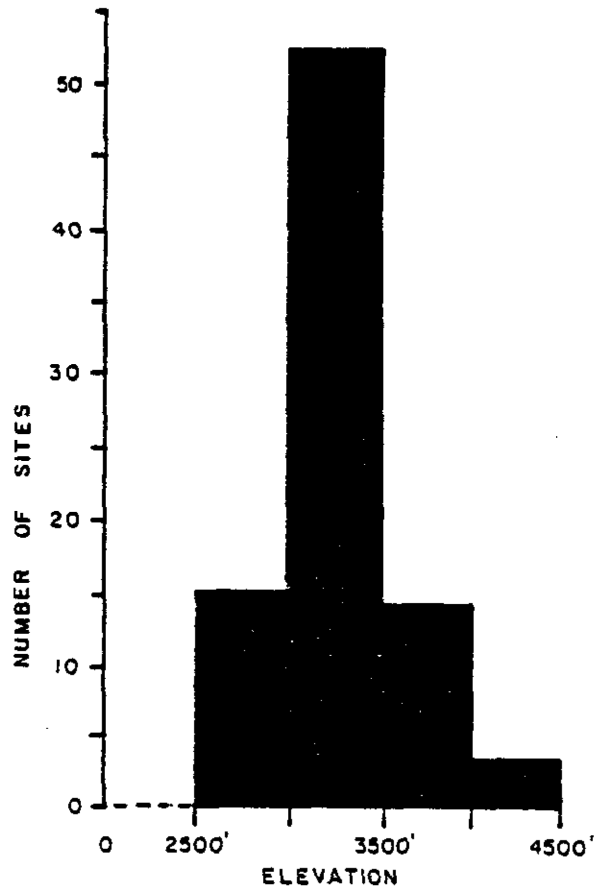
Fig. 3-19 illustrates the distribution of all prehistoric sites recorded in Phase I by elevation. As in Section 3.4, the sites are grouped into 500 feet asl intervals. Elevations range from 2850 feet asl to 4400 feet asl. Few sites have previously been recorded within this elevation range within the local study area (see Section 3.4): consideration of archaeological resources from upper Hat Creek valley alters current knowledge about prehistoric utilization of uplands. Distribution of Phase I prehistoric sites by physiographic context is as follows:

	Terrace	Plain or Gentle Slope	Ridge	Not Recorded
Number	12	46	5	22
Percent	14	54	6	26

The first year of Phase II survey recorded 97 prehistoric sites and 4 sites with prehistoric as well as historic artifacts and/or features. Tables 3-12 and 3-13 list these sites along with data regarding artifacts collected from the ground surface. To facilitate comparisons of site distributions between proposed development zones, results from sampling strata A, B, D, E and H have been combined to form a zone encompassing all of Medicine Creek and Harry Creek drainages.* No archaeological sites were found in C stratum (powerplant) (see Fig. 3-9) and so it will be omitted from the following discussion.

All Phase II, year 1 survey quadrats were post-stratified (see Addendum C) (see Kish 1965) upon the basis of their

* Strata A, B, D and E were sampled at approximately the same rate so that it is statistically valid to combine their results. No significant difference between these results and those from stratum H led to its inclusion in the combined area.



Distribution of Phase I
Prehistoric Sites by Elevation

Figure 3-19

TABLE 3-12

PHASE II (1977) SURVEY: PREHISTORIC SITES

Column

Column	
1	Survey number
2	Borden designation
3	Site area collected
4	Estimated total site area
5	Number of basalt debitage collected
6	Estimated total number of basalt debitage
7	Number of chert debitage collected
8	Estimated total number of chert debitage
9	Number of other debitage collected
10	Estimated total number of other debitage
11	Number of debitage collected
12	Estimated total number of debitage
13	Number of tools collected
14	Estimated total number of tools
15	Number of artifacts collected
16	Estimated total number of artifacts
17	Site type: L.S. - Lithic Scatter C.D. - Cultural Depression(s) L.S./C.D. - Lithic Scatter and Cultural Depression(s)

TABLE 3-12 - (Cont'd)

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
A1-I	EeRj 103	20	20	20	20	2	2	0	0	22	22	0	0	22	22	L.S.
A6-I	EeRj 104	8	8	16	16	0	0	0	0	16	16	0	0	16	16	L.S.
A8-I	EeRj 93	852	852	692	692	231	231	5	5	928	928	84	84	1012	1012	L.S.
A8-II	EeRj 94	252	252	4	4	0	0	0	0	4	4	0	0	4	4	L.S.
B7-I	EeRj 106	368	368	688	688	0	0	1	1	689	689	34	34	723	723	L.S.
B13-I	EeRj 95	136	136	185	185	3	3	0	0	188	188	2	2	190	190	L.S./C.D.
B13-II	EeRj 96	124	124	41	41	10	10	2	2	53	53	4	4	57	57	L.S.
B13-III	EeRj 97	190	190	60	60	2	2	1	1	63	63	3	3	66	66	L.S.
B13-IV	EeRj 98	216	216	424	424	43	43	1	1	468	468	12	12	480	480	L.S.
B14-I	EeRj 99	140	140	124	124	10	10	0	0	134	134	3	3	137	137	L.S.
B14-II	EeRj 100	164	164	133	133	16	16	2	2	151	151	13	13	164	164	L.S.
B14-III	EeRj 101	324	324	293	293	5	5	1	1	299	299	32	32	331	331	L.S./C.D.
D6-I	EeRj 105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
E10-I	EeRi 7	20	20	12	12	0	0	0	0	12	12	0	0	12	12	L.S.
E15-I	EeRi 8	100	100	71	71	2	2	0	0	73	73	2	2	75	75	L.S.
E15-II	EeRi 9	292	292	443	443	5	5	0	0	448	448	13	13	461	461	L.S.
E15-III	EeRi 10	352	352	138	138	2	2	0	0	140	140	30	30	170	170	L.S.
E15-IV	EeRi 11	28	28	0	0	11	11	0	0	11	11	6	6	17	17	L.S.
E36-I	EeRj 107	228	228	114	114	2	2	0	0	116	116	11	11	127	127	L.S.
H22-I	EeRj 12	40	40	30	30	0	0	0	0	30	30	7	7	37	37	L.S.
H40-I	EeRj 108	48	48	41	41	0	0	0	0	41	41	6	6	47	47	L.S.
I10-I	EeRj 181	20	429	71	1521	0	0	0	0	71	1521	0	0	71	1521	L.S.
I20-I	EeRj 114	32	111	223	774	0	0	0	0	223	774	14	48	237	822	L.S.
I20-II	EeRj 115	20	44	29	63	0	0	0	0	29	64	2	4	31	68	L.S.
I20-III	EeRj 116	20	71	40	142	0	0	0	0	40	142	0	0	40	142	L.S.
I22-I	EeRj 117	108	5481	0	0	3	152	0	0	3	152	3	152	6	304*	L.S.
I22-II	EeRj 118	16	54	0	0	0	0	0	0	0	0	1	3	1	3**	L.S.
I22-III	EeRj 119	40	3700	0	0	1	92	1	92	2	184	0	0	2	184***	L.S.
I28-I	EeRj 120	36	292	44	356	1	8	0	0	45	366	6	48	51	414	L.S.
I28-II	EeRj 121	12	20	57	96	0	0	0	0	57	95	3	5	60	100	L.S.
I36-I	EeRj 122	16	155	221	2143	1	9	0	0	222	2156	15	145	237	2301	L.S.
I36-II	EeRj 123	4	24	7	42	0	0	0	0	7	42	0	0	7	42	L.S.
I44-I	EeRj 124	44	429	13	127	95	926	0	0	108	1053	1	9	109	1062	L.S.
I44-II	EeRj 125	116	621	760	4074	28	150	0	0	788	4224	15	80	803	4304	L.S.

TABLE 3-12 - (Cont'd)

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
I44-III	EeRj 126	40	207	7	36	86	445	0	0	93	481	2	10	95	491	L.S.
I44-IV	EeRj 127	128	1704	360	4793	64	852	1	13	425	5659	33	439	458	6098	L.S.
I45-I	EeRj 128	24	74	51	158	10	30	0	0	61	18	7	21	68	209	L.S.
I47-I	EeRj 129	24	128	64	341	0	0	0	0	64	341	2	10	66	352	L.S.
I53-II	EeRj 131	16	119	13	97	7	52	0	0	20	48	0	0	20	148	L.S.
I53-III	EeRj 132	8	32	10	40	0	0	0	0	10	40	0	0	10	40	L.S.
I53-IV	EeRj 133	24	200	4	33	2	17	0	0	6	50	4	33	10	83	L.S.
I53-V	EeRj 134	24	64	193	386	10	20	0	0	203	406	0	0	203	406	L.S.
I53-VI	EeRj 135	12	36	0	0	38	114	0	0	38	114	3	9	41	123	L.S.
I53-VII	EeRj 136	84	374	76	339	318	1418	1	4	395	1762	7	31	402	1793	L.S.
I53-VIII	EeRj 137	52	257	111	550	2	10	0	0	113	560	5	24	118	584	L.S.
I53-IX	EeRj 138	68	429	10	63	23	145	0	0	33	208	4	25	37	233	L.S.
I53-X	EeRj 139	28	269	14	134	1	10	0	0	15	144	0	0	15	144	L.S.
I57-I	EeRj 183	28	168	387	2322	2	12	0	0	389	2334	21	126	410	2460	L.S.
I57-II	EeRj 182	40	483	104	1256	40	483	0	0	144	1739	11	132	155	1871	L.S.
I57-III	EeRj 184	4	4	40	40	0	0	1	1	41	41	4	45	45	45	L.S.
I60-I	EeRj 140	48	291	27	165	180	1097	0	0	207	1262	14	85	221	1347	L.S.
I60-II	EeRj 141	16	64	15	60	0	0	0	0	15	60	1	4	16	64	L.S.
I60-III	EeRj 142	36	264	80	583	78	569	0	0	158	1158	4	29	162	1188	L.S.
I60-IV	EeRj 143	68	816	167	2004	34	408	0	0	201	2412	10	120	211	2532	L.S.
I60-V	EeRj 144	8	48	86	516	0	0	0	0	86	516	6	36	92	552	L.S.
I60-VI	EeRj 145	56	649	35	406	139	1610	0	0	174	2018	9	104	183	2122	L.S.
I60-VII	EeRj 146	32	364	19	216	9	102	0	0	28	318	0	0	28	318	L.S.
I60-VIII	EeRj 147	24	72	36	108	35	105	0	0	71	213	7	21	78	234	L.S.
I60-IX	EeRj 148	4	8	0	0	20	40	0	0	20	40	0	0	20	40	L.S.
I73-I	EeRj 149	28	100	103	370	5	17	0	0	108	388	10	36	118	424	L.S.
I73-II	EeRj 150	20	87	19	83	3	13	0	0	22	96	0	0	22	96	L.S.
I73-III	EeRj 151	16	67	74	308	1	4	0	0	75	313	5	21	80	333	L.S.
I73-IV	EeRj 152	12	96	80	640	0	0	0	0	80	640	0	0	80	640	L.S.
I74-I	EeRj 153	24	160	38	254	58	388	0	0	96	640	4	26	100	666	L.S.
I74-II	EeRj 154	156	2971	2223	42337	113	2152	0	0	2336	44489	134	2552	2470	47041	L.S.
I74-III	EeRj 155	20	128	45	287	10	63	0	0	55	352	0	0	55	352	L.S.
I74-IV	EeRj 185	12	48	23	92	0	0	0	0	23	92	1	4	24	96	L.S.
I76-I	EeRj 156	36	204	111	629	0	0	0	0	111	629	7	39	118	668	L.S.
I76-II	EeRj 157	20	40	37	74	0	0	0	0	37	74	6	12	43	86	L.S.

TABLE 3-12 - (Cont'd)

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
J3-I	EeRj 158	16	80	46	230	0	0	0	0	46	230	0	0	46	230 ±	L.S.
J4-I	EeRj 159	232	3040	1280	16775	15	196	0	0	1295	16971	67	878	1362	17849	L.S./C.D.
J4-III	EeRj 161	4	8	10	20	0	0	0	0	10	20	2	4	12	24	L.S.
J4-IV	EeRj 159	384	2668	2872	19957	1970	13689	8	55	4850	38701	64	444	4914	34145	L.S./C.D.
J4-V	EeRj 159	8	32	38	152	0	0	0	0	38	152	1	4	39	156	L.S.
J4-VI	EeRj 162	68	1523	117	2620	14	313	0	0	131	2933	6	134	137	3067	L.S.
J4-VII	EeRj 159	8	560	1	70	0	0	0	0	1	70	1	70	2	140	L.S./C.D.
J15-I	EeRj 163	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
J15-II	EeRj 164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
J15-III	EeRj 165	36	111	24	74	3	9	0	0	27	83	2	6	29	89	L.S.
J18-I	EeRj 166	52	477	373	3423	11	101	0	0	384	3524	6	55	390	3579	L.S.
J18-II	EeRj 167	316	3280	982	10195	107	1111	0	0	1089	11306	53	550	1142	11855	L.S.
J18-III	EeRj 168	204	2172	404	4302	4	42	0	0	108	4344	10	106	418	4450	L.S.
J18-IV	EeRj 169	560	3911	1731	12091	135	943	11	77	1877	13111	120	838	1997	13949	L.S.
J18-V	EeRj 170	332	5976	221	3978	30	540	0	0	251	4518	11	198	262	4716	L.S.
J18-VI	EeRj 171	228	1732	1431	10876	73	554	0	0	1504	11430	107	813	1611	12243	L.S.
J18-VII	EeRj 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
J18-VIII	EeRj 173	84	1300	1130	17488	57	882	0	0	1187	18370	26	402	1213	18772	L.S.
J18-IX	EeRj 174	20	128	8	51	1	6	0	0	9	57	3	19	12	76	L.S.
J22-I	EeRj 175	8	10	7	9	0	0	0	0	7	9	0	0	7	9	L.S.
J22-II	EeRj 176	12	33	3	8	0	0	0	0	3	8	3	8	6	16	L.S.
J22-III	EeRj 177	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
J25-I	EeRj 178	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
J33-I	EeRj 73	8	8	0	0	17	17	0	0	17	17	0	0	17	17	L.S.
J33-II	EeRj 86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C.D.
J38-I	EeRj 179	20	68	42	142	0	0	0	0	42	142	4	13	46	155+	L.S.
J38-II	EeRj 180	12	32	25	67	0	0	0	0	25	67	5	13	30	80++	L.S.
K1-I	EeRj 87	36	116	31	100	60	193	0	0	91	293	0	0	92	296	L.S.
K1-II	EeRj 88	8	8	40	40	0	0	1	1	41	41	0	0	41	41	L.S.
K2-I	EeRj 90	172	12766	432	32062	1187	88097	1	74	1620	120234	20	1484	1640	110141	L.S.
K2-II	EeRj 91	4	4	18	18	0	0	0	0	18	18	0	0	19	19	L.S.
K3-I	EeRj 92	100	638	53	338	78	498	0	0	131	836	12	77	143	913	L.S.

* 87 basalt nodules collected as well
** 439 basalt nodules collected as well
***352 basalt nodules collected as well

\+ 80 pieces of calcined bone collected
++ 59 pieces of calcined bone collected
± 1 spall tool collected

TABLE 3-13

PHASE II (1977) SURVEY - SITE TOOL ASSEMBLAGES

BORDEN SITE DESIGNATION	QUADRAT - SITE DESIGNATION	BASALT PROJECTILE POINTS	CHERT PROJECTILE POINTS	BASALT PROJECTILE POINT BASES	CHERT PROJECTILE POINT BASES	BASALT POINT TIPS	CHERT POINT TIPS	BASALT BIFACE FRAGMENTS	CHERT BIFACE FRAGMENTS	BASALT BIFACE ENDS	CHERT BIFACE ENDS	BASALT BIFACES	CHERT BIFACES	BASALT STEEP-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	CHERT STEEP-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	BASALT NARROW-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	CHERT NARROW-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	BASALT STEEP-ANGLE FORMED UNIFACES	CHERT STEEP-ANGLE FORMED UNIFACES	BASALT STEEP-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	CHERT STEEP-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	BASALT ACUTE-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	CHERT ACUTE-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	BASALT GRAVERS	CHERT GRAVERS	BASALT MICROBLADES	CHERT MICROBLADES	BASALT BIPOLAR IMPLEMENTS	TOTAL NUMBER OF TOOL TYPES
EeRj 93	A 8-I					X						X	X	X	X	X	X					X				X			9
106	B 7-I											X		X						X		X				X			5
95	B13-I															X													1
96	B13-II					X						X		X												X			4
97	B13-III													X								X							2
98	B13-IV													X															1
99	B14-I					X						X				X													3
100	B14-II			X				X								X				X		X							5
101	B14-III			X		X		X				X		X		X					X					X			8
EeRi 8	E15-I													X		X													2
9	E15-II									X				X		X		X								X			5
10	E15-III					X								X		X		X											4
11	E15-IV														X														1
EeRj 107	E36-I							X		X												X							3
EeRi 12	H22-I															X						X							2
EeRj 108	H40-I					X										X													2
181	I10-I	X				X		X																					3
114	I20-I							X						X		X										X			4
115	I20-II					X														X									2
117	I22-I															X													1
118	I22-II													X															1
120	I28-I									X						X								X					3
121	I28-II					X		X						X								X							4
122	I36-I					X				X				X															3
124	I44-I																										X		1
125	I44-II							X							X	X				X									4
126	I44-III							X																					1
127	I44-IV					X		X		X		X		X	X	X				X				X					9
128	I44-I									X				X								X							3
129	I47-I													X															1
133	I53-IV													X		X													2
135	I53-VI														X														1
136	I53-VII					X									X		X			X	X			X			X		7
137	I53-VIII							X						X															2
138	I53-IX						X													X									2
183	I57-I													X															1

TABLE 3-13 - (Cont'd)

BORDEN SITE DESIGNATION	QUADRAT - SITE DESIGNATION	BASALT PROJECTILE POINTS	CHERT PROJECTILE POINTS	BASALT PROJECTILE POINT BASES	CHERT PROJECTILE POINT BASES	BASALT POINT BIFACE TIPS	CHERT POINT BIFACE TIPS	BASALT BIFACE FRAGMENTS	CHERT BIFACE FRAGMENTS	BASALT BIFACE ENDS	CHERT BIFACE ENDS	BASALT BIFACES	CHERT BIFACES	BASALT STEEP-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	CHERT STEEP-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	BASALT NARROW-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	CHERT NARROW-ANGLE MARGINAL UNIFACIAL RETOUCH FLAKES	BASALT STEEP-ANGLE "FORMED" UNIFACES	CHERT STEEP-ANGLE "FORMED" UNIFACES	BASALT STEEP-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	CHERT STEEP-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	BASALT ACUTE-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	CHERT ACUTE-ANGLE MARGINAL BIFACIAL RETOUCH FLAKES	BASALT GRAVERS	CHERT GRAVERS	BASALT MICROBLADES	CHERT MICROBLADES	BASALT BIPOLAR IMPLEMENTS	TOTAL NUMBER OF TOOL TYPES
EeRj 182	I 57-II	X												X	X		X												4
184	I 57-III													X		X													2
140	I 60-I					X			X					X	X												X		5
141	I 60-II							X																					1
142	I 60-III							X						X															2
143	I 60-IV	X				X	X		X					X	X					X							X		8
144	I 60-V								X											X		X							3
145	I 60-VI																X	X			X						X		4
147	I 60-VIII													X		X				X							X		4
149	I 73-I													X	X											X			3
151	I 73-III													X		X													2
153	I 74-I								X							X	X												3
154	I 74-II	X				X		X		X				X	X	X		X		X		X				X	X		12
185	I 74-IV													X															1
156	I 76-I													X															1
157	I 76-II															X													1
159	J 4-I			X		X		X		X		X		X	X	X				X		X				X		X	12
161	J 4-III					X										X													2
159	J 4-IV	X		X		X		X		X	X	X	X	X	X	X		X		X	X	X				X		X	17
159	J 4-V													X															1
162	J 4-VI					X								X		X		X											4
159	J 4-VII																	X											1
165	J 15-III					X														X									2
166	J 18-I						X							X	X	X		X		X									6
167	J 18-II	X		X			X	X		X				X		X		X		X		X				X			11
168	J 18-III					X		X						X				X											4
169	J 18-IV	X		X		X		X				X		X		X		X				X				X			10
170	J 18-V	X		X		X		X						X			X												6
171	J 18-VI			X				X		X				X		X								X		X			7
173	J 18-VIII																									X			1
174	J 18-IX																	X								X			2
176	J 22-II	X																X											2
179	J 38-I					X								X						X		X							4
180	J 38-II	X				X						X																	3
90	K 2-I					X		X		X		X		X	X		X					X				X	X	X	11
92	K 3-I									X				X	X		X	X	X						X				7

predominant vegetation: 1) parkland; and 2) open forest, and 3) closed forest. Table 3-14 gives the number of sites recorded for each vegetation zone within each proposed development zone. Table 3-15 gives the expected prehistoric site density, and Table 3-16, the expected number of prehistoric sites for each proposed development zone.

Average site area (in square meters)* for each vegetation zone within each proposed development zone is as follows:

	Parkland	Open Forest	Closed Forest
A, B, D, E and H	215.9	30.0	72.5
I	332.0	84.7	1427.3
J	1676.0	37.4	29.8
K	2706.4	-	-

Table 3-17 gives the range of site area for each vegetation zone within each proposed development zone. As with Phase I sites, most Phase II prehistoric sites are small: 45 percent are less than 100 m^2, though they appear to be somewhat larger than sites in the Phase I sample.

Table 3-18 gives the range for number of artifacts collected from the surface of prehistoric sites recorded during Phase II, year 1. The average numbers are as follows:

---

* Sample collections were made of surface artifacts from sites in strata I, J, K and L (see Section 3.2). Thus, figures for total area and number of artifacts are extrapolations from the sample statistics.

TABLE 3-14

NUMBER OF PREHISTORIC SITES AND SITE COMPONENTS RECORDED FOR EACH VEGETATION ZONE WITHIN EACH PROPOSED DEVELOPMENT ZONE

	Vegetation Zones			
Development Zones	Parkland	Open Forest	Closed Forest	Total
A,B,D,E and H (Medicine - Harry Creeks)	15	2	4	21
I (Open Pit Mine)	38	3	7	48
J (Houth Meadows Waste Embankment)	16	7	4	27
K (Headworks Reservoir)	5	0	0	5
Total	74	12	15	101

TABLE 3-15

PHASE II, YEAR I: EXPECTED NUMBER OF PREHISTORIC SITES AND SITE COMPONENTS PER HECTARE FOR VEGETATION ZONES WITHIN EACH PROPOSED DEVELOPMENT ZONE

	Vegetation Zones		
Development Zones	Parkland	Open Forest	Closed Forest
A,B,D,E and H (Medicine-Harry Creeks)	.104	.031	.017
I (Open Pit Mine)	.183	.038	.073
J (Houth Meadows Waste Embankments)	.271	.063	.042
K (Headworks Reservoir)	.104	-	-

TABLE 3-16

EXPECTED NUMBER OF PREHISTORIC ARCHAEOLOGICAL SITES AND SITE COMPONENTS FOR EACH VEGETATION ZONE WITHIN EACH PROPOSED DEVELOPMENT ZONE

	Vegetation Zones			
Development Zones	Parkland	Open Forest	Closed Forest	Total
A,B,D,E and H (Medicine-Harry Creeks)	110	17	18	145
I (Open Pit Mine)	102	16	19	137
J (Houth Meadows Waste Embankment)	39	14	12	65
K (Headworks Reservoir)	5	-	-	5
Total	256	47	49	352

TABLE 3-17

PHASE II, YEAR 1: RANGE OF AREA IN SQUARE METERS FOR
PREHISTORIC SITES AND SITE COMPONENTS
BY VEGETATION ZONE AND PROPOSED DEVELOPMENT ZONE

	Vegetation Zones		
Development Zones	Parkland	Open Forest	Closed Forest
A,B,D,E and H (Medicine-Harry Creeks)	20-852	20-40	6-228
I (Open Pit Mine)	8-2,971	24-155	4-5,481
J (Houth Meadows Waste Embankment)	8-5,976	9-111	8-68
K (Headworks Reservoir)	4-12,766	-	-

TABLE 3-18

PHASE II, YEAR 1: RANGE OF NUMBER OF ARTIFACTS COLLECTED FROM THE SURFACE OF PREHISTORIC SITES AND SITE COMPONENTS BY VEGETATION ZONE AND PROPOSED DEVELOPMENT ZONE

	Vegetation Zones		
Development Zones	Parkland	Open Forest	Closed Forest
A,B,D,E and H (Medicine-Harry Creeks)	4 - 1,012	22 - 37	0 - 139
I (Open Pit Mine)	10 - 6,098	7 - 237	1 - 405
J (Houth Meadows Waste Embankment)	0 - 5,018	0 - 47	0 - 47
K (Headworks Reservoir)	19 - 110,141	-	-

3.5 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

	Parkland	Open Forest	Closed Forest
A, B, D, E and H	214	30	51
I	188	104	109
J	834	13	23
K	22 282	-	-

Most Phase II, year 1 sites have few artifacts: 47 percent have less than 100 artifacts. All artifacts collected from the surface are of chipped stone, either vitreous basalt or cherts. Vitreous basalt predominates, but the percent of cherts varies from area to area:

Strata	Basalt (%)	Cherts (%)
A	91	9
B	93	7
D	0	0
E	82	18
H	100	0
I	71	29
J	90	10
K	61	39

More than half the sites have 70 percent or more of their artifacts made from vitreous basalt. On the average, then, Phase II, year 1 sites have more chert artifacts than do Phase I sites. Yet only 6 percent of the Phase II, year 1 sites have only chert artifacts, as compared to 9 percent of the Phase I sites.

Seventy-two (71 percent) of the Phase II, year 1 prehistoric sites and site components contained intentionally modified tools: seven sites had no artifacts and 22 sites had only utilized flakes and/or debitage. Prehistoric sites in the proposed development area are more likely to have tools than the average prehistoric sites in upper Hat Creek valley. Table 3-13 lists the tool types occurring at Phase II, year 1 sites.

Forty-two sites (58 percent) have three or less tool types; 30 sites (42 percent) have four or more tool types. In general, Phase II, year 1 sites have fewer tool types than do Phase I sites. However, Phase II, year 1 sites appear to have more tools per site: 38 (53 percent) have 25 or more tools, 21 (29 percent) have between six and 24 tools and only 12 (16 percent) have five or less tools. The number of tools per Phase II, year 1 site may be somewhat inflated by the techniques used to sample the surface artifacts, but it is still likely that they do indeed have a larger number of tools than do the Phase I sites.

Average artifact densities per square meter for each vegetation zone in each proposed development zone is as follows:

	Parkland	Open Forest	Closed Forest
A, B, D, E and H	1.5	1.0	1.2
I	3.7	6.5	4.8
J	4.8	1.3	2.3
K	4.7	-	-

Seven Phase II, year 1 prehistoric sites are cultural depressions without artifacts, while three cultural depression sites have associated artifacts. Eighty-nine sites are lithic scatters. No rock cairns were observed during Phase II, year 1 survey. Sites with artifacts were divided into size classes by the criteria defined for Phase I prehistoric sites. The results are in Table 3-19. In general, more sites in strata I, J and K tend to be large with high artifact densities than Phase I sites; while fewer sites in strata A, B, D, E and H tend to be large with high artifact densities than Phase I sites. In some instances, there is a paucity of medium-size sites (see Table 3-19).

TABLE 3-19

DISTRIBUTION OF PHASE II, YEAR 1
PREHISTORIC SITES AND SITE COMPONENTS BY SIZE CLASSES

	Site Area			Number of Debitage			Number of Tools			Number of Artifacts		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
A,B,D,E and H (Medicine - Harry Creeks)	39%	35%	26%	32%	50%	18%	9%	44%	48%	36%	46%	18%
I (Open Pit Mine)	35%	28%	37%	13%	33%	54%	13%	13%	74%	11%	33%	57%
J (Mouth Meadows Waste Embankment)	52%	7%	41%	19%	33%	48%	18%	14%	68%	19%	33%	48%
K (Headworks Reservoir)	40%	0%	60%	40%	0%	60%	20%	20%	60%	40%	0%	60%

TABLE 3-19 - (Cont'd)

	Artifact Density	
	Low	High
A,B,D,E and H (Medicine - Harry Creeks)	95%	5%
I (Open Pit Mine)	65%	35%
J (Houth Meadows Waste Embankment)	71%	29%
K (Headworks Reservoir)	40%	60%

Phase II, year 1 sites were also assigned to site groups by an algorithm which sorted sites by the defining characteristics of each group of Phase I sites (see Addendum D). The results are in Tables 3-20, 3-21 and 3-22; except for K stratum sites' results, which follow:

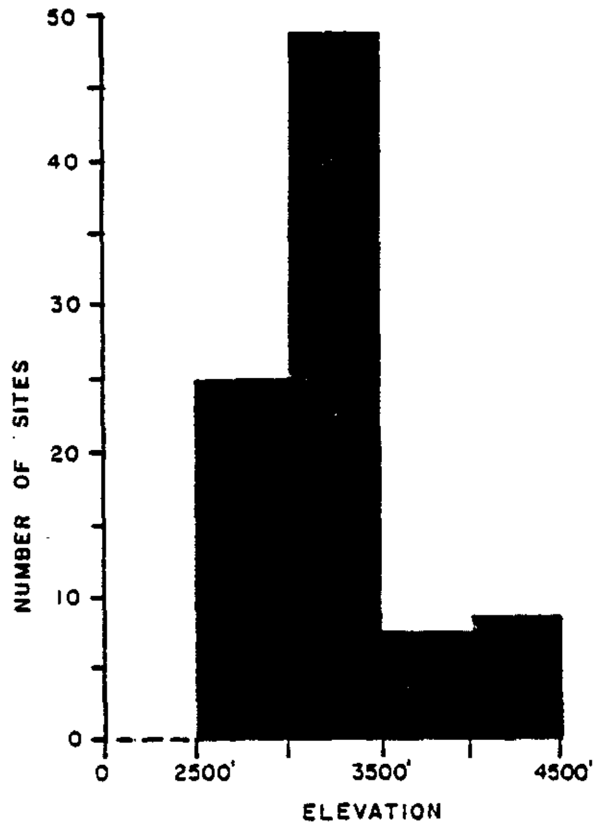
Site Group	K Stratum Parkland
1	0
2	0
3	2
4	0
5	0
6	3
7	0
TOTAL	5

None of the strata has a distribution of site groups similar to that of Phase I.

Fig. 3-20 illustrates the distribution of all prehistoric sites recorded in Phase II, year 1 by elevation in 500 feet asl intervals. Elevations range between 2848 to 4400 feet asl. The distribution is similar to that of Phase I sites, but with relatively fewer sites between 3500 to 4000 feet asl and relatively more sites under 3000 feet asl and over 4000 feet asl. Distribution of Phase II, year 1 prehistoric sites by physiographic context is as follows:

	Terrace	Plain or Gentle Slope	Ridge	Scarp
Number	19	68	9	4
Percent	19	68	9	4

This distribution by physiographic context is similar to that of Phase I sites.



Distribution of Phase II (1977)
Prehistoric Sites by Elevation

Figure 3-20

TABLE 3-20

PHASE II, YEAR 1: NUMBERS AND TYPES OF PREHISTORIC SITES AND SITE COMPONENTS RECORDED IN STRATA A,B,D,E AND H

	Environmental Zone			
Site Group	Parkland	Open Forest	Closed Forest	Total
1	6	1	0	7
2	1	0	0	1
3	2	0	0	2
4	3	0	1	4
5	1	0	0	1
6	2	1	2	5
7	0	0	1	1
Total	15	2	4	21

TABLE 3-21

PHASE II, YEAR 1: NUMBERS AND TYPES OF PREHISTORIC SITES AND SITE COMPONENTS RECORDED IN STRATUM I

	Environmental Zone			
Site Group	Parkland	Open Forest	Closed Forest	Total
1	10	0	6	15
2	0	1	0	1
3	4	0	0	4
4	5	1	0	6
5	4	0	0	4
6	15	1	1	17
7	0	0	0	0
Total	38	3	7	48

TABLE 3-22

PHASE II, YEAR 1: NUMBERS AND TYPES OF PREHISTORIC SITES AND SITE COMPONENTS RECORDED IN STRATUM J

	Environmental Zone			
Site Group	Parkland	Open Forest	Closed Forest	Total
1	1	0	0	1
2	0	0	0	0
3	5	0	0	5
4	5	1	2	8
5	2	0	0	2
6	1	3	1	5
7	2	3	1	6
Total	16	7	4	27

Prehistoric sites and site components surveyed in Phase II, year 2 are not included in the above discussion, as survey quadrats were selected to cover specified proposed development areas, rather than to comprise a random sample. Results from this portion of the survey (see Table 3-23) ought not to be construed as representative of any area other than the Phase II, year 2 survey areas, which are described in Section 3.2 (i.e. L stratum; quadrats B11, C7 to C10, H63 to H65, H60 and H67). However, surveyed L stratum quadrats almost totally cover the land area for the proposed mine surface facilities north of the open pit mine. Likewise, quadrats C7 to C10 combined with quadrats C1 to C6, surveyed in Phase II, year 1, almost totally cover the land area for the proposed powerplant.

No archaeological sites have been found in any of the C stratum quadrats (i.e. proposed powerplant; see Fig. 3-9): cultural heritage resources have been limited so far to single artifact finds. Only single artifact finds were found in quadrat B11 as well. Two archaeological sites, both in quadrat H63, were recorded in the H stratum quadrats besides single artifact finds. EeRj 198 is estimated to be 12 000 m^2 in area and to have 4109 artifacts. Most of these artifacts would be made of vitreous basalt. One hundred and nine tools are expected; collected tool types include a projectile point and retouched and/or utilized flakes. In addition, EeRj 198 has one cultural depression. EeRj 199 is much smaller (264 m^2) with fewer expected artifacts (288). Neither tools nor chert artifacts were collected from EeRj 199. Both sites lie on a large terrace immediately north of Medicine Creek.

Twelve prehistoric sites and one site with both historic and prehistoric components were recorded in L stratum. They range in area from 120 m^2 to 50 700 m^2 and average 5878 m^2. Only three

TABLE 3-23

PHASE II (1978) SURVEY - PREHISTORIC SITES

Column

1	Survey number
2	Borden designation
3	Site area collected
4	Estimated total site area
5	Number of basalt debitage collected
6	Estimated total number of basalt debitage
7	Number of chert debitage collected
8	Estimated total number of chert debitage
9	Number of other debitage collected
10	Estimated total number of other debitage
11	Number of debitage collected
12	Estimated total number of debitage
13	Number of tools collected
14	Estimated total number of tools
15	Number of artifacts collected
16	Estimated total number of artifacts
17	Site type: L.S. - Lithic Scatter C.D. - Cultural Depression(s) L.S./C.D. - Lithic Scatter and Cultural Depression(s)

TABLE 3-23 - (Cont'd)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
L1-I	EeRj 1	2848	50700	20280	362143	3564	63643	2	36	23846	425822	467	8339	24313	434161	L.S./C.D.
L1-II	EeRj 197	316.	2448	345	2654	105	808	0	0	450	3462	13	100	463	3562	L.S./C.D.
L1-III	EeRj 201	1416	16600	1243	14624	327	3847	0	0	1570	18471	51	600	1621	18534	L.S./C.D.
L1-IV	EeRj 189	156	640	82	342	40	167	0	0	122	509	7	29	129	538	L.S./C.D.
L1-V	EeRj 201	4	36	2	18	1	9	0	0	3	27	0	0	3	27	L.S.
L1-VI	EeRj 191	20	148	11	33	7	21	0	0	18	54	0	0	18	54	L.S./C.D.
L3-I	EeRj 186	140	880	61	381	19	119	0	0	80	500	8	50	88	550	L.S.
L3-II	EeRj 201	400	1739	173	752	11	48	0	0	184	800	7	30	191	830	L.S./C.D.
L4-I	EeRj 188	64	146	18	41	0	0	0	0	18	41	0	0	18	41	L.S.
L4-II	EeRj 192	80	500	6	38	0	0	0	0	6	38	0	0	6	38	L.S.
L4-III	EeRj 193	132	324	33	80	1	2	0	0	34	82	2	5	36	87	L.S.
L4-IV	EeRj 195	80	592	20	148	0	0	0	0	20	148	3	22	23	170	L.S.
L7-I	EeRj 196	192	192	17	17	0	0	0	0	17	17	3	3	20	20	L.S.
L7-II	EeRj 194	16	120	29	223	0	0	0	0	29	223	2	15	31	238	L.S.
L8-I	EeRj 193	68	360	116	611	0	0	0	0	116	611	6	32	122	643	L.S.
L11-I	EeRj 190	52	217	25	104	3	13	0	0	28	117	1	4	29	121	L.S.
L11-II	EeRj 192	160	780	31	151	1	5	0	0	32	156	3	15	35	171	L.S.
H63-I	EeRj 199	84	264	92	288	0	0	0	0	92	288	0	0	92	288	L.S.
H63-II	EeRj 198	1368	12000	396	3600	4	36	0	0	400	4000	12	109	412	4109	L.S./C.D.
HC5-I	EeRj 204	*	356	*	*	*	*	*	*	*	*	*	*	*	*	L.S.
5A-3-I	EeRj 205	176	-	2	-	3	-	0	-	5	-	0	-	5	-	L.S.
M-I	EeRj 13	*	336	*	*	*	*	*	*	*	*	*	*	*	*	L.S.

* Site located on reconnaissance survey, no surface collection made.

3.5 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

sites exceed 1000 m^2. The number of expected artifacts ranges from 20 to 434 161 with an average of 35 368. Nearly half of the sites (six) are expected to have 250 or more artifacts. An average of 711 tools is expected per site and the range is zero to 8339 tools. Ten sites are expected to have 50 tools or less. Most of the L stratum sites have three or less tool types; however, EeRj 1 and EeRj 201 have 10 or more tool types. Five sites have cultural depressions and all of these sites are located on the Hat Creek terraces. One lithic scatter site (EeRj 186) is located on top of a scarp east of Hat Creek; the remaining seven, on the edges of the lower Harry Creek ravine.

Ninety cultural depressions distributed among 37 sites have been recorded and mapped in the upper Hat Creek valley (see Fig. 3-21). Some have been located through informants rather than through the quadrat survey (EeRj 109, 202, 203, EeRk 35; and EdRj 2 and 3). Dimensions were measured as noted in Fig. 3-22; the presence of heat-cracked rock, matrix (soil) stain and/or artifacts, noted; and the vegetational and physiographic context, described. Each depression was photographed as well as mapped (see Plate 3-3 for an example). Average rim crest to rim crest diameter is 4.51 m (14.8 ft); average exterior edge to exterior edge diameter, 8.14 m (26.7 ft); and average depth, 35.8 cm (14.1 in). There is a greater range and variability in the exterior edge diameters than in rim crest diameters (see Snell 1979 for data and detailed analysis). Matrix stain is present in most (70 percent) depressions, while heat-cracked rock and associated artifacts are less common (39 percent and 55 percent, respectively). Cultural depressions in upper Hat Creek valley are frequently found on terraces (33 percent) and slopes (24 percent) though they do occur on other kinds of landform. Many of these depressions have southern, southwestern or southeastern exposures (42 percent).

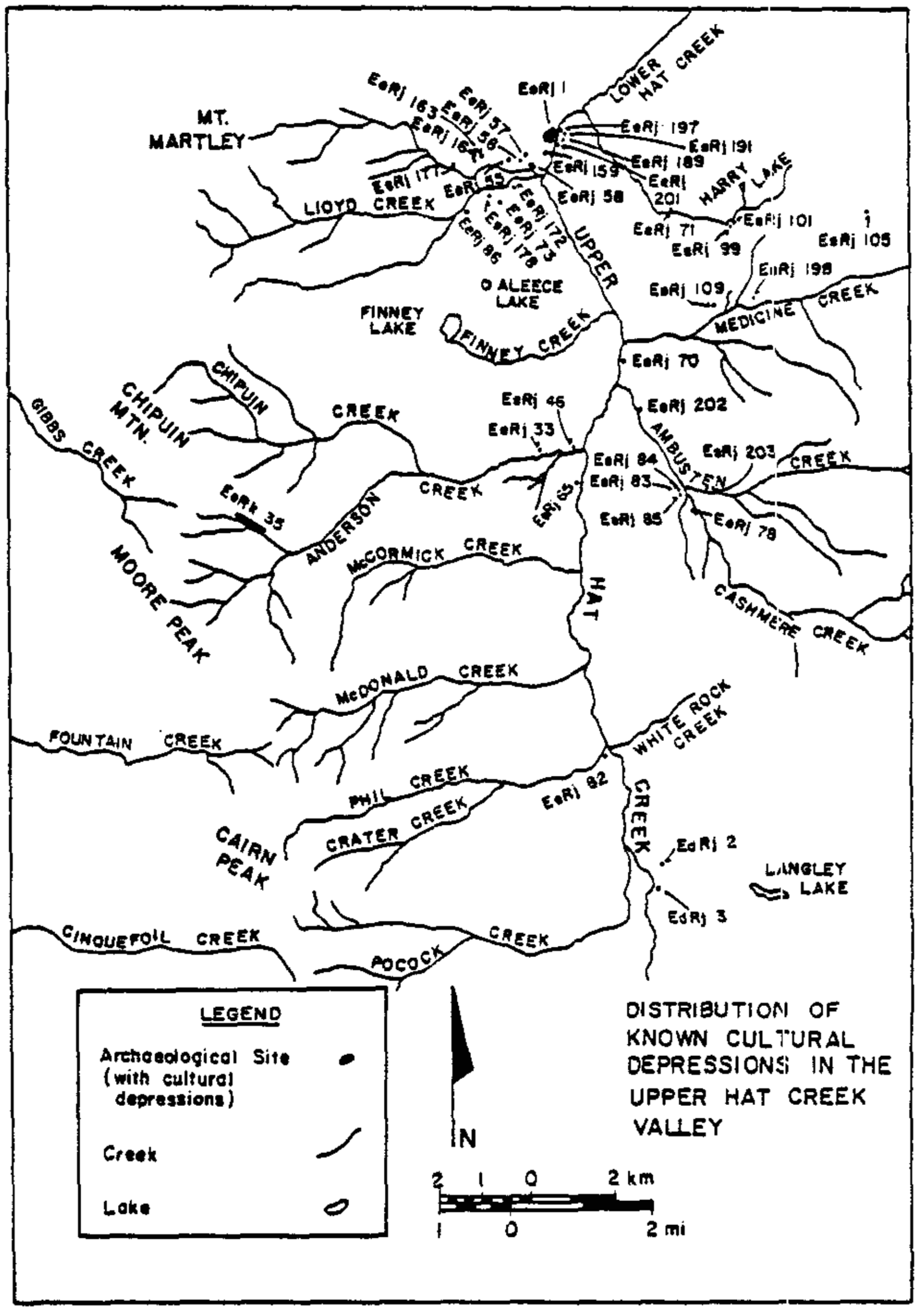
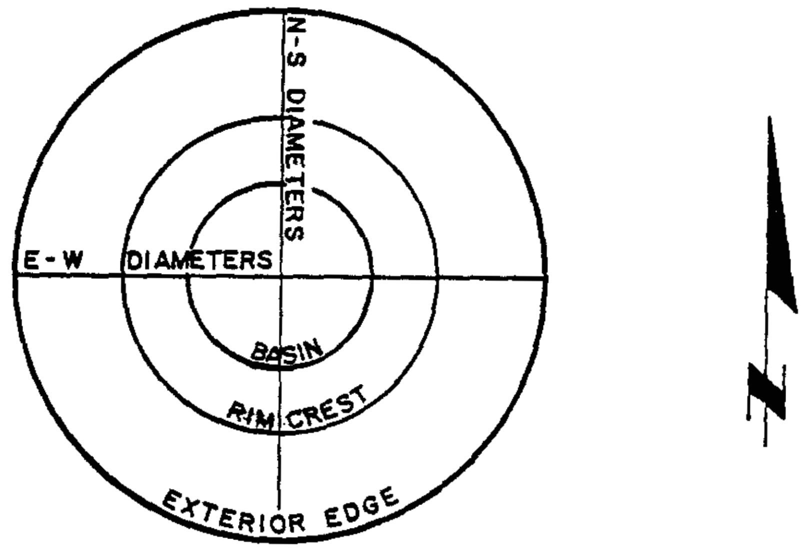
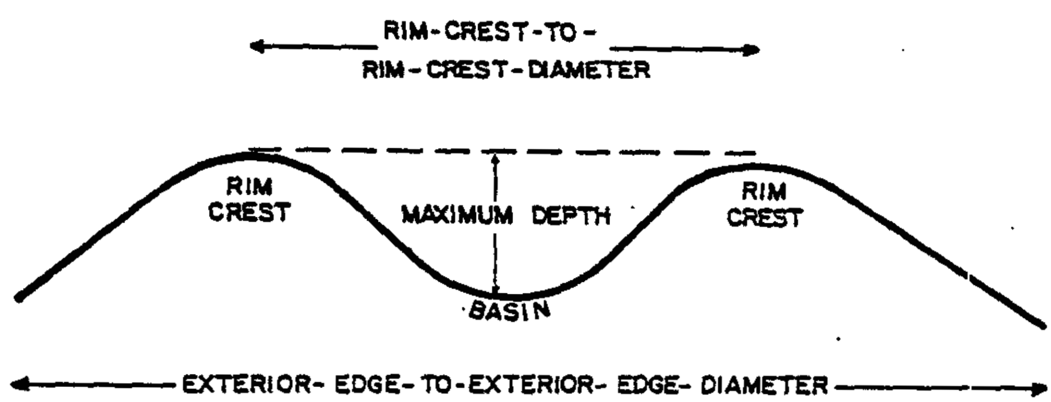

MT. MARTLEY
EeRj 163
EeRj 57
EeRj 56
EeRj 164
EeRj 177
EeRj 55
EeRj 1
EeRj 197
EeRj 191
EeRj 189
EeRj 159
EeRj 201
EeRj 58
EeRj 172
EeRj 73
EeRj 178
EeRj 86
LOWER HAT CREEK
HARRY LAKE
EeRj 101
EeRj 71
EeRj 99
EeRj 105
EeRj 198
EeRj 109
LLOYD CREEK
UPPER
O ALEECE LAKE
FINNEY LAKE
FINNEY CREEK
MEDICINE CREEK
EeRj 70
EeRj 46
EeRj 202
EeRj 33
CHIPUIN CREEK
CHIPUIN MTN.
GIBBS CREEK
EeRj 84
EeRj 83
EeRj 203
AMBUSTEN CREEK
EeRj 65
EeRj 85
EeRj 78
EeRk 35
ANDERSON CREEK
McCORMICK CREEK
MOORE PEAK
HAT
CASHMERE CREEK
McDONALD CREEK
FOUNTAIN CREEK
WHITE ROCK CREEK
PHIL CREEK
EeRj 82
CAIRN PEAK
CRATER CREEK
CREEK
EdRj 2
LANGLEY LAKE
EdRj 3
CINQUEFOIL CREEK
POCOCK CREEK
LEGEND
Archaeological Site (with cultural depressions)
Creek
Lake
N
2 1 0 2 km
1 0 2 mi
DISTRIBUTION OF KNOWN CULTURAL DEPRESSIONS IN THE UPPER HAT CREEK VALLEY

Figure 3-21



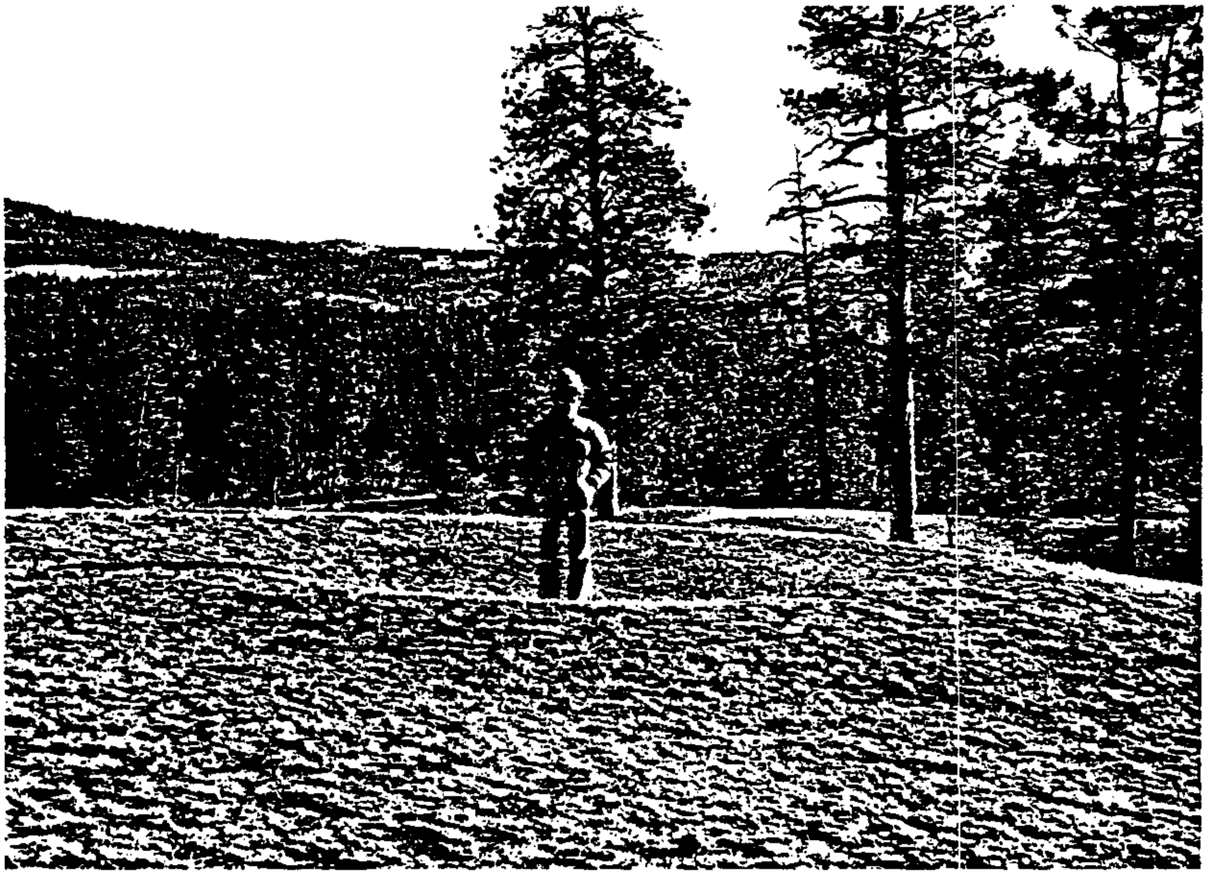
PLAN VIEW OF CULTURAL DEPRESSION



SIDE VIEW OF CULTURAL DEPRESSION

Dimensions Recorded for Cultural Depressions

Figure 3-22



General View of Cultural Depression
in Upper Hat Creek Valley

Plate 3-3

Non-parametric statistical tests on the dimensions indicate that cultural depressions recorded in Phase I are not from the same population as those recorded in either year of Phase II; nor are the depressions from the 2 years of Phase II likely to come from the same populations. In other words, the cultural depressions in the proposed development zones differ in dimensions to some extent from the typical upper Hat Creek cultural depression. Generally, cultural depressions recorded in Phase II, year 2 are larger than those recorded in Phase II, year 1; which are, in turn, larger than those recorded in Phase I.

Preliminary statistical analyses have suggested that variability in exterior edge diameters may in part be a function of physiography. Depressions on slopes are subject to more mass wasting than those on plains. As the depression "creeps" down-slope, its diameter grows. Another possible factor is the presence of more than one rock pavement in an earth oven. Excavations have uncovered reused earth ovens with several rock pavements in cultural depressions with large exterior edge diameters and moderately large rim crest diameters. Also, the rim crest diameter may be correlated with an earth oven's rock pavement's diameter (or topmost pavement's diameter in the case of a reused oven). If so, rim crest diameter may be a predictor of pavement diameter when only survey data is available. Differentiating between cultural depressions resulting from earth ovens and those resulting from pithouses is still problematic (see Snell and Beirne 1979 for details).

During Phase I and Phase II, test excavations were carried out at 10 archaeological sites. The following paragraphs summarize the results. Table 3-24 lists all radiocarbon dates obtained by this project with their associated sites. All radiocarbon analyses were performed by the Saskatchewan Research Council's Radiocarbon Dating Laboratories.

TABLE 3-24

RADIOCARBON DATES FOR ARCHAEOLOGICAL SITES EXCAVATED BY THE HAT CREEK ARCHAEOLOGICAL PROJECT

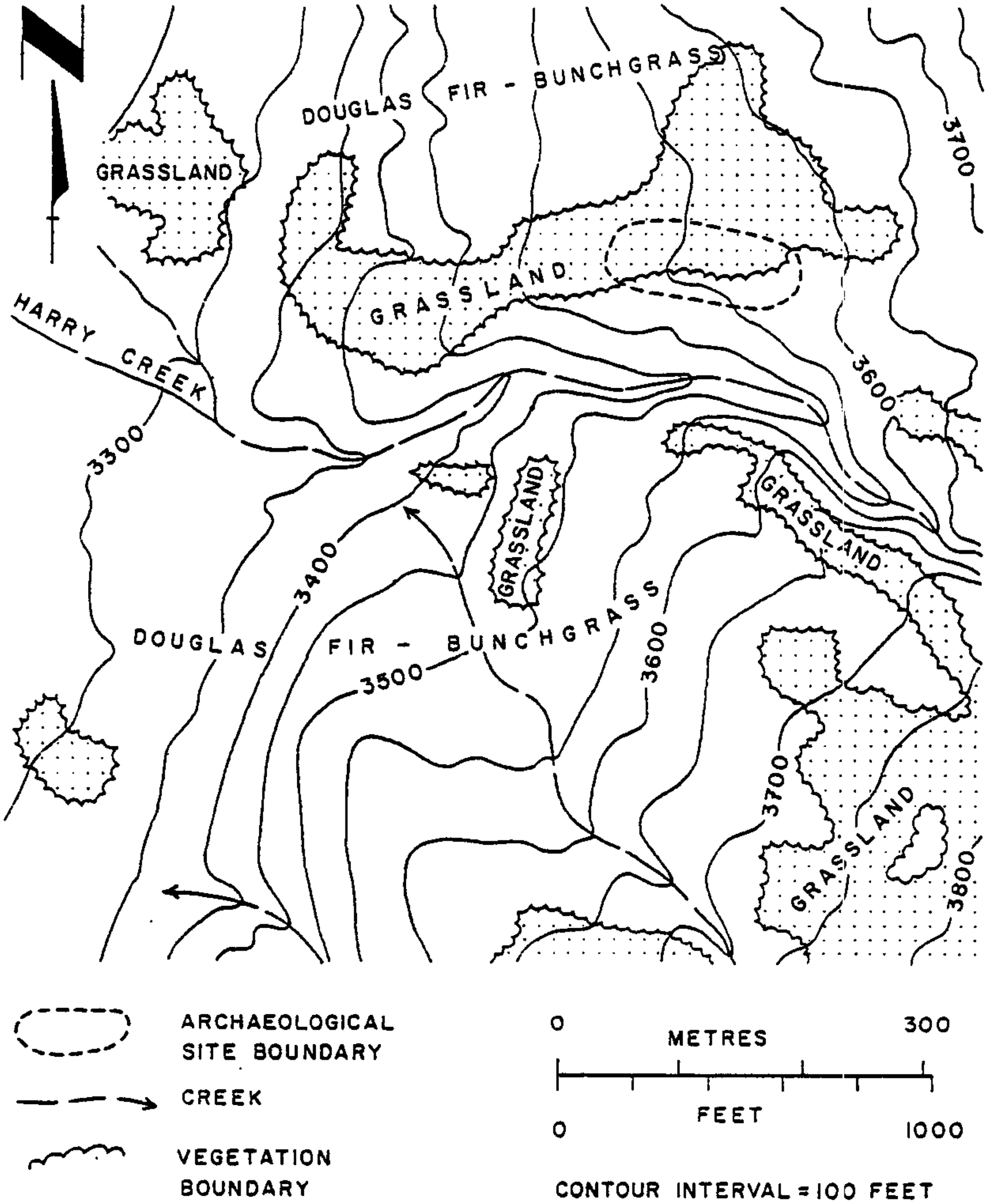
Archaeological Site	Radiocarbon Date	Sample Number
EeRj 1		
cultural feature # 9		
pavement # 1	970 ± 55	S-1579
pavement # 2	2,030 ± 45	S-1580
cultural feature #10	140 ± 50	S-1582
EeRj 46	1,550 ± 60	S-1454
EeRj 55		
area A	1,220 ± 70	S-1455
area D	600 ± 40	S-1581
EeRj 71		
primary basin	2,120 ± 65	S-1453
secondary basin	2,245 ± 50	S-1642
EeRj 101	2,090 ± 65	S-1456

Analyses of all radiocarbon samples were performed by the Saskatchewan Research Council's Radiocarbon Dating Laboratories.

EeRj 71, recorded in the 1976 survey, consists of a 1676 m^2 lithic scatter (designated as Area "B") and a single large (122 m^2) cultural depression (designated as Area "A") located at the eastern periphery of the scatter. The cultural depression's rim crest to rim crest diameter is 5.6 m (18.4 ft) and its exterior edge to exterior edge diameter is 12.3 m (40.4 ft). The site is situated on the north bank of a deeply incised portion of Harry Creek (see Fig. 3-23). Limited test excavations were carried out on the cultural depression at the end of the 1976 field season. A 5 m x 1 m trench, divided into five 1 m x 1 m excavation units, running from the depression center towards the western boundary of the feature was selected for subsurface investigation (see Fig. 3-24). Four units were completely excavated.

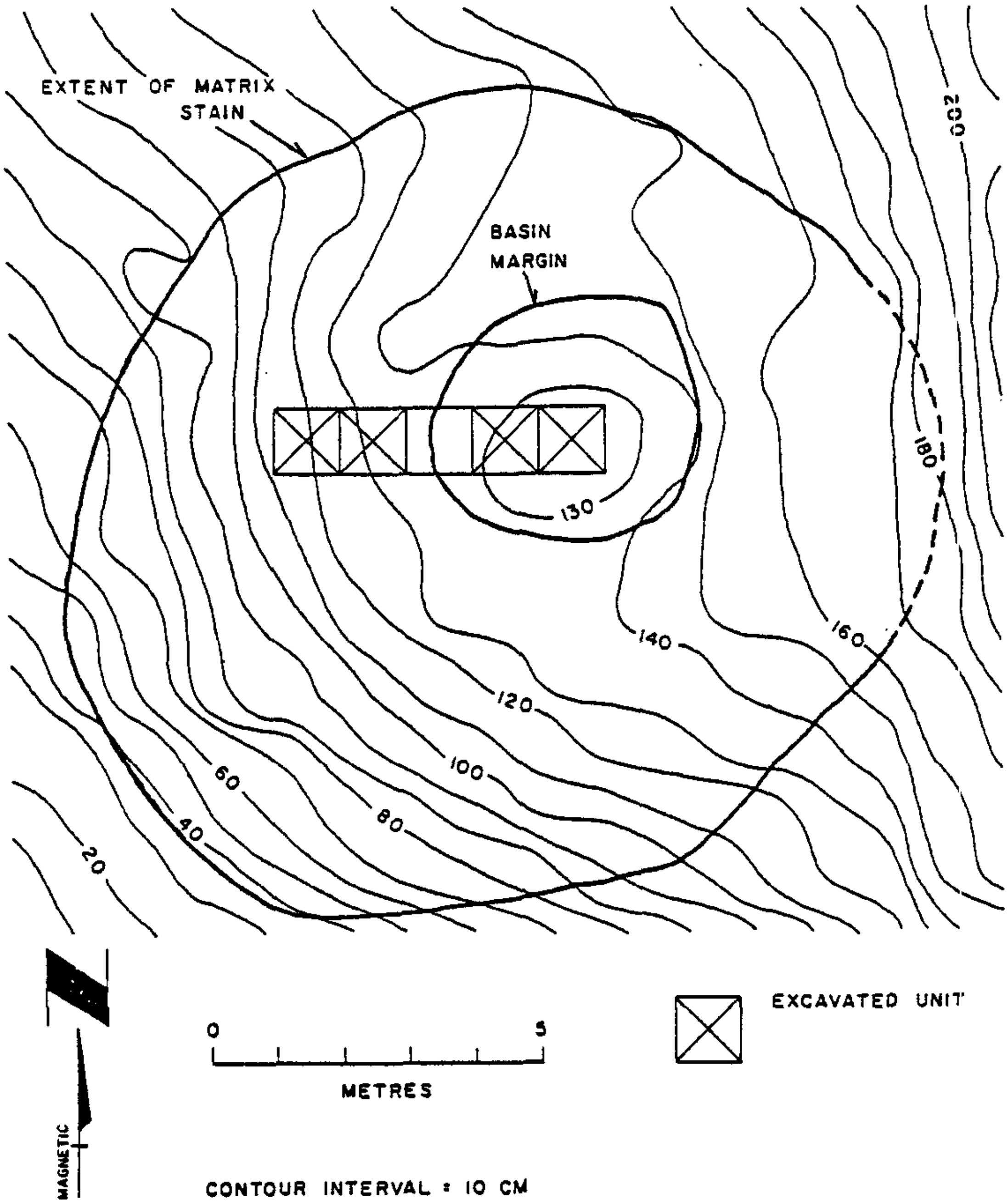
Excavations exposed a cultural deposit consisting of dark grey sandy silt, heat-cracked rock and carbonized plant remains. This matrix overlies sterile, baked glacial till. In the depression's centre, the cultural deposit is 90 cm thick and extends down into a shallow basin dug out of the till. Towards the outer margin of the feature, the deposit averages 50 cm in depth; however, this increases in areas where additional smaller basins have been dug into the till layer. Ash, charcoal and till lenses were observed throughout the cultural deposit.

Two charcoal samples, one from the bottom of the central basin and the other from a secondary basin at the feature's margin yielded datas of 2120 ± 65 years B.P. (S-1453) and 2245 ± 50 years B.P. (S-1642), respectively. Botanical identification of other floral samples indicates the dominant element is coniferous charcoal (Ketcheson 1979: 27). No remains of plants used in ethnographic subsistence were identified in the samples (ibid.). A small sample of faunal material was also recovered. The



EeRj 71 ENVIRONMENTAL SETTING

Figure 3-23



EeRj 71, Cultural Feature No. 1: Cultural Depression Plan and Contour Map

Figure 3-24

majority of the sample are unidentifiable fragments except for one complete specimen designated as mule deer (Odocoileus hemionus hemionus) (Ham 1979).

A total of 10 lithic items were recovered from the excavations: one basalt microblade fragment, one basalt biface, five pieces of basalt debitage and five pieces of chert debitage. The microblade fragment typologically dates to the Early Nesikep period (ca. 7000 to 2800 B.P.) (Sanger 1970; Stryd 1973). However, the depositional context in the depression is presently undetermined. The fact that this typological date does not corroborate the radiocarbon date suggests the possibility that this artifact may have been displaced from an earlier ground surface through aboriginal excavation of the depression. An alternate interpretation is that the microblade is associated with the use of the depression and indicates that microlithic technology was retained in post-2800 B.P. times. (Note: Stryd (1973) sets the end of the Early Nesikep period and microblade technology at ca. 2800 B.P.)

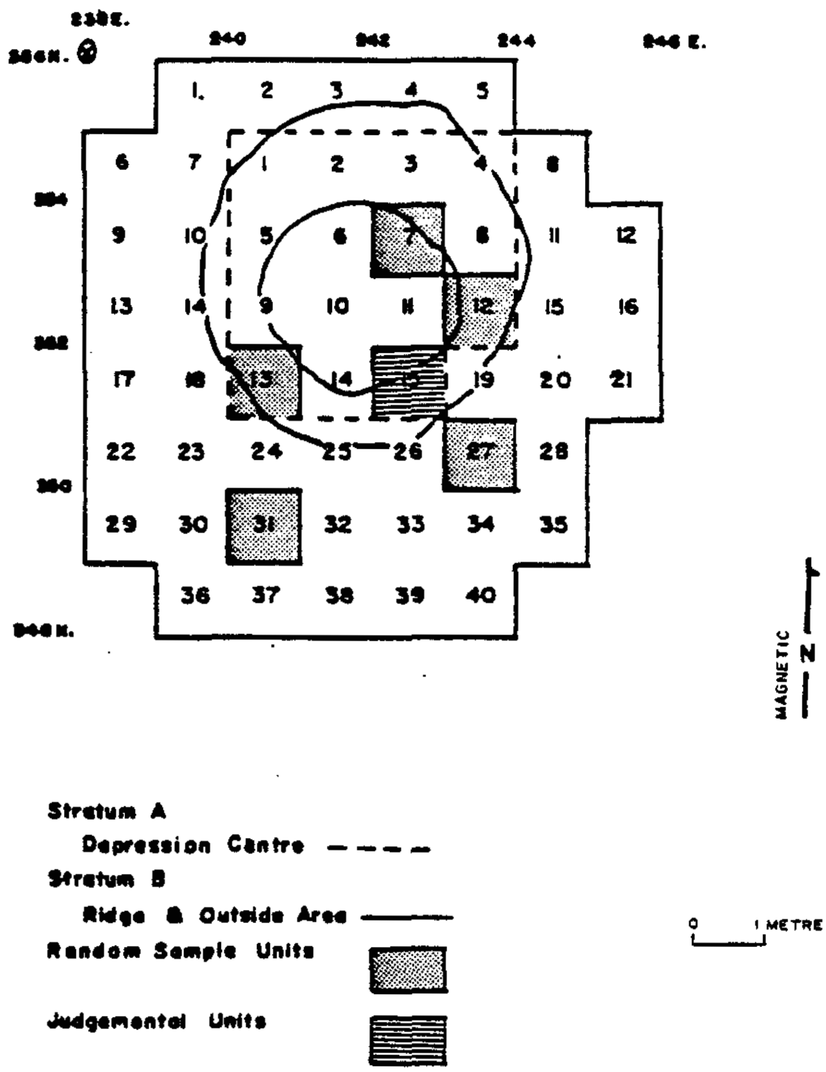
The above data indicate that this depression represents a prehistoric earth oven. Such structures are ethnographically documented as being used for processing plant and animal food resources (Dawson 1891; Teit 1900, 1906, 1909). The relatively large surface area and depth of cultural deposits containing lensing of ash, carbon and heat-cracked rock suggest repeated utilization of the structure.

EeRj 46, recorded in 1976, is situated atop Anderson Creek's north bench. A total collection of the site's surface yielded a basalt biface fragment and 43 pieces of basalt debitage. The single cultural depression has an exterior edge to exterior edge diameter of 7.5 m (24.6 ft); and a rim crest to rim crest diameter of 5.2 m (17.1 ft). Three 1 m x 1 m units were randomly selected from within the basin; two units, from outside the basin (see Fig. 3-25). Another unit was selected later to assist interpreting the depression's structure.

Excavation uncovered a rock pavement and a culturally deposited sediment composed of charcoal, ash and heat-cracked rock. The basin in which the pavement lies had been dug into glacial till. Subsurface artifacts from EeRj 46 are a basalt biface fragment, two retouched and/or utilized flakes, a Kamloops phase projectile point (basalt), 50 pieces of basalt debitage and a piece of chert debitage. An unburnt trembling aspen branch was recovered in addition to ponderosa pine charcoal. No faunal remains were found. A charcoal sample has been radiocarbon dated at 1550 ± 60 years B.P. (S-1454). On the basis of the above evidence, EeRj 46 is interpreted as the remains of a single rock pavement earth oven.

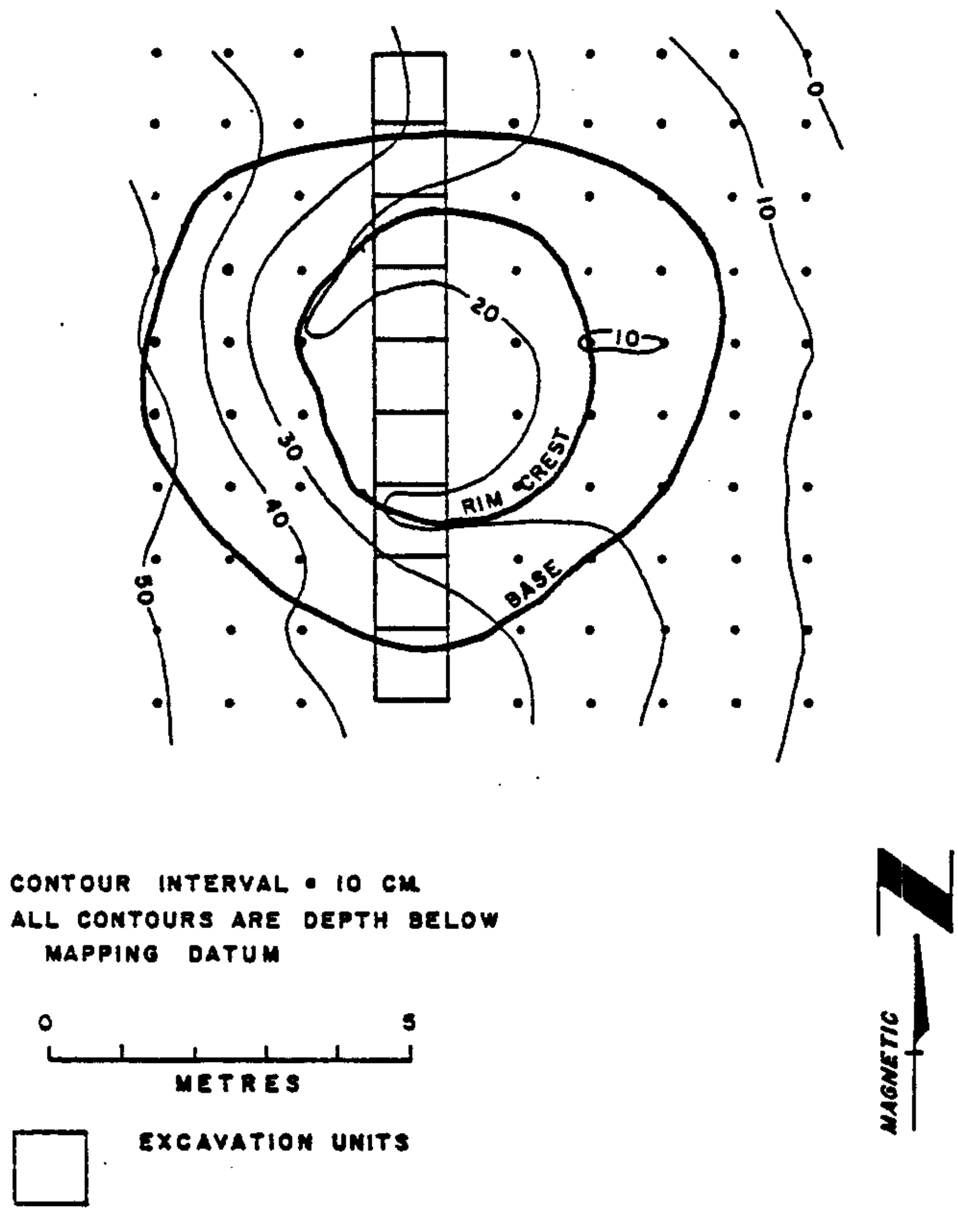
In 1977, EeRj 101 on the south bank of Harry Creek was surveyed; and later in the summer the site was subjected to test excavations. EeRj 101 consists of a cultural depression and lithic scatter. The depression's exterior edge to exterior edge diameter is 6.6 m (26.0 ft) and its rim crest to rim crest diameter, 3.6 m (11.8 ft). The surface artifact assemblage comprised bifaces (seven), a microblade fragment, retouched and/or utilized flakes (23), basalt (293) and jasper (six) debitage. A 9 m x 1 m trench with nine 1 m x 1 m units, running north-south through the depression's centre was excavated (see Fig. 3-26).

Like EeRj 46, EeRj 101 appears to be the remnants of a single rock pavement earth oven (see Plate 3-4). The culturally deposited matrix is characterized by charcoal, ash and heat-cracked rock. A charcoal sample has been dated at 2090 ±



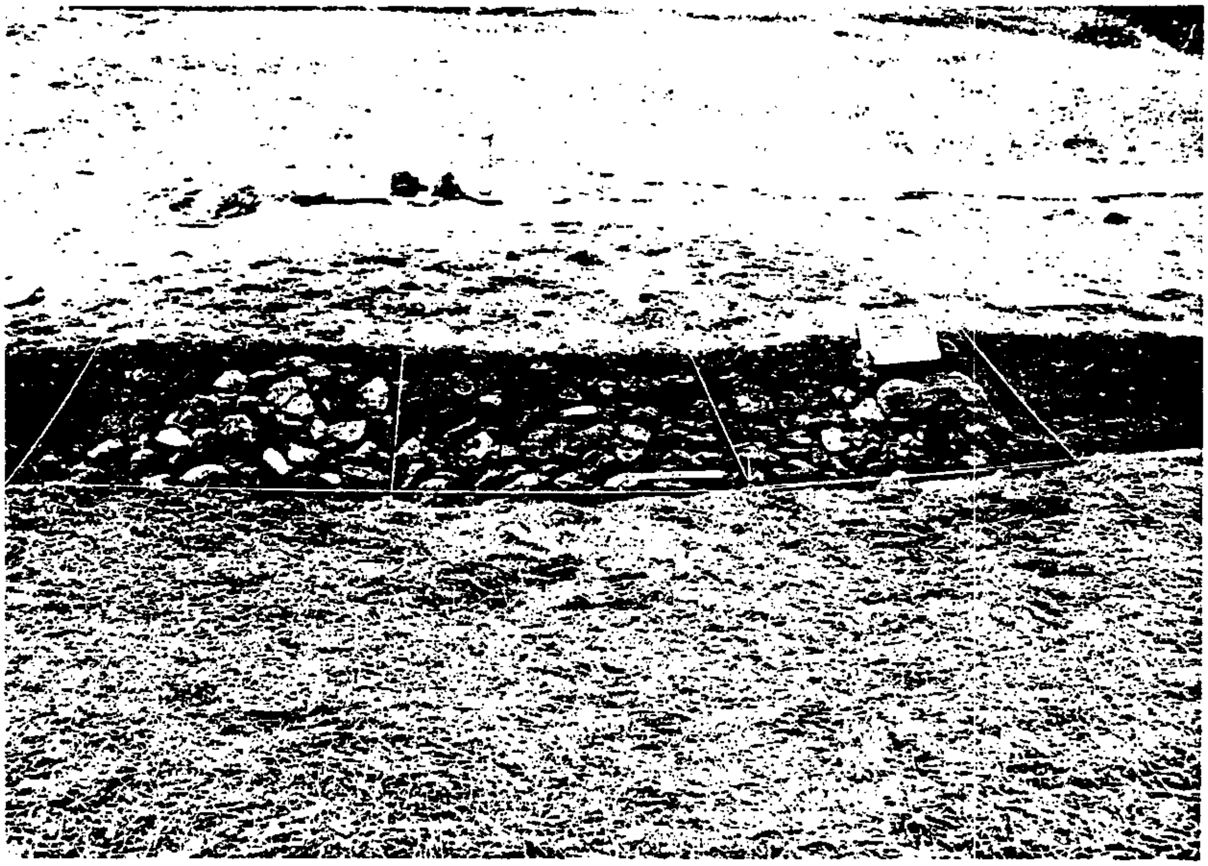
EeRj 46, Cultural Feature No. 1:
Cultural Depression Excavation Plan Map

Figure 3-25



EeRj 101 Cultural Feature No. 1: Cultural Depression Excavation Plan and Contour Map

Figure 3-26



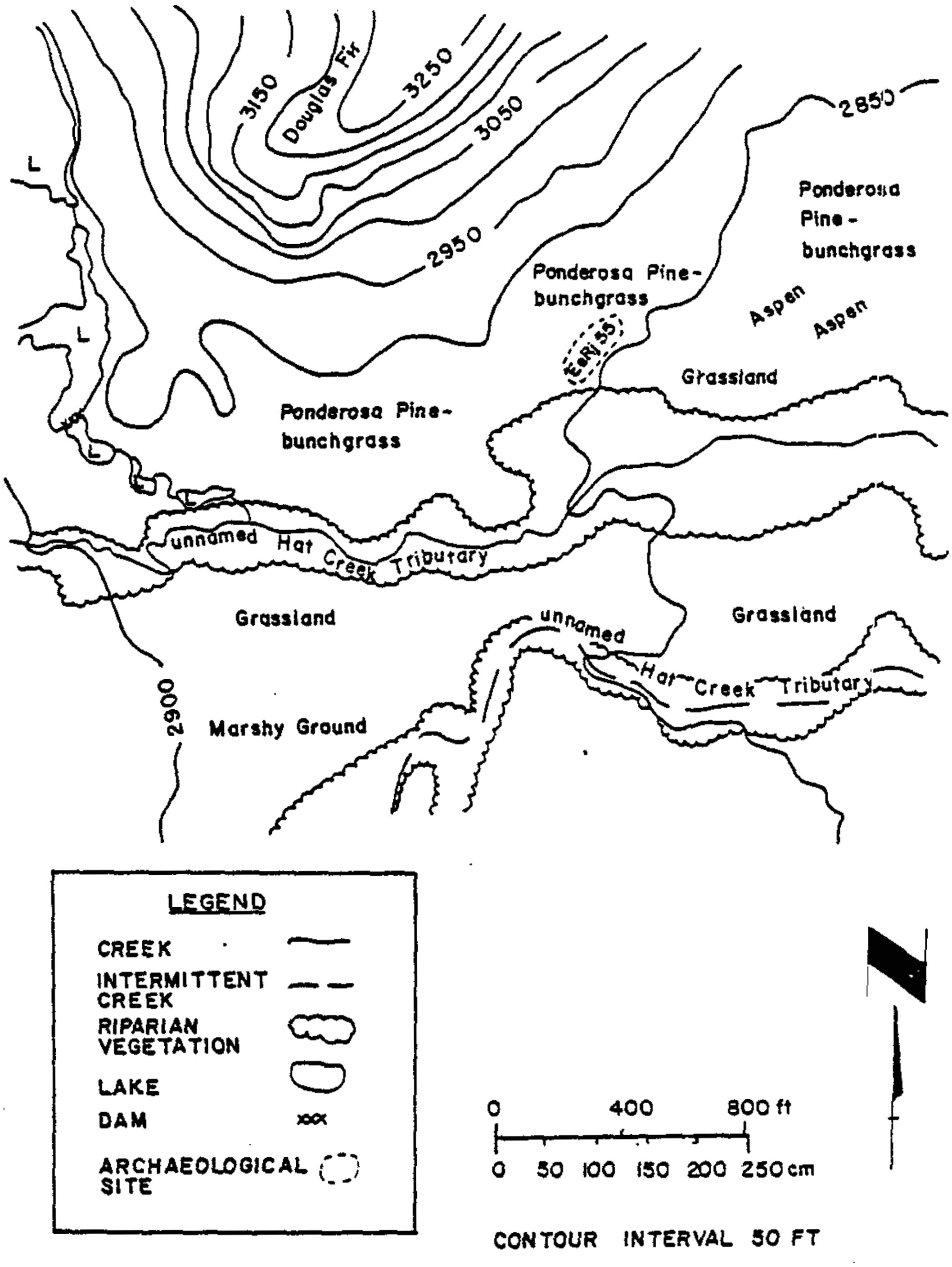
Rock Pavement Exposed in EeRj 101
Excavation Trench

Plate 3-4

65 years B.P. (S-1456). While coniferous species dominate the charcoal, several deciduous tree species are present: willow, trembling aspen and alder. Besides charcoal, a charred bulb fragment from a member of the Lily family (Liliaceae), a burnt onion bulb and a burnt rhizome fragment from the Composite family (Compositae) were also found. Faunal remains were limited to a single unidentifiable bone fragment. Four potential grinding stones had been included in the rock pavement. From units north of the basin, 45 pieces of basalt (19) and jasper (26) debitage were retrieved along with three retouched and/or utilized flakes.

Two cultural depressions were recorded in 1976 at EeRj 55, a site located in Houth Meadows (see Fig. 3-27). The larger depression, Area A, has a rim crest to rim crest diameter of 6.9 m (27.3 ft); the smaller depression, Area D, has a diameter of 3.6 m (11.8 ft). Exterior edge diameters for areas A and D are 11.9 m (39.0 ft) and 4.2 m (13.8 ft), respectively. In addition, 165 pieces of debitage and three retouched flakes were collected from the site's surface (Area B). Twenty-one artifacts are chert; 147 vitreous basalt. A 13 m x 1 m trench was excavated through the centre of Area A and six randomly selected 2 m x 2 m units were excavated in Area B in 1977. Seven 1 m x 1 m units arranged in a cross-trench were excavated in Area D in 1978. Test excavations in Area C revealed that the depression is natural rather than cultural. These test units yielded 9047 lithic artifacts, a birch-bark (Betula papyrifera) container (see Fig. 3-28), tons of heat-cracked rock, numerous pieces of charcoal and other floral remains, as well as a number of bone fragments.

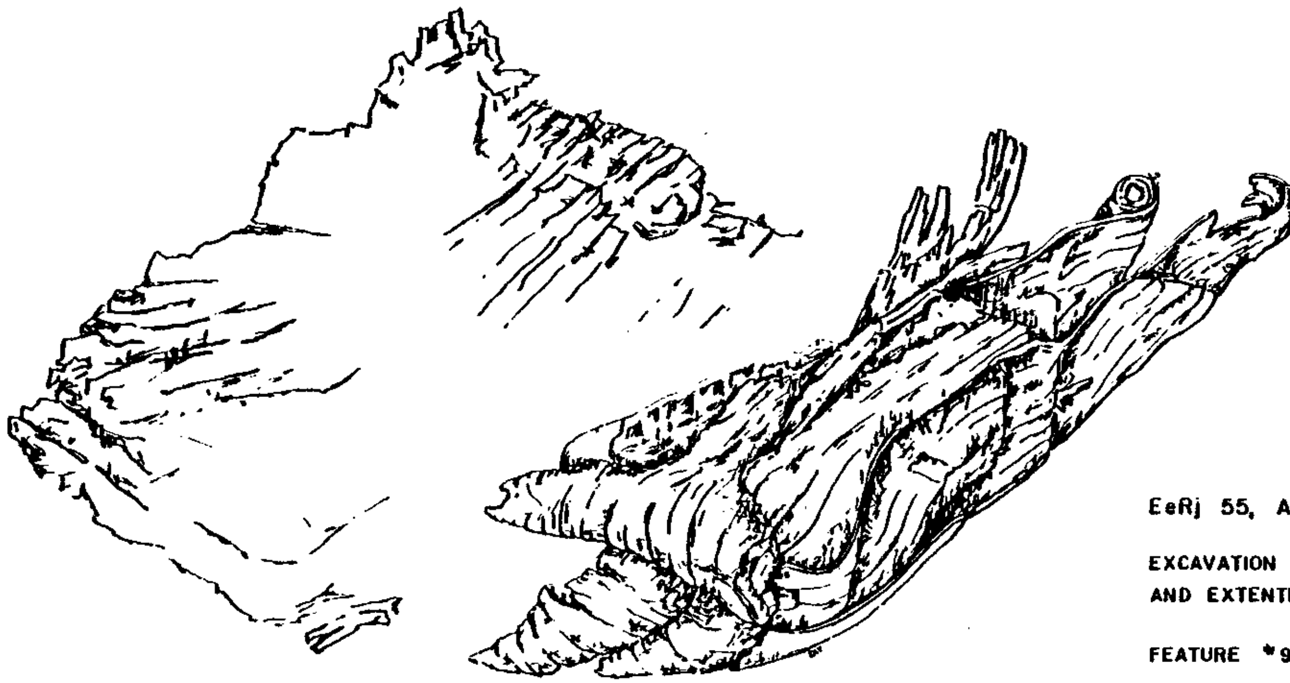
Areas A and D appear to be the archaeological remains of earth ovens. Four rock pavements were defined in Area A; one rock pavement, in Area D. While Area D's structure is fairly comparable to that of root roasting ovens described ethnographically



EeRj 55, Physiographic Location Map

Figure 3-27

Figure 3-28



EeRj 55, Area A

EXCAVATION UNIT 5A
AND EXTENTION

FEATURE #9

N.E. CORNER VIEW

Scale 1: 4.65

BARK CONTAINER IN WHICH SALMON REMAINS WERE ENCLOSED

(Dawson 1891; Teit 1900, 1906, 1909), two of Area A's pavements and their associated basins are the result of a more painstaking construction.

Repeated use of this site for roasting activities is indicated by the five rock pavements and stratigraphic evidence for at least seven separate roasting episodes. Reuse of the site may have been an energy-saving measure: reusing rocks from previous ovens may have been preferable to gathering fresh rocks dispersed over a large area.

Most of the floral remains from Area A are coniferous charcoal. Exceptions include an unidentifiable root or rhizome fragment, burnt capsules (Allium sp.) and birch-bark (Betula papyrifera) fragments (Ketcheson 1979). Identified species from Area A's faunal remains are elk (Cervus elaphus linnaeus) (Ham 1979), wood rat (Neotoma cinera) (ibid.) and sockeye salmon (Oncorhynchus nerka) (Crockford-Dawson 1979). The salmon remains were wrapped in the birch-bark container and buried under the rim of Area A's largest rock pavement.

Area D also contained large amounts of coniferous charcoal, but, in addition, contained many unburnt ponderosa pine needles, a few ponderosa pine cones, one unburnt ponderosa pine seed and unburnt kinnikinnick (Arctostaphylos uva-ursi) leaves (Ketcheson 1979). There is some evidence for a thick layer of ponderosa pine boughs within the oven (ibid.). Faunal remains include grouse (Dendragapus obscurus), large mammals and small mammal bones as well as an antler fragment (Ham 1979).

Few artifacts were found in direct association with any of the ovens. Most are debitage or retouched and/or utilized flakes, except for a projectile point from Area A. Those artifacts found in the ovens' fill could easily have been deposited during a previous occupation of the site and included in an oven during its construction and use. Ninety-eight percent of Area B's 8947 artifacts are debitage. Blades and retouched tools are equally represented (0.9 percent and 0.8 percent, respectively). Retouched tools include four projectile points and three scrapers. Vitreous basalt is the predominant raw material (86.2 percent). Evidence for a prehistoric camp site was obtained from Area B's artifacts. Cursory examination of tool and debitage types suggests that processing activities were more common than procuring activities. Preliminary microwear analysis has suggested that cutting and severing occurred more often than scraping (cf. Howe 1978).

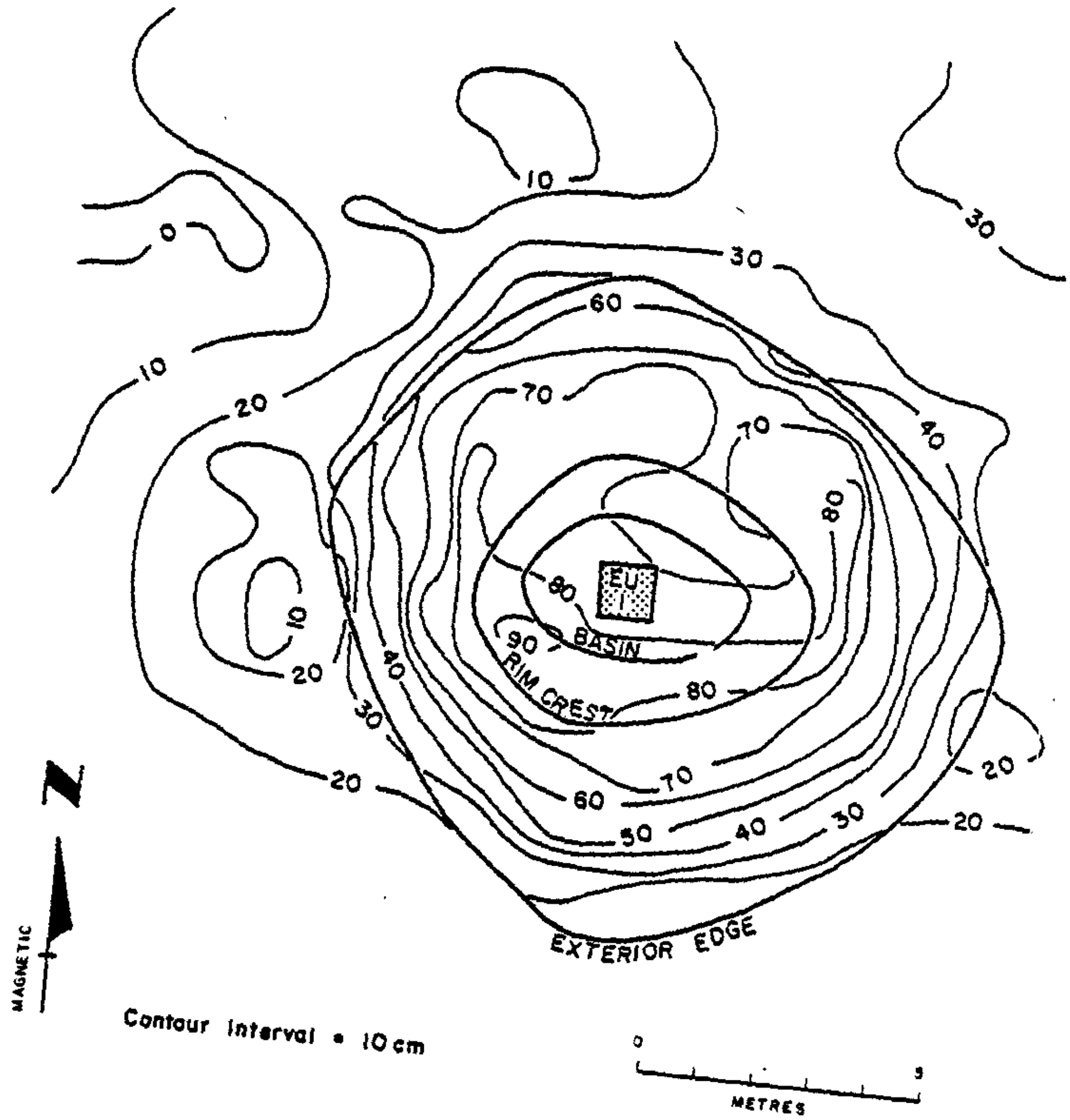
Little can be said in reference to the ovens' antiquity. One use of Area A's third pavement is dated at 1220 ± 70 years B.P. (S-1455) by radiocarbon analysis. Area D's single pavement is dated at 600 ± 40 years B.P. (S-1581). No datable organic material was recovered from Area B. Projectile points from Area A and Area B are similar to those dated by Sanger (1970) between 5000 B.P. and 2000 B.P.

EeRj 1 is located on the plain and creek terraces at the junction of upper and lower Hat Creek valleys. Extending over 7 ha, EeRj 1 is composed of a lithic scatter, 15 cultural depressions, a small pictograph, a midden, six historic structures and numerous historic artifacts. Though previously recorded in the B.C. Site Inventory file, EeRj 1 was not described in detail until the Phase II, year 2 survey. A sample collection made of surface artifacts yielded 23 846 pieces of debitage, 451 retouched tools of all types, 14 blades, two pieces of ground stone and 475 historic artifacts. Nine of the cultural depressions appear to be earth oven remnants; five, possibly six, of the cultural depressions, pithouse remnants. Test excavations were carried out at two cultural depressions (cultural features 9 and 10) during Phase II, year 2. Cultural features 9 and 10 have rim crest diameters of 5.4 m (17.7 ft) and 10.8 m (35.4 ft), respectively; and exterior edge diameters of 12.9 m (42.3 ft) and 14.7 m 48.2 ft), respectively.

Limited time restricted excavations at cultural feature 9 to a 1 m x 1 m unit in the depression's basin (see Fig. 3-29), which was excavated to a depth of nearly 2 m. Culturally deposited sediments were encountered to a depth of about 1.5 m and consisted of charcoal, ash, burned earth and heat-cracked rock. Two rock pavements were defined: 1) 15 cm to 55 cm below surface and 2) 95 cm to 120 cm below surface. The upper pavement has been dated by a radiocarbon sample at 970 ± 550 years B.P. (S-1579); the lower pavement, at 2030 ± 45 years B.P. (S-1580). Beneath the lower pavement are culturally sterile sands and gravels, which are most likely part of an abandoned, post-Pleistocene stream channel (McCullough 1979).

A worked bone and 104 lithic artifacts were recovered, including six retouched and/or utilized flakes. Chert (21 percent), jasper (7 percent) and chalcedony (1 percent) artifacts occur along with the predominant basalt artifacts (71 percent). Floral remains from EeRj 1, cultural feature 9 are composed mainly of coniferous charcoal, but ponderosa pine cones and Douglas-fir needles are also present (Ketcheson 1979). Bone fragments from large and small mammals, and fish were recovered as well, but only one deer bone was identifiable (Ham 1979).

Cultural feature 10 was tested using a 13 m x 1 m trench running north-south through the depression's centre. Thirteen 1 m x 1 m units were defined, but only 10 were excavated (see

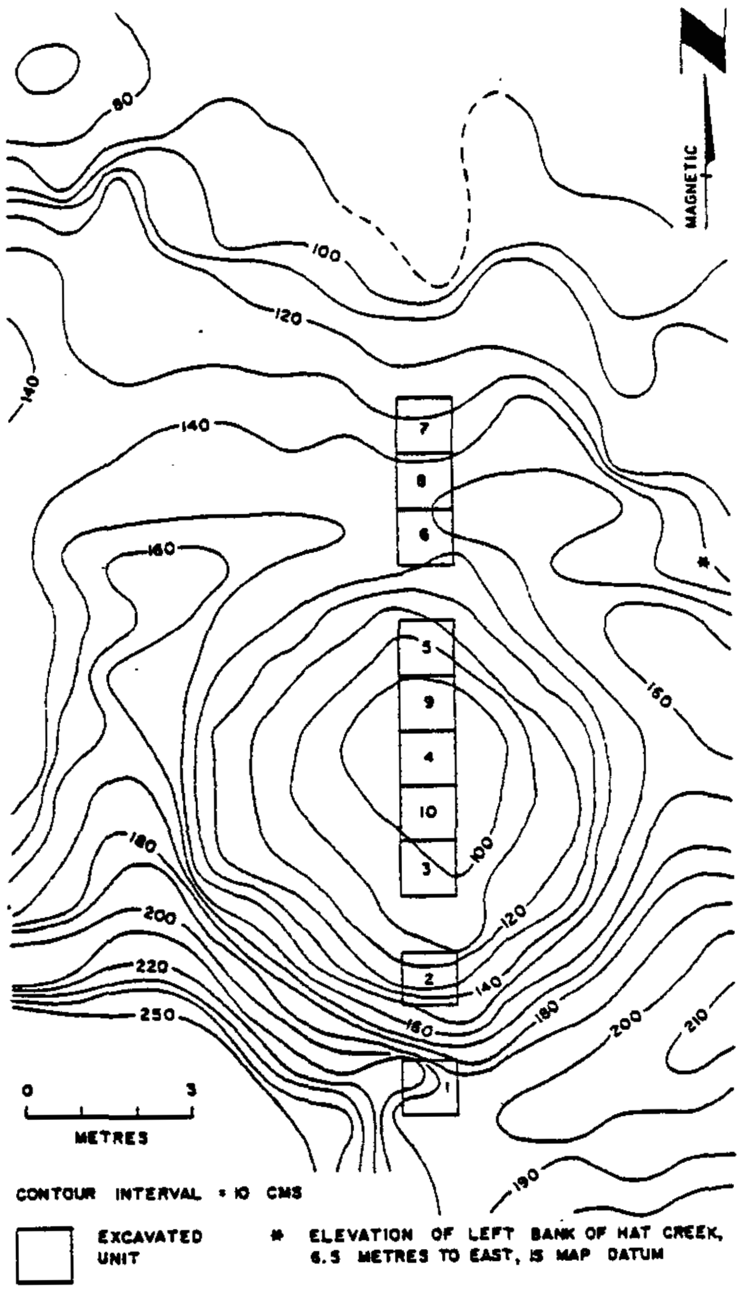


EeRj 1, Cultural Feature No. 9: Cultural Depression
Excavation Plan and Contour Map

Figure 3-29

Fig. 3-30). Several culturally deposited sediments were found to overlie layers of sand, pebbles and gravel. Intercollation of cultural and natural layers suggests that the site has been flooded by Hat Creek (McCullough 1979). Layers of charcoal and ash occur as well as stained matrix layers. A thick concentration of ash in the middle of the trench is similar to that described by Blake (1974) as EeRk 9's hearth and by Stryd (1973), for other housepits near Lillooet. Other features include a 80 cm x 100 cm x 15 cm (31.5 x 39.4 x 5.9 in) concentration of heat-cracked rock near the basin's southern perimeter, a 25 cm x 100 cm x 25 cm (9.8 x 39.4 x 9.8 in) concentration of unburnt cobbles and pebbles near the basin's northern periphery, a 45 cm x 45 cm x 21 cm (17.7 x 17.7 x 8.3 in) pit filled with charcoal and heat-cracked rocks near the ash concentration and a potential posthole near the ash concentration as well. The features containing heat-cracked rocks may also be hearths, similar to the less common type described by Stryd (1973). Stryd (ibid.) also noted concentrations of unburnt rocks in housepits near Lillooet, but could only speculate upon their origin.

Artifacts were found in units both inside and outside EeRj 1, cultural feature 10's basin. Stone artifacts include a uniface, bifaces (six), projectile points (nine), a scraper, ground stone (two), retouched and/or utilized flakes (89) and debitage (1137). Most are made from basalt (80 percent); while 16 percent are made from chert, 1 percent from chalcedony and 3 percent from jasper. Two of the projectile points are akin to Kamloops phase points. Two bone awls, two worked beaver incisors, two pieces of worked bone and a unilaterally barbed bone point fragment (see Fig. 3-31) were also found. Other artifacts include a small, spherical, ground stone; a steatite pipe fragment; a blue, glass bead fragment; a mother-of-pearl button; a wooden button; a stone pendant; and a bone disc bead.



EeRj 1, Cultural Feature No. 10, Excavation Plan and Contour Map.

Figure 3-30

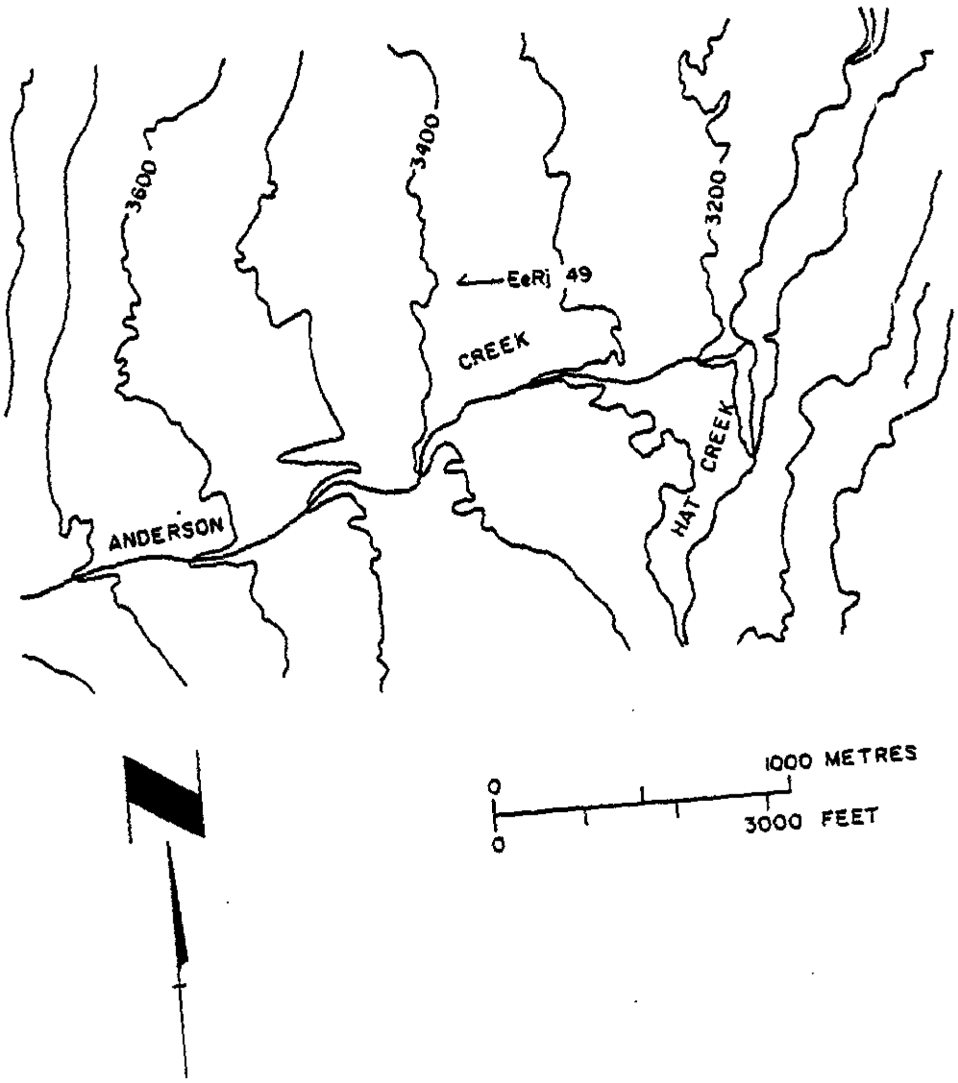
Unilaterally - Barbed Bone
Harpoon Point Excavated from
EeRj 1, Cultural Feature # 10.

Figure 3-31

Floral remains include unburnt Douglas-fir needles; willow wood fragments; blueberry leaves; pithy twigs from elderberry (Sambucus sp.); unburnt bark from birch (Betula sp.) ponderosa pine and juniper (Juniperus sp) (Ketcheson 1979). These data provide slim evidence for woven and bark baskets, and beds cushioned with confier boughs (ibid.). Many pieces of faunal material were collected (4863) and identifiable species include rabbit (Lepus americana), marmot, squirrel, beaver, domestic dog, black bear, mule deer, elk, salmon, geese, duck, a bird of prey and a songbird (Ham 1979). A deer skull fragment with attached antler suggests that the deer was killed in autumn before the antler was shed (ibid.). Burnt or charred bones account for 39 percent of the remains by weight. Butchering marks occur on a beaver bone and some bones appear to have been cracked open for marrow (ibid.).

A sample from the middle of the trench provides a radiocarbon date of 140 ± 50 years B.P. (S-1582). An assemblage composed mainly of artifacts manufactured by a prehistoric technology with a few historic artifacts is consistent with placing the occupation of EeRj 1, cultural feature 10 in the protohistoric period, as are the Kamloops phase projectile points. In general, the cultural remains are similar to those from EeRk 9, a historic housepit near Lillooet (see Blake 1974).

EeRj 49, a lithic scatter site situated in the sage-covered, hummocky moraines on the west slope of upper Hat Creek valley (see Fig. 3-32), was recorded and surface collected in 1976. In addition to 150 items of debitage, surface remains include a chert microblade, a basalt microblade core, a chert formed uniface and a single chert retouched flake. The first three artifacts are all diagnostic of the Early Nesikep period (ca. 7000 to 2800 B.P.) (Sanger 1970; Stryd 1973). The excavation of two 2 m x 2 m units in 1977 corroborates this interpretation.



EeRj 49 Physiographic Location Map

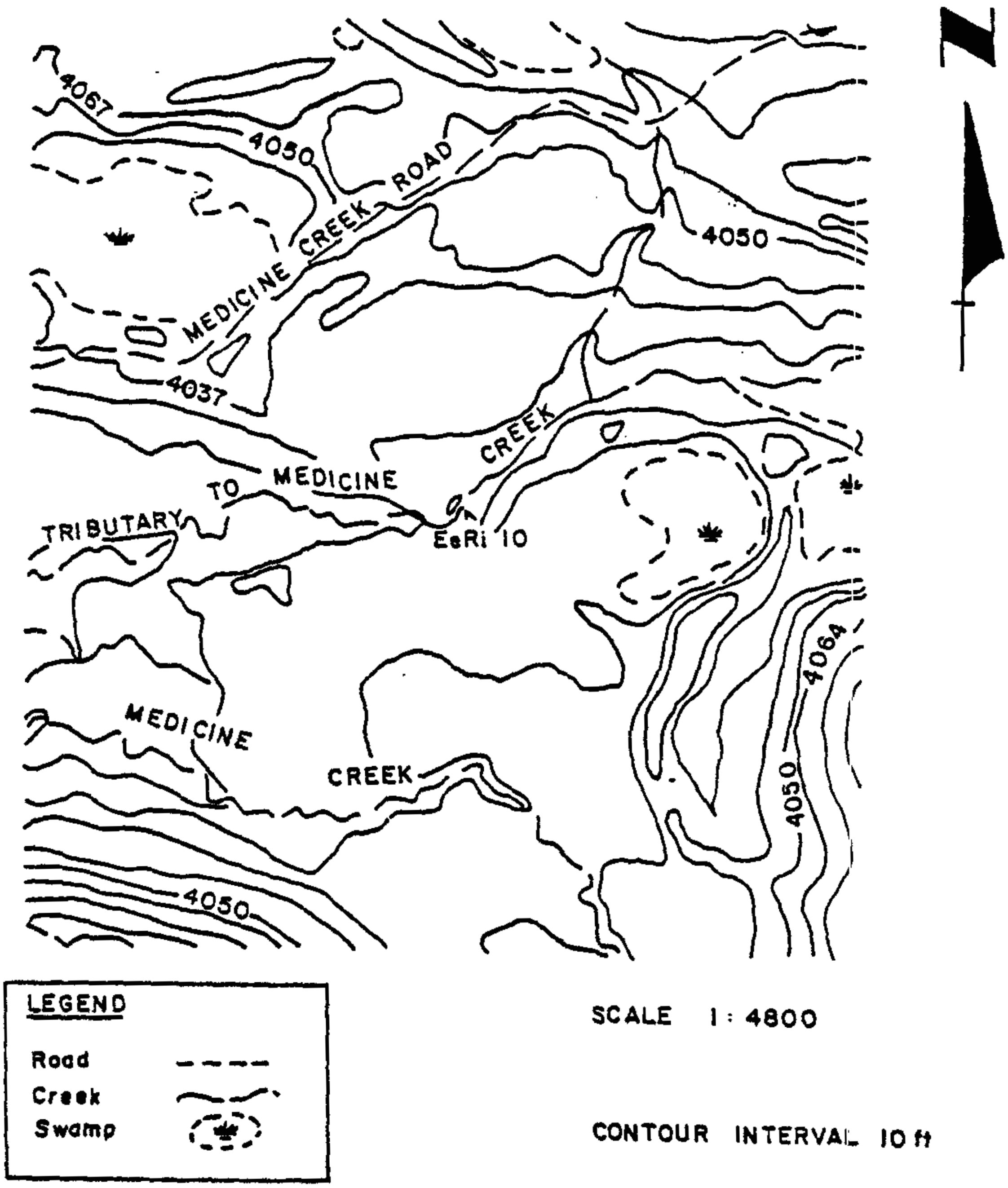
Figure 3-32

A total of 190 chipped stone artifacts were recovered during excavations; no preserved organic remains were observed. Subsurface cultural materials were recovered from a silt layer extending 10 to 15 cm below the surface and the upper portion of an underlying clay layer.

In the first 10 cm of deposit below surface, 155 items (81.5 percent) were recovered; the remainder were found in the second 10 cm level (10 to 20 cm below surface). Deeper levels were culturally sterile. Lithic debitage accounts for the majority of the subsurface assemblage (132 items, 69.5 percent). Microblades constitute the second most prevalent artifact class (53 items, 28.9 percent). Also attributable to microlithic technology are two microblade core fragments. The number of retouched tools in the assemblage is low: only two retouched flakes were recovered.

The surface and subsurface remains are interpreted to represent a single occupation of the site during the Early Nesikep period. The absence of any organic remains precludes any absolute dating. The small site area (84 m^2), shallow depth of deposit, distance from water, and relatively restricted artifact assemblage all suggest a brief occupation of the site by a small group for extractive activities.

EeRi 10, recorded in 1977 during quadrat survey, is a medium-size lithic scatter in the Medicine Creek drainage (see Fig. 3-33). Collected surface artifacts include a point tip, a formed scraper (see Fig. 3-34), 28 retouched and/or utilized flakes and 140 pieces of debitage. All but four artifacts are vitreous basalt; the remainder are chert. In 1978, 10 randomly selected 2 m x 2 m units were excavated at this site. A total of 2402 chipped stone artifacts was found in this excavation sample. No other cultural remains were evident.



EeRi 10 Physiographic Location Map

Figure 3-33

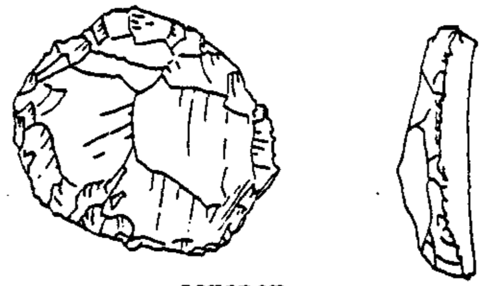
Microblades are the most salient component of EeRi 10's excavated assemblage: no microblades were collected from the surface, yet 108 were discovered in text excavation. Two microblade cores were also found (see Fig. 3-34). Besides these artifacts, a lanceolate point, four unifaces, three bifaces, two gravers (see Fig. 3-35), four pieces of pecked and/or utilized flakes, and 2171 pieces of debitage compose the assemblage. Eighty-three percent of the excavated artifacts are vitreous basalt. Except for one piece of obsidian debitage, the rest of the artifacts are chert, chalcedony and jasper.

On the basis of the microblades and microblade cores, EeRi 10 most likely dates to the Early Nesikep period (ca. 7000 to 2800 B.P.) (see Sanger 1970; Stryd 1973). No suitable organic material was recovered for radiocarbon dating or floral identification. A cursory examination of wear on the artifacts suggests that wood, bone and/or antler were worked by EeRi 10's occupants. Diversity in tool and debitage types suggest further that EeRi 10 was occupied as a base camp.

EeRj 153, a small lithic scatter, lies atop a knoll south of Finney Creek's former channel (see Fig. 3-36). A sample collection of EeRj 153's surface artifacts during the 1977 survey yielded a biface fragment, three retouched and/or utilized flakes and 87 pieces of debitage (38 basalt, 51 chert, 7 jasper). In 1978 five 2 m x 2 m units arranged in a cross-trench were excavated.

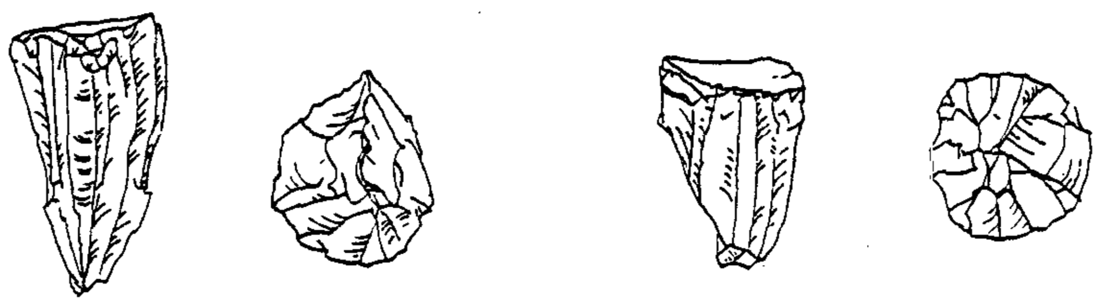
No floral or faunal material was discovered during excavations. Consequently, there is no radiocarbon date for EeRj 153, either. Recovered artifacts include a basalt biface, microblades (two basalt, one jasper), retouched and/or utilized flakes (17 basalt, four chert, four jasper) and debitage

point tip



scraper

SURFACE COLLECTION

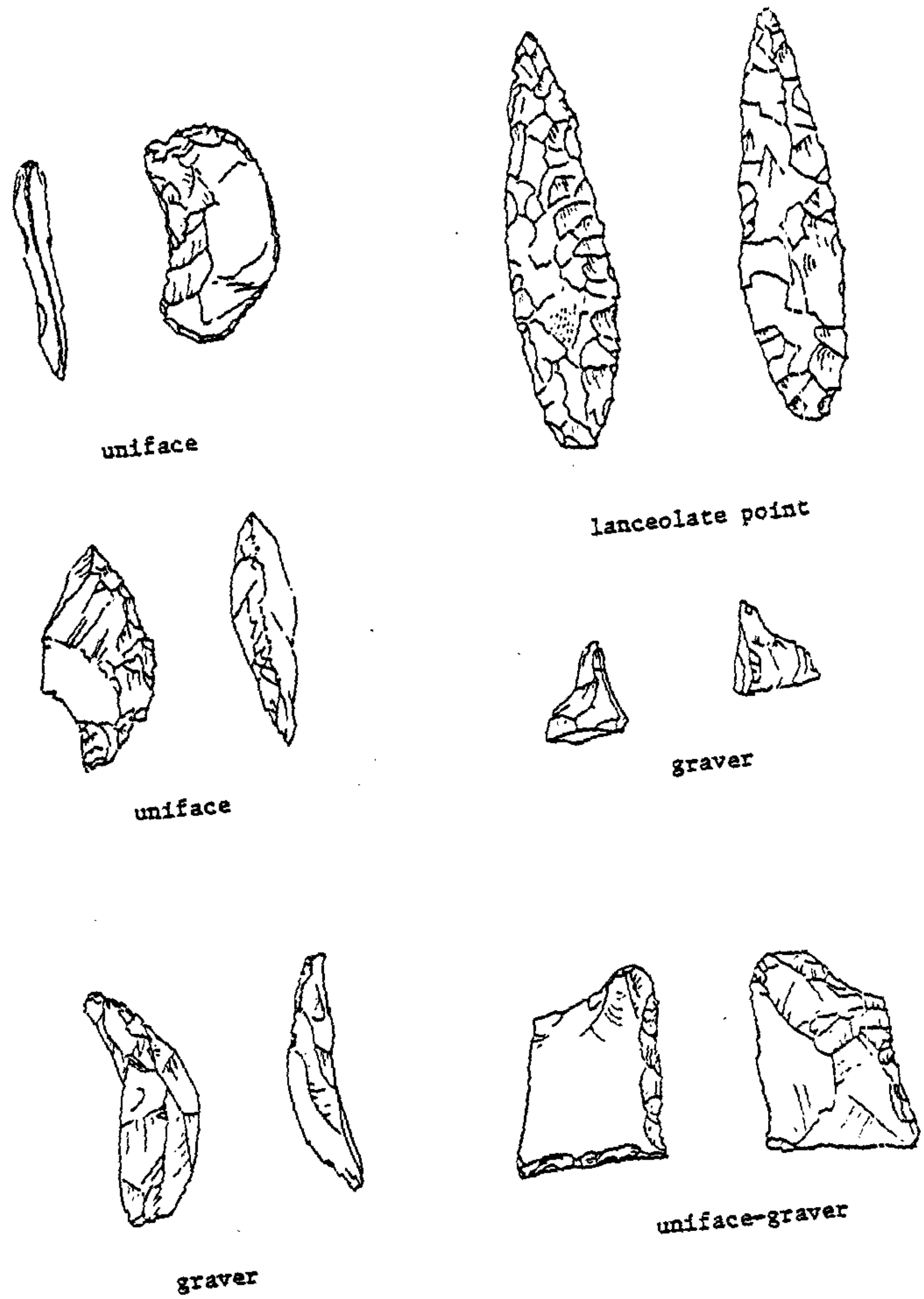


Microblade cores

EXCAVATION

Diagnostic Artifacts from
EeRi 10

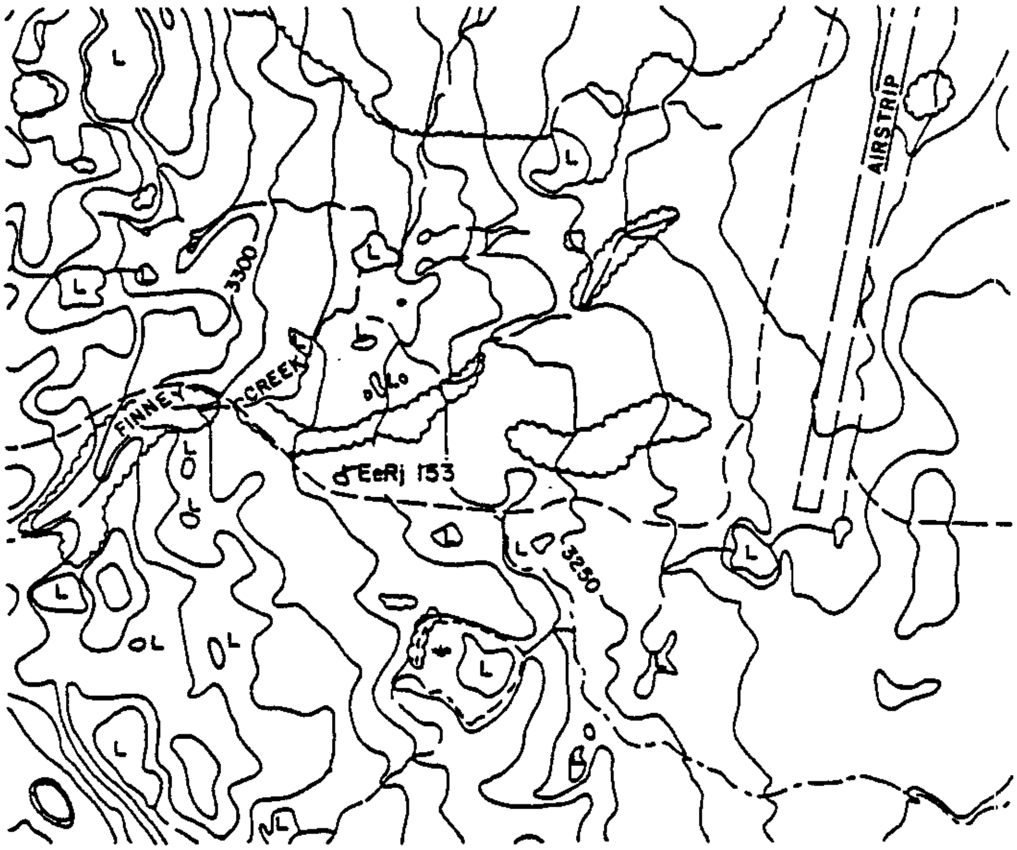
Figure 3-34



Diagnostic Artifacts

Excavated from EeRi 10

Figure 3-35



SCALE 1:4800

CONTOUR INTERVAL

LEGEND

Track or Trail

Lake

Creek

Swamp

Ditch

Trees

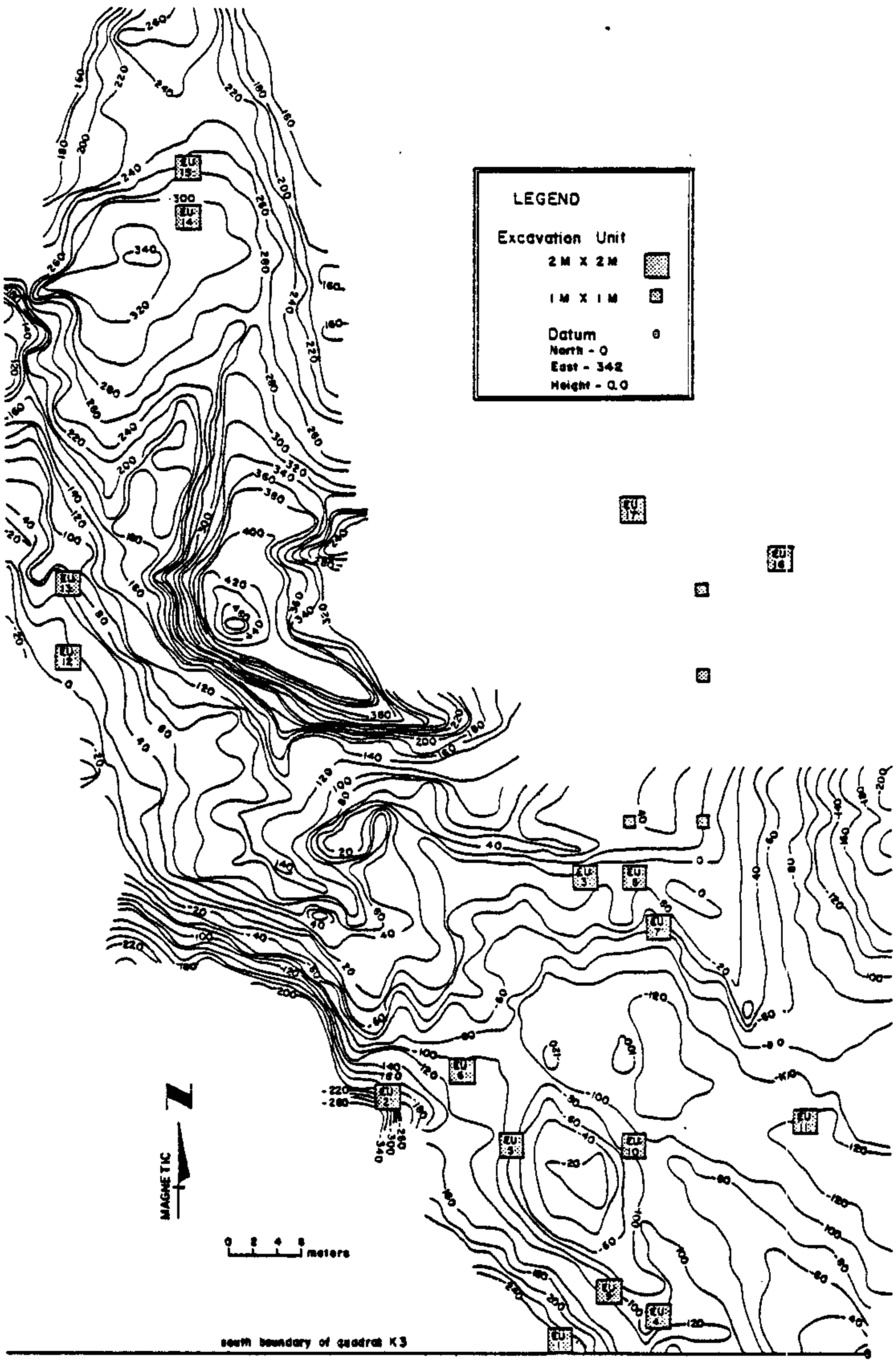
EeRj 153 Physiographic Location Map

Figure 3-36

(1955 basalt, 76 chert, 65 chalcedony and 160 jasper). In feature No. 1, 942 pieces of debitage (all but 1 jasper flake are basalt) concentrated inside a 13 cm x 15 cm x 3 cm (5.1 x 5.9 x 1.2 in) area. The average weight of feature No. 1's debitage is 0.17 gm. Feature No. 1 has the appearance of swept-together waste flakes after an episode of tool making and/or repairing. Several of the artifacts show macroscopic signs of wear: step fractures, nibbled edges and rounded edges. EeRj 153, on the evidence of debitage types, seems to have been the location of the final stages of tool manufacture. In addition, cutting and/or scraping of hard materials may have also taken place. Some hunting is inferred from its location which overlooks the creek channel, which is well-traveled by game.

EeRj 92 is a lithic scatter located on a high terrace east of upper Hat Creek, just south of its confluence with Anderson Creek. In 1977, EeRj 92 was recorded and a sample collection, made of its surface artifacts. In 1978, prior to excavation, a total collection was made of its known extent. However, after excavations had commenced, another portion of the site was discovered in a seasonally marshy area. Lack of time did not permit collection of its surface artifacts. Results of the survey are as follows: a chert microblade; a jasper biface; a basalt scraper; a jasper graver; retouched and/or utilized flakes (14 basalt, 7 chert, 3 jasper) and debitage (144 basalt, 135 chert, 3 chalcedony, 31 jasper, 10 other silicious material).

Fifteen 2 m x 2 m units were originally selected for a stratified random sample, but unit 2 was not excavated due to the presence of large boulders inside the unit; and unit 15, due to lack of time. Two 2 m x 2 m units were chosen judgementally from the portion of EeRj 92 discovered in 1978; and four 1 m x 1 m units were chosen judgementally to determine connections between the new area and the rest of the site (see Fig. 3-37).



EeRj 92 Site Plan and Contour Map

Figure 3-37

Stratigraphic interpretations have been complicated by massive slides and slumps (McCullough 1979). In general, cultural remains were retrieved from sediments blown or washed into the site. These artifacts include bifaces (four), scrapers (two), microblades (13), macroblades (three), retouched and/or utilized flakes (26 basalt, 36 chert, 5 chalcedony, 10 jasper, 2 andesite) and debitage (1621 basalt, 2592 chert, 211 chalcedony, 639 jasper, 2 other silicious material). Several features consisting of areas of discoloured sediments occur in EeRj 92. Identifiable faunal remains include mule deer, elk and grouse (Ham 1979). Floatation samples produced no floral remains of note. No radiocarbon dates are available. Several discrete activity areas are suggested by the artifact distribution. Also, a concentration of faunal remains with artifacts is interpreted as a butchering area (Odell 1979) or a midden.

The presence of microblades suggest that the site was occupied during the Early Nesikep period (i.e. prior to 2800 B.P.) (see Stryd 1973); while the presence of macroblades may indicate an occupation near the beginning of the period (ca. 5000 to 7000 B.P.) (see Sanger 1970). However, since no blade cores were found and blades may be produced by accident, these inferences concerning a blade technology and associated chronology are tentative. Geological evidence tends to support the hypothesis of an early occupation: artifacts were recovered from sediments which had accumulated in "tension cracks" on the surface of a slide (McCullough, personal communication). This implies that EeRj 92 was occupied shortly after the slide stabilized. No absolute date is available for this geologic event, but there is evidence that this slide is not recent (McCullough 1979).

EeRj 159 is an extensive lithic scatter (52 290 surface items) and cultural depression (six) site in Houth Meadows. A sample collection of surface artifacts in 1977 yielded nearly every type of chipped stone tool as well as debitage. In 1978, seven clusters of artifacts were defined on EeRj 159's land surface (see Fig. 3-38) and a total of 28 2 m x 2 m excavation units was selected from these strata. Time permitted the excavation of only 14 units; each cluster though was represented in the actual excavation sample.

Table 3-25 gives the number of tools and debitage excavated by cluster and unit. Despite scattered artifacts on their surface, clusters C* and F yielded no subsurface artifacts. Only 12 pieces of debitage (2 basalt, 7 chert, 3 jasper) were excavated from cluster D, all from one unit. Both test units in cluster G produced similar results. Tools from cluster G include a basalt biface and a projectile point cut from sheet iron, similar in shape to an iron projectile point from the Lillooet area, described by Stryd (1973: 408) (see Section 3.3). Most of the artifacts (77 percent) are made of basalt; the remainder, chalcedony (2 percent) chert (11 percent) and jasper (10 percent).

One unit in cluster B yielded very few artifacts (19), while the other unit was rather productive (861). Most of the tools are retouched and/or utilized flakes. The only other tool type present in cluster B's excavated assemblage is microblades (eight). All but 14 artifacts are made of basalt; chert, chalcedony and jasper comprise the remainder.

A total of 5949 artifacts was excavated from cluster E's 2 units. Nearly all the artifacts (5800 or 97 percent) are debitage. Besides retouched and/or utilized flakes (122), bifaces (four), unifaces (one), projectile points (one) and microblades

---

* In cluster C's instance, this may be attributable to the extremely small sample size - approximately 0.7 percent of the land surface.

TABLE 3-25

EeRj 159: EXCAVATED ARTIFACT ASSEMBLAGE BY CLUSTER, UNIT AND ARTIFACT TYPE

Cluster	Unit	Number of Tools	Number of Debitage	Total Number of Artifacts
A	1	947	16,576	17,623
A	2	273	1,399	1,672
B	2	3	16	19
B	3	43	818	861
C	2	0	0	0
D	1	0	0	0
D	3	0	12	12
D	4	0	0	0
E	2	100	4,424	4,524
E	3	45	1,380	1,425
F	1	0	0	0
F	2	0	0	0
G	1	5	34	39*
G	4	3	39	42
Total		1,419	24,698	26,117

* *ferrous projectile point*

(16) comprise most of the tools. As above, basalt is the most common material (66 percent), but with a large quantity of chert (29 percent). Jasper (4 percent) and chalcedony (1 percent) artifacts are present as well. Many pieces of chert and jasper appeared to have been subjected to high temperatures.

Unit 2 of cluster A was productive (1672), but unit 1 was phenomenal (17 523). Most of these artifacts are debitage (17 975), but both units together yielded a large number of tools (1220) as well. Unit 2's tools consist of a biface, microblades (164), macroblades (two) and retouched and/or utilized flakes (106). Unit 1's tools consist of unifaces (two), bifaces (two), projectile points (seven), scrapers (two), microblades (789), macroblades (19) and retouched and/or utilized flakes (122). In addition, unit 1 produced two microblade cores and two microblade core fragments. Basalt artifacts predominate (97 percent). Chert (2 percent), chalcedony (0.2 percent), jasper (0.3 percent) and obsidian (0.1 percent) artifacts occur, too.

No floral remains were found, consequently no floral identification or radiocarbon dating were carried out. Small amounts of faunal remains permitted the identification of the following: mule deer, beaver, other large and small mammals, and a species of bird. Most of the artifacts were confined to 25 cm (9.8 in) below the surface. Unit 1's microblades (789) probably represent the largest collection excavated to date in the southern interior; with the addition of microblades from EeRj 159's other units, a uniquely large (977) microblade collection originating from a single excavated site emerges. Diagnostic artifacts from EeRj 159 suggest that the site's occupation spans from the beginning of the Early Nesikep period to historic times, though the occupation may be intermittent (see Sanger 1970; Stryd 1973).

3.5 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

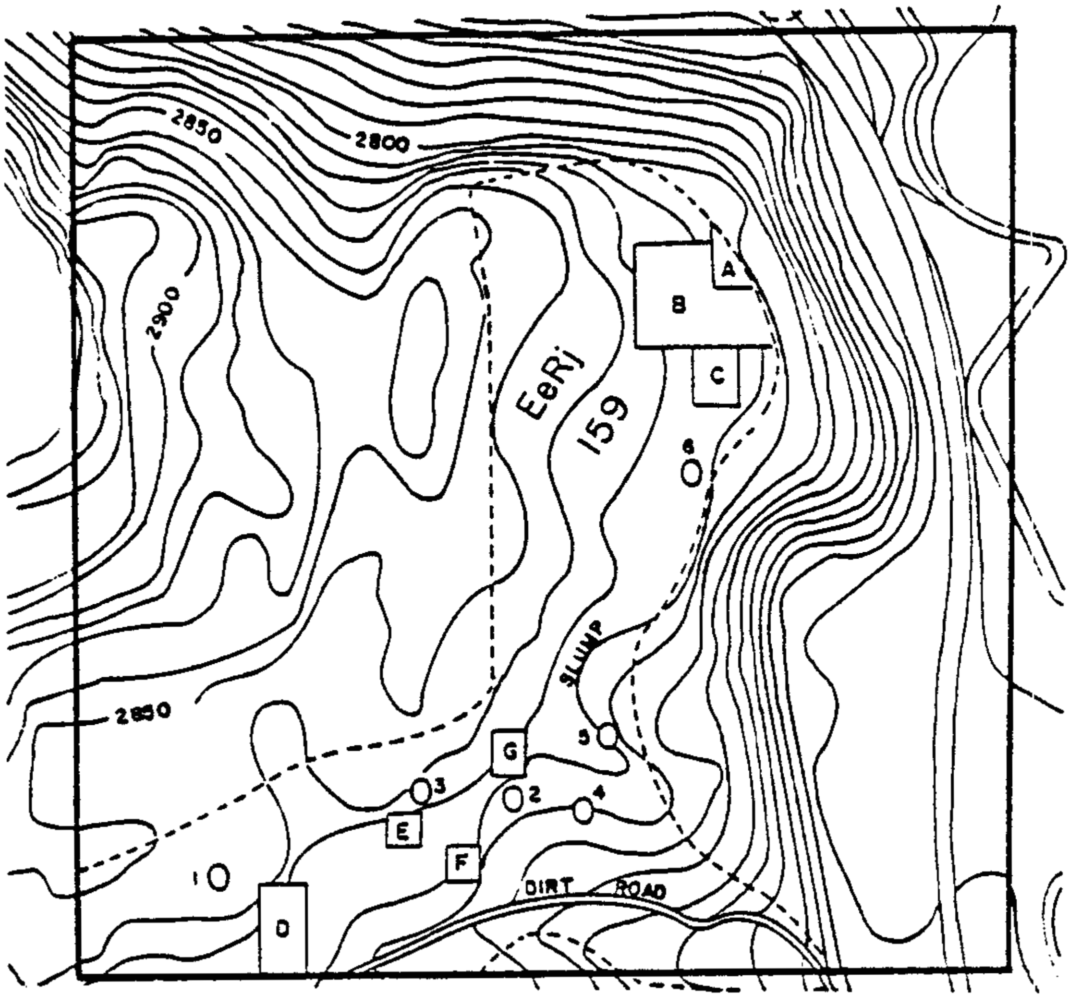
(b) Historic Archaeological Sites

Historic sites were located by two methods: 1) during quadrat survey (described in Section 3.4); and 2) during a special historic structure inventory. The latter method was executed by R. Froese with the assistance of the Hat Creek Archaeological Project. Historic structures were found using information provided by local residents. Data regarding the historic structures' architecture and furnishings were recorded, but no artifacts were collected. Table 3-26 lists the numbers and types of artifacts collected from historic sites and site components. These data were then analyzed to determine date(s), function and origin (Donahue 1979). Oral history and archival information supplemented interpretation based upon archaeological materials (ibid.).

Thirteen historic sites and six sites with both prehistoric and historic components were recorded by the project (see Fig. 3-39). Thirty-seven historic structures were also recorded in detail at 15 of the 19 sites. Thus, the average number of structures per historic site is 2.05. Fig. 3-40 shows the locations of the 37 historic structures. The 19 sites can be divided into the following kinds:

homestead/farm	9	
large ranch	1	
sawmill	1	
coal mine	3	
irrigation flume	1	
ephemeral occupation	3	
protohistoric housepit and homesteads	1	(Donahue 1979)

EeRj 207 was originally a homestead which was later incorporated into the coal mining operation (Graham 1977). EeRj 1, cultural feature No. 10, a protohistoric housepit, was discussed in Section 3.5(a).



EeRj 159:

EXCAVATION SCHEME

Scale 1: 3, 116

Figure 3-38

LEGEND

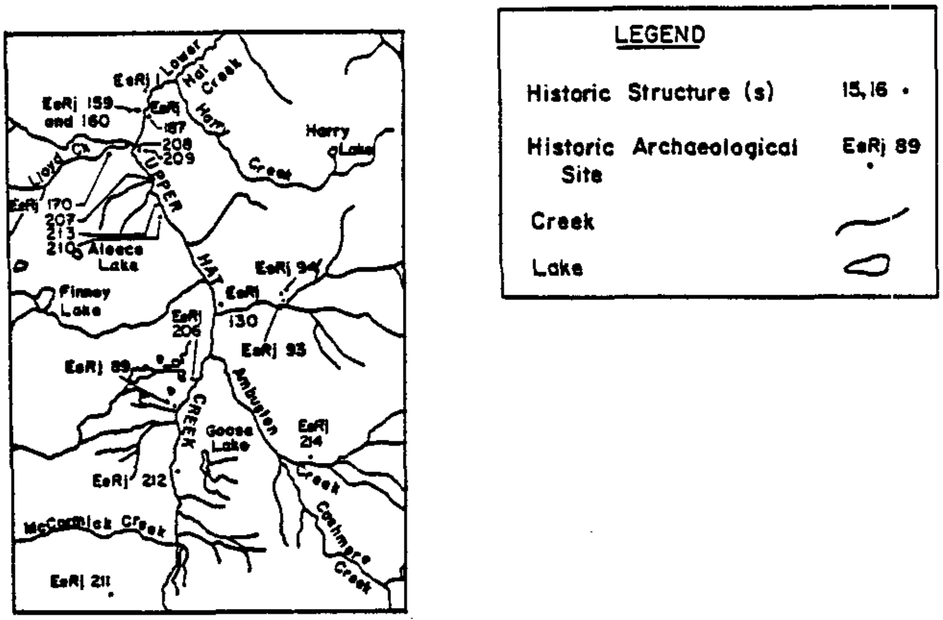
Site Boundary	----
Sampling Stratum For Excavation Units	
Cultural Depression	O

TABLE 3-26

PHASE II SURVEY: HISTORIC SITES

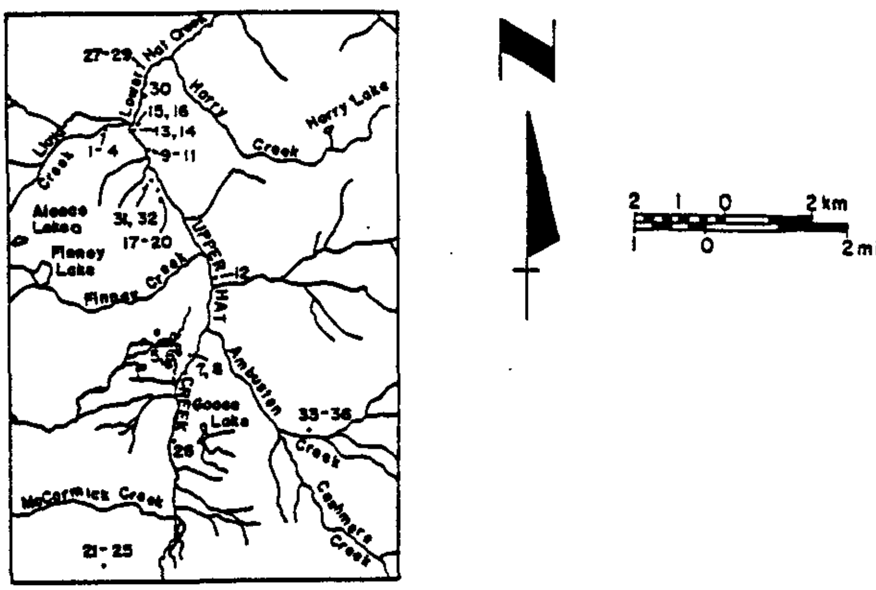
Survey Number	Borden Designation	Area Sampled (m2)	Sampling Fraction	Unidentifiable Fragments					Identifiable Fragments							Extant Structures
				Glass	Ferrous Metal	Non-Ferrous Metal	Ceramics	Other	Bone	Diagnostic Artifacts	Glass	Ferrous Metal	Non-Ferrous Metal	Ceramics	Other	
A8-I	EeRj 93	852	1.00	12	0	0	0	0	0	0	0	1	0	0	0	0
A8-II	EeRj 94	252	1.00	0	8	2	10	0	22	3	102	15	3	0	4	0
J4-II	EeRj160	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
J4-IV	EeRj159	1548	0.14	3	0	0	0	0	0	0	0	0	0	0	0	0
J18-V	EeRj170	500	0.06	493	10	9	155	9	6	15	14	22	0	0	18	4
I53-I*	EeRj130	–	–	0	0	0	0	0	0	0	0	0	0	0	1	1
K1-III	EeRj 89	72	1.00	0	0	0	0	2	0	16	2	5	5	1	6	3
L1-I	EeRj 1	2848	0.06	372	26	0	5	8	1	0	6	56	0	0	5	6
L3-II	EeRj201	400	0.23	0	0	0	0	0	0	1	0	0	0	0	0	0

* Midden area for this site was outside the quadrat boundaries



Distribution of Recorded Historic Archaeological Sites in Upper Hat Creek Valley

Figure 3-39



Distribution of Recorded Historic Structures in Upper Hat Creek Valley

Figure 3-40

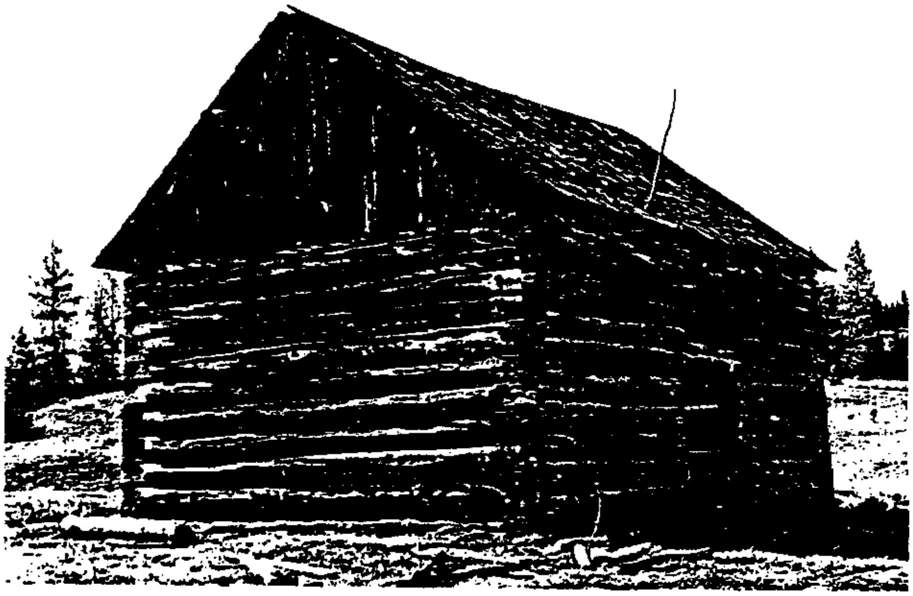
The irrigation flume is an elevated wooden structure for part of its course and an unlined ditch for the remainder. Four structures have a frame construction; 31 structures, a log construction; and one structure (historic structure No. 17 at EeRj 210), a combined log and frame construction. Most of the buildings have either milled plank (21) or tamped earth (11) floors. Most roofs are single pinnacoid (30) in form; only four roofs are flat. Roofs overlaid with earth (20) are most common. Shingles occur on six structures. Numbers and types of log-notching are as follows:

Dovetail	Saddle	Lapkeying
12	18	4

Orientation of doors and windows in the buildings are as follows:

	North Wall	South Wall	East Wall	West Wall
Door	3	12	16	10
Window	12	20	16	13

Twenty-two structures are interpreted as houses; 10 as barns (see Plate 3-5 for an example); two as sheds and one as a bunkhouse. Two structures' function were unidentifiable. Only eight structures are stable or intact (see Plate 3-5), while 20 structures are unstable, semi-collapsed (see Plate 3-6) or totally collapsed. Three structures are known only through their burnt foundations and were not included in the historic structure inventory, but were recorded during quadrat survey. Miscellaneous structures also recorded during quadrat survey, but not listed in the historic structure inventory, include root cellars, outhouses and a historic well.



Intact Barn (EeRj 170) in Houth Meadows,
Upper Hat Creek Valley

Plate 3-5

Semi-Collapsed Log Building (EeRj 89),
Upper Hat Creek Valley

Plate 3-6

3.5 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

Examples of early bottles and jars, such as those made in Ricketts' 3-piece body mould, occur at several sites as well as glass objects made from more modern techniques (Donahue 1979). Some identified pieces include liquor bottles, pharmaceutical jars and window glass (ibid.). Most ceramic fragments are not decorated and a few display a manufacturer's trademark (ibid.). White earthenware, ironstone china and porcelain are relatively common (ibid.). One piece of high-quality porcelain is probably of Japanese manufacture (ibid.). Both machine-cut and wire nails in a variety of forms and sizes were found (ibid.). Many metal objects pertain to farm tools and machinery (ibid.). Several rifle cartridges occur as well (ibid.). Miscellaneous objects were made of wood, rubber, plastic and leather (ibid.).

Faunal material collected from the surface of EeRj 94 has been identified as mule deer, horse and large mammal(s) (Ham 1979). Butchering marks were noted on both deer and horse bone (ibid.). A piece of retouched glass was also collected from this site (Donahue 1979). Faunal material from the surface of EeRj 170 include mule deer, bird and possibly elk (Ham 1979).

Initial occupation dates for the historic sites range from ca. 1890 to 1919, though EeRj 94 may have been occupied as early as 1880 (Donahue 1979). Both EeRj 1 and EeRj 187 may have historical remains dating back to ca. 1890. These dates are consistent with the chronology derived from oral history and archival sources (see Section 2.4). Utilization of upper Hat Creek valley was transient in nature prior to 1880. Substantial structures were most likely introduced into the valley during the homesteading period: 1880 to 1920. Occupations at some sites extend into the 1930s (ibid.). Evidence for the occupation of homesteads by Indians was obtained for the following sites: EeRj 94, 130, 207 and 214. EeRj 211 contains the remains of the

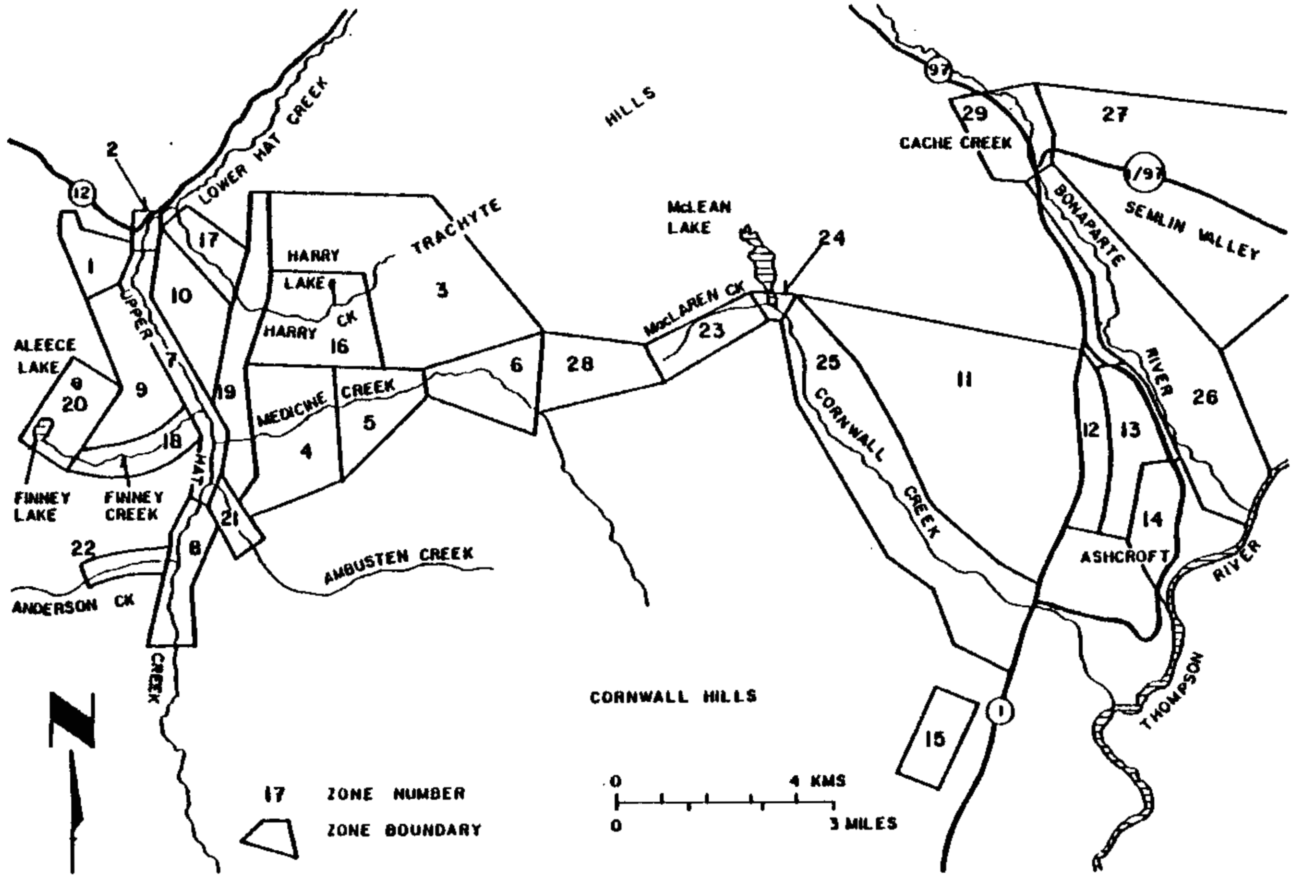
China Ranch, which was run by a Chinese entrepreneur during the early 1900s (see Section 2.4). Detailed interpretation was handicapped by the limited amount of collected data (ibid.).

(c) Archaeological Zones

The site study area has been divided into 20 archaeological zones as shown in Fig. 3-41. Zones have been defined by enclosing within a boundary a natural environmental unit (e.g. river valleys, high grasslands, desert plains) or a culturally modified unit (e.g. city), in which the cultural heritage resources are expected to form a coherent pattern. For example, archaeological zone No. 3 is characterized by heavily forested, rugged terrain. Few archaeological sites are expected in zone No. 3 and the majority of sites ought to be small lithic scatters with low artifact densities.

Table 3-27 summarizes salient characteristics of the 29 archaeological zones. Zone No. 20's palaeoenvironmental resources are Finney and Aleece lakes. Finney Lake retains an entire palynological record of postglacial vegetation successions, whereas the pollen-laden sediments in Aleece Lake represent an incomplete record of postglacial times (Hebda 1979). Localized resources in zone Nos. 4, 5, 7 and 19 are represented by lithic raw material sources: jasper in zone Nos. 4, 5 and 7, and vitreous basalt in zone No. 19 (Magne 1979). In zone Nos. 15 and 27, the localized resources are ethnographically favoured root-gathering grounds (Davidson 1915). Non-localized resources include deer, elk, berries, firewood, etc. Urban and rural areas were differentiated because cultural heritage resources are subject to more damage and destruction in urban areas than in rural areas. Grasslands and forests represent differences in the

Figure 3-41



Archaeological Zones Identified in the Local Study Area

TABLE 3-27

CHARACTERISTICS OF ARCHAEOLOGICAL ZONES IDENTIFIED IN THE LOCAL STUDY AREA

ZONE CHARACTERISTICS	ARCHAEOLOGICAL ZONES																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
upland	x	x	x	x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x	x	x			x	
lowland											x	x	x	x	x										x	x	x		x
no major water source	x		x						x	x	x	x	x		x				x								x	x	
lake																x				x				x					
creek		x		x	x	x	x	x								x	x	x			x	x	x		x				x
river														x												x			x
localized resources				x	x		x								x				x								x		
non-localized resources	x	x	x					x	x	x	x	x	x			x	x	x		x	x	x	x	x	x	x		x	x
grassland	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x				x		x	x	x	x		x
forest			x	x	x	x					x						x		x	x	x		x		x			x	
rural	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	
urban														x															
paleoenvironmental resources																				x									
lithic scatters	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
cultural depressions	x	x	x	x	x		x	x				?	?	x	x	x					x	x				x	x		x
expected site density	H	H	L	M	M	M	H	M	L	L	L	M	M	M	M	M	L	M	M	L	M	M	L	M	M	H	H	L	H

x = present
blank = absent
L = low
M = medium
H = high

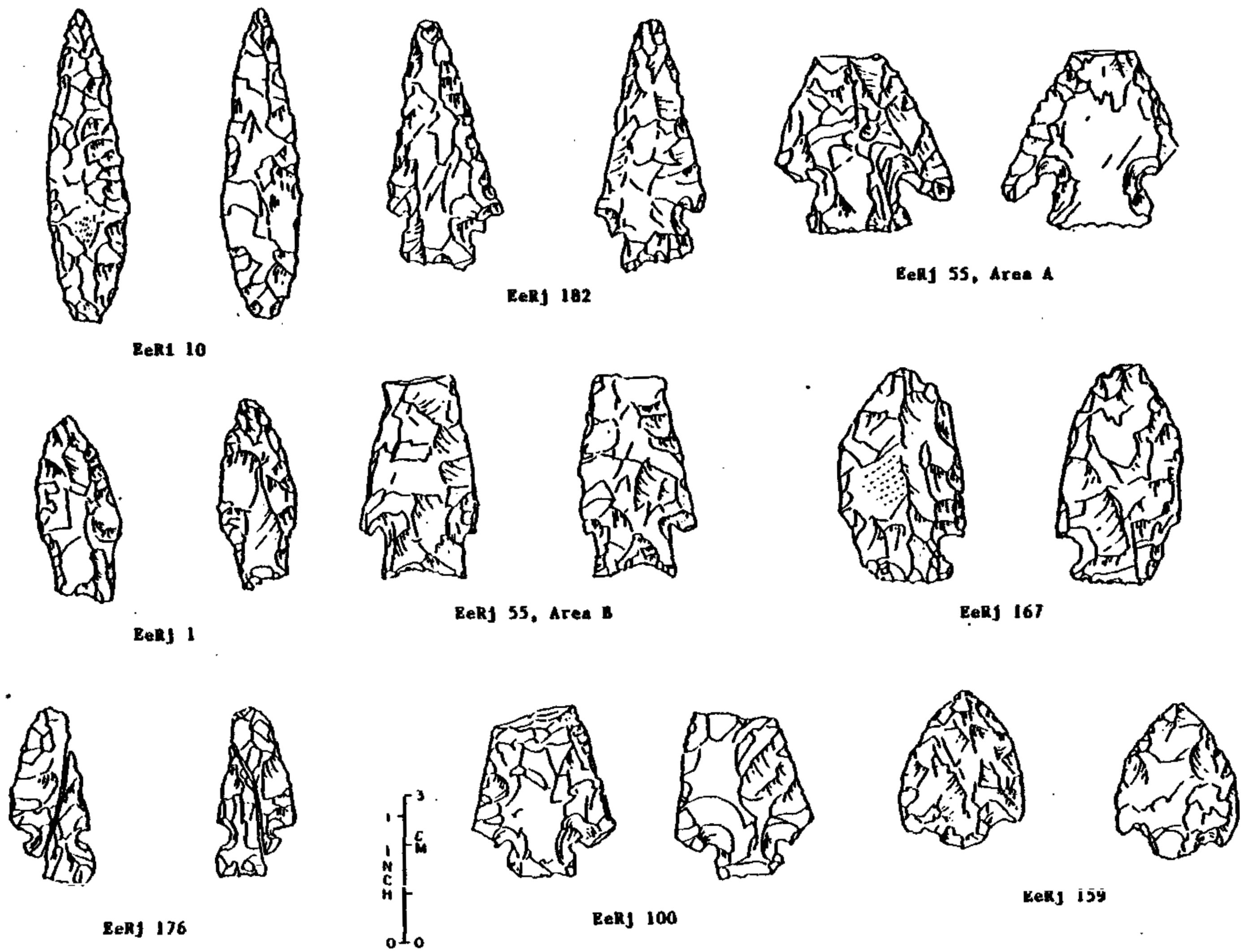
"visibility" of archaeological sites, as well as providing different environmental contexts for past subsistence-settlement systems.

(d) Artifact Collections

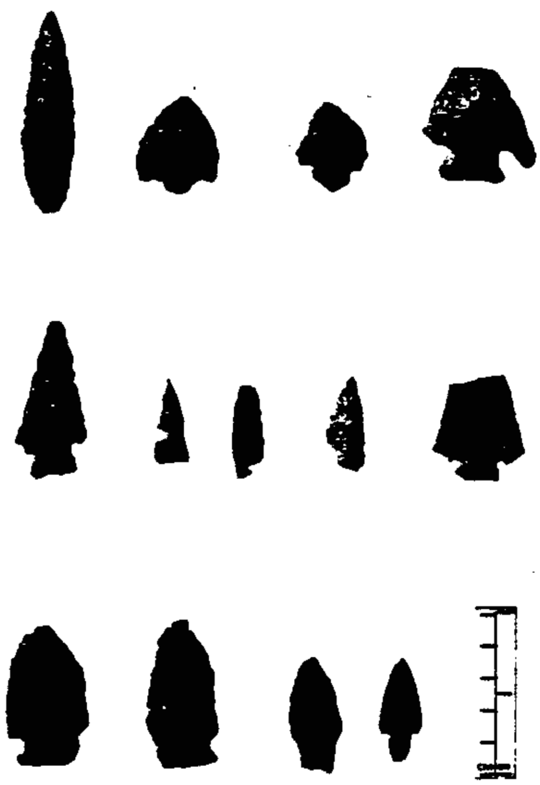
The Hat Creek Archaeological Project has the largest known collection of prehistoric and historic artifacts (more than 235 000) from the upper Hat Creek valley. Unlike other collections from the valley, these artifacts, their archaeological context and their environmental context have been carefully documented. Chipped stone tools and debitage predominate, with debitage being the single largest class of artifacts. Studies (Pokotylo 1978; Ludowicz 1979) have demonstrated that debitage are not devoid of cultural information. Debitage analyses may provide information about technology and economic activities (ibid.). As noted in Section 3.5(a), the project's microblade collection from EeRj 159 may be the largest to date from a single archaeological site in the southern interior. The project's total microblade collection numbers more than 1600 (see Plate 3-1). Other types of chipped stone artifacts include unifaces, bifaces, projectile points, macroblades, gravers and cores (see Figs. 3-34 and 3-42 and Plates 3-2 and 3-7). Very few ground stone artifacts were collected by the project: the most notable items are a nephrite adze fragment and a steatite pipe bowl fragment (see lower left-hand corner of Plate 3-8).

Several bone and antler artifacts were collected during excavation, including awls, a disc bead and a unilaterally-barbed harpoon point (see Plate 3-8 and Fig. 3-31). Other barbed harpoon points have been recovered from the southern interior (see Sanger 1969; Wilson 1973), and similar points have been reported as heads to beaver spears used ethnographically (see Fig. 3-43) (Teit 1906: 226, 1909: 523). A single birch-bark container has

Figure 3-42

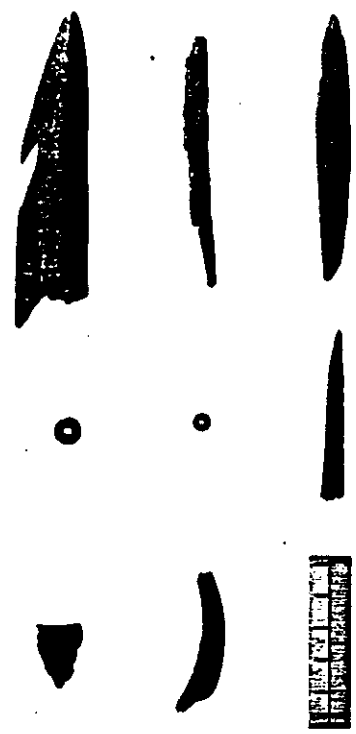


Select Projectile Points from Upper Hat Creek Valley Archaeological Sites



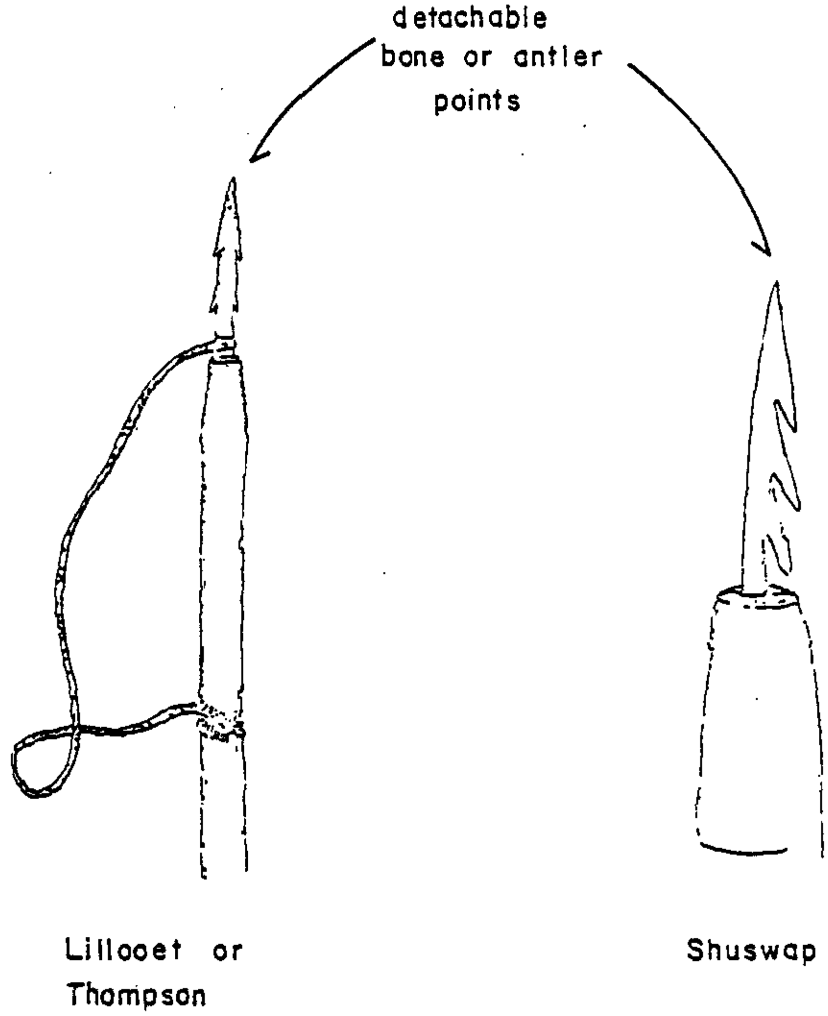
Select Projectile Points from
Hat Creek Archaeological Project
Collections

Plate 3-7



Select Proto-Historic Artifacts
from EeRj 1, Cultural Feature #10

Plate 3-8



EXAMPLES OF BEAVER-SPEARS

Utilized Ethnographically by

Interior Peoples

(after Teit 1906, 1909)

Figure 3-43

also been collected (see Fig. 3-28). Birch-bark containers and baskets are relatively common from the southern interior (see Sanger 1969, 1970; Stryd 1973; Wilson 1973). Historic artifacts include mostly glass, metal and ceramic fragments, and nails (see Plates 3-9 and 3-10). Some larger items such as wood stove parts have also been collected. Notable items include an ivory utensil handle (see Plate 3-9), mother-of-pearl buttons (see Plate 3-9), a ferrous projectile point (lower right-hand corner of Plate 3-7) and retouched glass (see Pokotylo and Beirne 1978: Plate 3-4).

Mr. I. Lehman of upper Hat Creek valley has the largest known amateur collection of upper Hat Creek valley artifacts. Mr. Lehman also appears able to recount accurately each major artifact's location, as well as the locations of numerous archaeological sites.* Outstanding items in Mr. Lehman's collection include a complete nephrite adze (see Plate 3-11) and a possible Palaeo-Indian projectile point (Alberta point style?). Mr. P. Milner also of upper Hat Creek valley, may also have a collection: he is acquainted with local mineral sources and archaeological sites. Mr. Wiley, former foreman for Mr. J.B. Jackson, Hat Creek valley, has remarked that he has collected bottles from historic sites (Wiley, personal communication).

(e) Archaeological and Historical Records

The only known archaeological records for the upper Hat Creek valley are those of the Hat Creek Archaeological Project, Weber and Seymour's (1976) transmission line survey through the valley, ARESCO Ltd.'s transmission line survey through the valley and the B.C. Site Inventory file, which contains data about

---

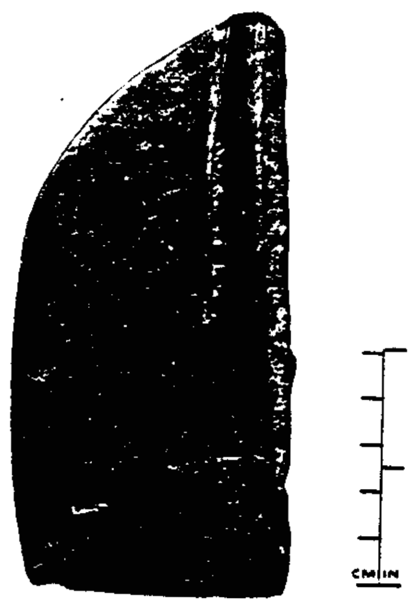
* Mr. Lehman directed members of this project to two cultural depression - lithic scatter sites: EeRk 35 and EeRj 202.

Select Historic Artifacts from
Hat Creek Archaeological Project Collections

Plate 3-9

Select Glass Fragments from Hat
Creek Archaeological Project Collections

Plate 3-10



Nephrite Adze Fragment from I. Lehman Collection

Plate 3-11

archaeological sites in addition to those recorded by the above agencies. Graham (1977) has located and summarized some archival (especially land titles) and library records concerning upper Hat Creek valley. He has also participated in an inventory of the Ashcroft Museum holdings and has noted few items specifically related to upper Hat Creek valley history (Graham, personal communication). Ms. M. Balf of the Kamloops Museum has compiled a history of the Kamloops area (Balf 1969) and of the Hat Creek Hotel, located at Carquile (Balf 1978), from various historical records. Uninvestigated sources of historical records include the holdings of the Lillooet Museum and family records (e.g. bibles, photographs, birth and marriage certificates, letters) of Hat Creek valley residents. Library and archival sources have not yet been scrutinized sufficiently to determine their relevance to upper Hat Creek valley history.

(f) Oral History, Folklore and Traditions

Graham's (1977) compilation of upper Hat Creek valley history from oral and written sources is the only known study of the valley's oral history resources. His study is limited to informants of European descent and is only a cursory survey of the potential data. Graham (1977) concentrated on the history of homesteading and landholding, with some description of economic activities. Social and political aspects of the valley's history were not ascertained. A number of local residents lived in the Hat Creek valley around 1900, or had parents or grandparents who were participants in the local history. These people are probable sources for completing the oral history. Graham also has photographic documentation of traditional ranching activities (Graham, personal communication).

3.5 SUMMARY OF CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

Ethnographic data concerning native peoples in upper Hat Creek valley are probably available from members of local bands. Several studies have been successful in gleaning information from present-day informants in surrounding locales (Bouchard 1968 to 1977; Bouchard and Kennedy 1977; Kennedy 1971 to 1977; Kennedy and Bouchard 1975; Turner 1978). Casual conversations with members of the Bonaparte Band have indicated that a study for the upper Hat Creek valley may provide information regarding folklore, subsistence activities and native peoples' history.

3.6 SYNTHESIS OF CULTURAL HERITAGE INFORMATION FROM THE REGIONAL, LOCAL AND SITE STUDY AREAS

As mentioned in Section 3.3, the prehistory of most of the southern interior plateau is currently divided into the following periods which are a modification of the chronology proposed by Sanger (1970): 1) Lochnore complex (? to 7000 B.P.),* 2) Early Nesikep period (7000 to 2800 B.P.) and 3) Late Nesikep period (2800 B.P. to historic period). In general, archaeologists who study the southern interior plateau set the beginning of the historic period at the onset of the gold rush (1858); and several define a protohistoric period (ca. 1750 to 1858) in which European trade goods infiltrated the native material culture while native culture remained substantially intact. The Late Nesikep period has been refined by Stryd (1973) into four phases which include the protohistoric period and the Kamloops phase (1200 to 200 B.P.). Sanger (1969: 147-149) originally proposed the definition for the Kamloops phase. Diagnostic artifacts for this phase include small, triangular, side-notched points (see Plate 3-2).

---

* The Lochnore complex, as described by Sanger (1970), may be a local manifestation of the more widespread Old Cordilleran Culture (see Butler 1961).

Very little is known about the Lochnore complex. At EdRk 7, near the Fraser River, the Lochnore complex "is distinguished by the absence of microblades, the presence of leaf-shaped points, edge-battered cobbles and macroblades" (Sanger 1970: 112)). Several projectile points similar to Palaeo-Indian point styles from the plains have been reported in southern British Columbia (e.g. Duff and Borden 1954). Together, these projectile points and EeRk 7 constitute the majority of our knowledge about the southern interior's earliest inhabitants.

While more sites dating from the Early Nesikep period have been investigated than potential Old Cordilleran Culture sites, our understanding of the period is still fragmentary. The presence of a microblade technology is considered diagnostic of Early Nesikep occupations (Sanger 1970; Stryd 1973). Pithouses do not appear in the archaeological record until the end of the Early Nesikep period (ibid.); and the few microblades (generally, less than a half dozen per site) found in association with housepits were probably incorporated accidentally unto the pithouse when it was constructed. Projectile points from this period tend to be large, which implies the use of spears and darts with atlatls (i.e. throwing sticks). Formed scrapers are more common during the Early Nesikep period than later.

Most sites assigned to the Early Nesikep period usually have yielded fewer than 50 microblades (see Section 3.3). Exceptions include sites excavated by Sanger (1970) at the Lochnore-Nesikep locality along the Fraser River (677 microblades, of which 444 came from EdRk 8) and EeRh 3 near Cache Creek (226 microblades) (Whitlam 1978). A few sites with microblades and/or microblade cores have been reported near Lillooet, on the Chilcotin plateau and in the Okanagan valley. Absence of microblades in other areas may be attributable to the concentration of archaeological research on housepit sites; however, some attempts were made to locate sites with microblades in the vicinity of Shuswap Lake, but with no success (Fladmark 1969; Johnson Fladmark 1973).

Most archaeological investigations have concentrated upon Late Nesikep period sites, and, as mentioned above, particularly housepit sites (see Section 3.3). While large projectile points persist into the Late Nesikep period, small projectile points begin to appear ca. 1800 to 1200 B.P., possibly marking the advent of the bow and arrow (Stryd 1973). Microblade technology disappears and ground stone artifacts increase during this period (Sanger 1970; Stryd 1973). Bone and antler artifacts are more prevalent in Late Nesikep period sites, but this may be due to rapid deterioration of organic materials (ibid.). Kamloops phase projectile points have been reported from sites along the Fraser, Thompson and South Thompson rivers, on the Chilcotin plateau, in the Nicola valley and in the Okanagan valley. However, these points are less frequently found in the southern Okanagan valley (Grabert 1974: 71).

Cultural depressions which have been interpreted as housepits vary greatly in size. Near Lillooet, housepits tend to have diameters between 8 m and 13 m (26.2 to 42.7 ft) (Stryd and Hills 1972); in the Semlin and Bonaparte valleys, between 6.5 m and 26 m (21.3 to 85.3 ft) (Pokotylo 1977); at the Fraser-Chilcotin rivers' confluence, between 4.5 m and 16.0 m (14.8 to 52.5 ft) (Matson and Ham 1975); near Williams Lake, between 6 m and 16 m (19.7 to 52.5 ft) (Kenny 1972); along the Arrow Lakes, between 6 m and 15 m (19.7 to 49.2 ft) (Mitchell and Turnbull 1968, 1969); and along the South Thompson River, between 6 m and 16 m (19.7 to 52.5 ft) (Wilson 1973). In the Okanagan valley, many cultural depressions have diameters between 2.0 m and 3.5 m (6.6 to 11.5 ft) and may be remnants of tipis (Copp 1974). Other small cultural depressions in the southern interior have been interpreted as cachepits. Baker (1975) has recorded several cultural depressions in

Botanie valley which he believes to be earth oven remains. Unfortunately, no detailed description of these ovens has been published yet.

Several protohistoric housepits have been excavated in the southern interior. With a few exceptions, these sites have received little attention from researchers, who have been primarily interested in reconstructing prehistoric lifeways. Protohistoric components are recognizable by the predominance of artifacts manufactured with a prehistoric technology (and often including Kamloops phase projectile points) and the presence of a few European trade goods. Items commonly found include glass beads (especially turquoise), wooden buttons, mother-of-pearl buttons, ferrous projectile points, nails and other metal fragments.

In all these periods, most of the lithic artifacts were chipped from vitreous basalt. Artifacts made from cherts occur in most areas of the southern interior plateau, but are more common in the Kootenays (Choquette 1971a, 1971b, 1972, 1973, 1974a, 1974b, 1974c, 1975, 1976a, 1976b; Blake 1975) and in the Okanagan valley (Grabert 1974). Diversity in artifact styles is more evident in earlier periods, with more cultural homogeneity developing during the Late Nesikep period. Prehistoric inhabitants of the Okanagan valley appear to have been influenced by Columbia River plateau cultures (Grabert 1974) while inhabitants of the Arrow Lakes-Kootenays region appear to have been influenced greatly by plains cultures (Borden 1956; Choquette 1973; Mitchell and Turnbull 1968, 1969). Artifacts with widespread distributions during the Late Nesikep period include Kamloops phase points, barbed antler or bone harpoon heads, birch-bark containers, steatite pipes, antler wedges, bone needles and awls and beaver tooth tools.

Faunal remains have been consistent with the reconstruction of prehistoric subsistence strategies (see Section 2.3(c)). Mule deer, elk and beaver are the most commonly identified mammal remains. Horse bones, including some which have been butchered, have been found in several protohistoric housepits. Fish are often represented but are rarely identified. However, most identified fish bones have been from salmon, with the notable exception of sucker from a site along the South Thompson River (Eldridge 1974). Contrary to what is indicated in the ethnographies, prehistoric peoples in the southern interior appear to have collected freshwater shellfish regularly. Also, a number of sites have yielded many bird bones, including waterfowl, despite the small emphasis placed on avian food resources in the ethnographies. Little evidence for the collection of plant species has survived in the archaeological record. There are general indications that roots and berries were utilized.

Housepits conform with ethnographic descriptions of pit-houses: semi-subterranean structures with an earth-wood roof supported by posts (see Fig. 2-3). Hearths tend to be located in the centre of the housepit and often consist of only a shallow depression filled with ash (Stryd 1973; Blake 1974). Cachepits and postholes appear in some, but not all, of the excavated housepits. Large quantities of splintered bone are usual, as well as small amounts of heat-cracked-rock from stone-boiling cooking techniques. A wide assortment of artifact types are often found, indicating a wide range of activities.

Burials, pictographs, petroglyphs and fishing stations are the least frequently recorded sites in the local study area (see Section 3.4). Most of the prehistoric sites have a lithic scatter component (74 percent), making lithic scatters the most prevalent kind of site. Cultural depressions appear at 48 percent of the sites in the local study area. Sites with both a lithic scatter component and cultural depression(s) constitute 22 percent of the total. Most sites of all types have been located on terraces in ponderosa pine parklands. In addition, nearly all the sites are below 2500 feet asl. Lithic scatters tend to be found at higher elevations than cultural depressions.

Unlike the regional study area, many of upper Hat Creek valley's recorded sites have microblades and/or microblade cores (20 to 25 percent), and over 1600 microblades (including fragments) have been collected. If microblade technology is exclusively associated with the Early Nesikep period, then the upper Hat Creek valley appears to have more sites dating from this period than any other locale in the southern interior. In addition, a number of sites (approximately 10 percent) in the upper Hat Creek valley have Kamloops phase projectile points, which date their occupation(s) to the Late Nesikep period. All of the earth ovens which have had test excavations have been dated through radiocarbon analysis to the Late Nesikep period as well (see Table 3-24). A radiocarbon date (see Table 3-24) and the mixture of native and European artifacts indicate that the excavated housepit was occupied during the protohistoric period. No sites in the upper Hat Creek valley are reliably dated to a period comparable to the Old Cordilleran Culture; however, several sites have yielded macroblades, leaf-shaped points and artifacts encrusted with a calcium carbonate deposit derived from the soil. These sites may represent very old occupations, but further research is necessary to determine their age. Archaeological and geological evidence suggest that EeRj 92 is likely to be a very old site (see Section 3.5).

Artifacts from the upper Hat Creek valley are usually chipped from vitreous basalt. At locations where nodules of chert and jasper are easily available, as much as 39 percent of the artifacts are chipped from these silicious materials. Several quarry sites for either vitreous basalt or cherts and jasper have been identified in the valley. While areas such as the Arrowstone Hills are reputed as lithic raw material sources in the ethnographies, no actual quarry sites have yet been recorded in the regional study area. Prehistoric lithic technology in the upper Hat Creek valley includes blade-making (both micro- and macro-), flaking and bipolar techniques. Ground stone artifacts are scarce compared with other locales in the regional study area. Few examples of bone and antler artifacts exist in the valley as well, probably because most of the sites appear to represent "open-air" occupations which would increase the liklihood that these artifacts would deteriorate before they could be buried in an archaeological deposit. Projectile point styles from every period are known to exist in the valley.

Similar to other locales in the southern interior, cultural homogeneity seems to increase during the Late Nesikep and protohistoric periods in the upper Hat Creek valley. Artifact assemblages from these later sites compare favourably with the lists of widespread artifacts listed earlier in this section. Artifacts, especially projectile points, from earlier sites in the valley are more often unlike artifacts from earlier sites in other areas in the southern interior. Faunal remains from upper Hat Creek valley sites are consistent with remains from sites in other locales; however, over 70 percent of the upper Hat Creek valley faunal remains were collected from the protohistoric housepit at EeRj 1. Waterfowl, other bird species and freshwater shellfish were included in the identified remains along with the more common mule deer, elk and beaver. Salmon may have been brought into the valley, though the salmon potential of Hat Creek is unknown. Butchered horse bones were discovered at a historic site, EeRj 94.*

---

* Since oral history places EeRj 94's occupation between 1880 and 1900 (Graham, personal communication), horses may have been eaten at a later date than had been previously suggested by Teit (1909: 533).

Cultural depressions in the upper Hat Creek valley range from under 2.0 m (6.7 ft) to 11.0 m (36.1 ft) in diameter and average 4.51 m (14.8 ft). Most appear to be the remains of earth ovens. Some are simple in construction and similar to those described in the ethnographies (see Section 2.3.3), whereas others are quite complex and show signs of reuse. Several have more than one rock pavement. Floral and faunal analyzes have indicated the possibility of roots, meats and, possibly, pine cones being roasted in these ovens. It is also probable that these roasted items were placed in a bed of conifer needles or other herbage (Ketcheson 1979). A single excavated cultural depression proved to be a housepit: EeRj 1, cultural feature 10. Other cultural depressions at EeRj 1 may be housepits as well. Test excavations indicated that EeRj 1, cultural feature 10 is similar in several ways to other protohistoric housepits in the southern interior.

Only one pictograph has been found in upper Hat Creek valley: a small, red ochre figure on the limestone scarp at EeRj 1. No burials, petroglyphs or fishing stations have been uncovered, though one rock cairn was located. (Rock cairns have been known to mark burials.) Less than 20 percent of sites in the valley have any cultural depressions, which is half the frequency of occurrence for those sites recorded in the local study area. More than 90 percent of the sites have a lithic scatter component, as compared to 74 percent for the local study area. Most sites are located in ponderosa pine parkland, as is the case in other locales; but more than 55 percent are located on either plains or slopes, which are uncommon locations for local study area sites. Finally, all of upper Hat Creek valley sites are situated above 2500 feet asl in contrast to the local study area in which most sites are recorded below this elevation. This point emphasizes how little research has been done in the upland areas of the southern interior prior to the Hat Creek Archaeological Project, despite ethnographic documentation of the role upland areas played in native subsistence-settlement strategies (see Section 2.3(c)).

SECTION 4.0 - ASSESSMENT OF THE CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA

4.1 CRITERIA USED TO ASSESS CULTURAL HERITAGE RESOURCE VALUES

Criteria for assessing the value of cultural heritage resources have been grouped into two major types: value to science and research, and value to the public. Value to the public is dependent on scientific or research value, inasmuch as the public derives value from cultural heritage resources through their scientific interpretation.

Scientific value is equivalent to research potential, which is determined by the kinds, quantities, variety and quality of data present in a cultural heritage resource. The translation of data into valuable information depends upon the integrity or condition of the resource and its data, and the data's redundancy, i.e. whether it duplicates existing information and substantiated hypotheses. A resource's value may be enhanced if the resource itself or some of its data are, in some measure, unique.

If the study of data from a cultural heritage resource could contribute to methodological development, then both research potential and value have been attributed to that resource. If a cultural heritage resource has research potential for disciplines other than archaeology and history (e.g., ethnology, geology, climatology), then a value has been attributed to that resource as well.

For a cultural heritage resource to have value for the public, it must have scientific value and the potential for education or interpretation. Interpretation is distinguished from education in that it provokes thought upon a concept, rather than teaching a concept (cf. Tilden 1977). Interpretation can be regarded as the complement to appreciation.

4.1 CRITERIA USED TO ASSESS CULTURAL HERITAGE RESOURCE VALUES - (Cont'd)

(a) Uniqueness

A cultural heritage resource's uniqueness varies both with its context and its frame of reference. For instance, an artifact itself may not be unique (e.g., a Viking figurine in a prehistoric Eskimo midden). Similarly, a resource may not be unique in a worldwide context, but may be unique nationally, regionally, or locally: the large number of cultural depressions at Keatley Creek is not unique in the southern interior plateau, but it is unique for the Lillooet-Lytton-Ashcroft region.

Uniqueness is not synonymous with significance; a unique cultural heritage resource usually represents only a small part of a region's past cultural lifeways. Most social science research is currently endeavouring to explicate the basic nature of cultural and social systems. With this research goal in mind, a set of non-unique cultural heritage resources which represent a fundamental aspect of a prehistoric subsistence strategy may, as a group, be as scientifically valuable as a single, unique resource.

Though uniqueness may or may not determine a cultural heritage resource's scientific value, the resource's public value is generally enhanced by uniqueness. Novelties have always appealed to people.

(b) Integrity

Integrity refers to the condition of a cultural heritage resource with respect to the completeness and/or preservation of its data. An archaeological site's or zone's integrity depends upon the relative disturbance of its cultural remains by human or natural forces. For an artifact, integrity depends upon its relative completeness; and for an archaeological record, historical record, oral history, folklore or tradition, upon its relative completeness and reliability. A resource with high integrity was deemed to have a higher potential for interpretation than a resource with low integrity.

(c) Duplication of Extant Information

This criterion is self-explanatory. New information or the first instances of corroborating evidence are usually considered to be more valuable than data which support already well-accepted knowledge. This criterion was used to aid the determination of relative value for other criteria: its application to a resource as a whole has little meaning since no two resources are exactly alike.

(d) Chronological Information

Any resource whose data could order past events, societies and/or cultures in time was considered valuable for its chronological information. An archaeological site with several distinct artifact assemblages from different periods of the local culture history, an archaeological zone whose sites can be seriated (ordered in time) by geological information and a family bible which lists birthdates are a few examples of resources which this report would assess as valuable for their potential chronological information.

(e) Palaeoenvironmental Information

Evidence for the nature of palaeoenvironment(s) can be gleaned from geological, palaeontological, palynological and palaeobotanical data. In addition, palaeoenvironmental conditions may be documented by verbal sources (e.g. records, folklore) or by implicit relationships between human behaviour and environment (e.g. the use of snowshoes implies winters characterized by deep snow). If such evidence or documentation existed in a resource, that resource's potentially valuable palaeoenvironmental information was recognized by this report.

4.1 CRITERIA USED TO ASSESS CULTURAL HERITAGE RESOURCE VALUES - (Cont'd)

(f) Socio-economic Information

Socio-economic information can be derived from various kinds of data. In fact, since cultural heritage resources are often the products and by-products of socio-economic behaviour, nearly all these resources impart some socio-economic information. Trivial information must be distinguished from substantial information in order to determine a resource's relative value.

Information is substantive when it is both relevant to a gap in current knowledge about socio-economic behaviour and extractable from the available data. To illustrate, an archaeological site whose artifacts exhibit clear wear patterns assignable to specific tool uses was acknowledged as having more potentially valuable socio-economic information than a site whose artifacts' wear patterns were obscured.

(g) Technological Information

Information regarding technology may be classified as a kind of socio-economic information, but will be considered separately here to emphasize the "how" aspect, rather than "what", "where", "when", and "who", of economic behaviour. This division reflects current trends in archaeological research.

Verbal resources and current traditions were inspected for valuable documentation of past technology (e.g. folklore which preserves an ancient technique for building fish weirs and modern ranching practices which illuminate aspects of an 1860's homesteader's daily life). Cultural heritage resources in an archaeological context were recognized as having valuable technological information when the entire resource or some of its components could be associated with a specific technology (e.g. fish hooks vs. barbed fish spears vs. nets, flakes vs. bipolar shatter).

4.1 CRITERIA USED TO ASSESS CULTURAL HERITAGE RESOURCE VALUES - (Cont'd)

(h) Ecological Information and Evolutionary Information

Cultural heritage resources which contained the fortuitous conjunction of valuable palaeoenvironmental and socio-economic data, for which time could be held constant, were deemed likely to yield ecological information. Likewise, those resources for which variations in time could be monitored and which contained palaeoenvironmental, socio-economic and/or technological data were deemed likely to yield evolutionary information.

(i) Methodological Development

Any cultural heritage resource whose natural context posed problems for its own study and analysis could potentially stimulate the development of new methodology, and thus would have been considered valuable academically in this report. For example, heavily forested archaeological zones may be deemed valuable for the development of survey techniques stimulated by the difficulty in observing archaeological sites and artifacts where the ground cover is thick.

(j) Education

If a cultural heritage resource can be incorporated into or can supply information for an educational programme, so that it eliminates deficiencies in that programme, then that resource has educational value. To determine educational value, the potentials of the resources must be measured against the needs of public programmes. Current educational needs for cultural heritage materials have been ascertained for this report through interviews with various provincial educators (see Clouthier 1979). These educators also provided criteria for determining a cultural heritage resource's suitability for meeting these needs (ibid.).

(k) Recreation

Many people find recreation in satisfying their curiosity about other cultures, other places and other times than their own. A valuable recreational facility or programme is created when suitable cultural heritage resources are interpreted so as to satisfy and to stimulate further the public's curiosity. Recreation can overlap with education, but is separated by the voluntary nature of the activity. Whether a resource or its data was noted as being suitable for recreational interpretation depended on its potential to provoke thought and to entertain.

Tourism is an aspect of recreation which emphasizes economic value. A cultural heritage resource was considered more valuable if its recreational potential was accompanied by a tourism potential. For example, one resource may be suitable only for providing information for a public lecture series, whereas another resource could be restored and exist as a recreational facility which would attract tourists (e.g. Fort Langley).

(l) Heritage

Any cultural heritage resource which commemorated the events, documented the history and/or preserved the cultural identity of an ethnic group was recognized as having heritage value for that group. Indeed, such a resource has heritage value for all peoples in its celebration of diversity in the human experience.

(m) Cultural Heritage Resource Management

Management plans are currently being developed in British Columbia for the conservation of cultural heritage resources, the interpretation of heritage to the public, and the enhancement of their public value (Charlton 1979). As these plans are realized, cultural heritage resources will assume varying management values depending on how well they satisfy the needs defined in the management plans.

For this report, the management values of the resources were determined by anticipating the needs of those management plans currently being formulated. These predictions are based upon statements by representatives of the Heritage Conservation Branch at the 1979 meeting of B.C. Archaeologists and at a seminar on "Heritage Resource Management" hosted by the Department of Archaeology, Simon Fraser University, 1 March 1979.

4.2 PROCEDURES USED TO ASSESS CULTURAL HERITAGE VALUES

In assessing cultural heritage resources, their current and their future or potential values have been taken into account. Trends observed in society's appraisement of cultural heritage have been extrapolated to predict the future value of the resources. However, unforeseen events and developments may necessitate a review of these predictions at the time of the licensing hearings for the project.

To diminish the adverse effects of this and other conceivable situations, a method of evaluation has been employed which is amenable to modifications required by changes in priorities. No resource has been judged more significant than another per se, and therefore more worthy of active mitigation. Instead, assessment has inventoried and summarized the kinds and the quality of constituent values inherent in the cultural heritage resources. The criteria outlined in Section 4.1 have provided the framework for this assessment, i.e. each criterion provides a measure for each constituent value.

To quantify the presence of each constituent value within each cultural heritage resource, relative to other resources in the regional study area, the following scale has been used:

4.2 PROCEDURES USED TO ASSESS CULTURAL HERITAGE VALUES - (Cont.')

0	=	no value
1	=	little value
2	=	average value
3	=	more than average value
4	=	very valuable
5	=	most valuable
I.D.	=	indeterminable value

This scale does not denote the relative significance of cultural heritage resources; rather it indicates "how much" of each constituent value is represented in each resource.

Each potentially endangered resource is tabulated in Appendix A with an assessment of the kinds and the quality of its constituent cultural heritage values. In Part 2 of this report, recommendations have been made to mitigate deleterious impacts to these constituent values of cultural heritage resources, through actions prescribed for relevant resources. Adopting this procedure has ameliorated the quandary of deciding which potentially endangered resources to preserve or to salvage when all are believed to have latent significance.

If at the time of the licensing hearings, society's priorities differ from those which were anticipated, the recommendations for mitigation could be amended without re-assessing the cultural heritage resources. Since each mitigative action was designed to ameliorate adverse impact to a specified constituent cultural heritage value, components of the proposed mitigation programme could be added, deleted or modified depending upon the re-evaluation of the constituent value.

For example, suppose an extensive excavation programme has been recommended for a number of stratified archaeological sites to recover chronological information regarding the local culture history. If in the intervening time between the completion of this report and

4.2 PROCEDURES USED TO ASSESS CULTURAL HERITAGE VALUES - (Cont')

the commencement of mitigation the local culture history has been established, then this programme could be either curtailed or omitted. In another example, expansion of the provincial park system might require the inclusion of a comprehensive recreational development programme within the mitigation.

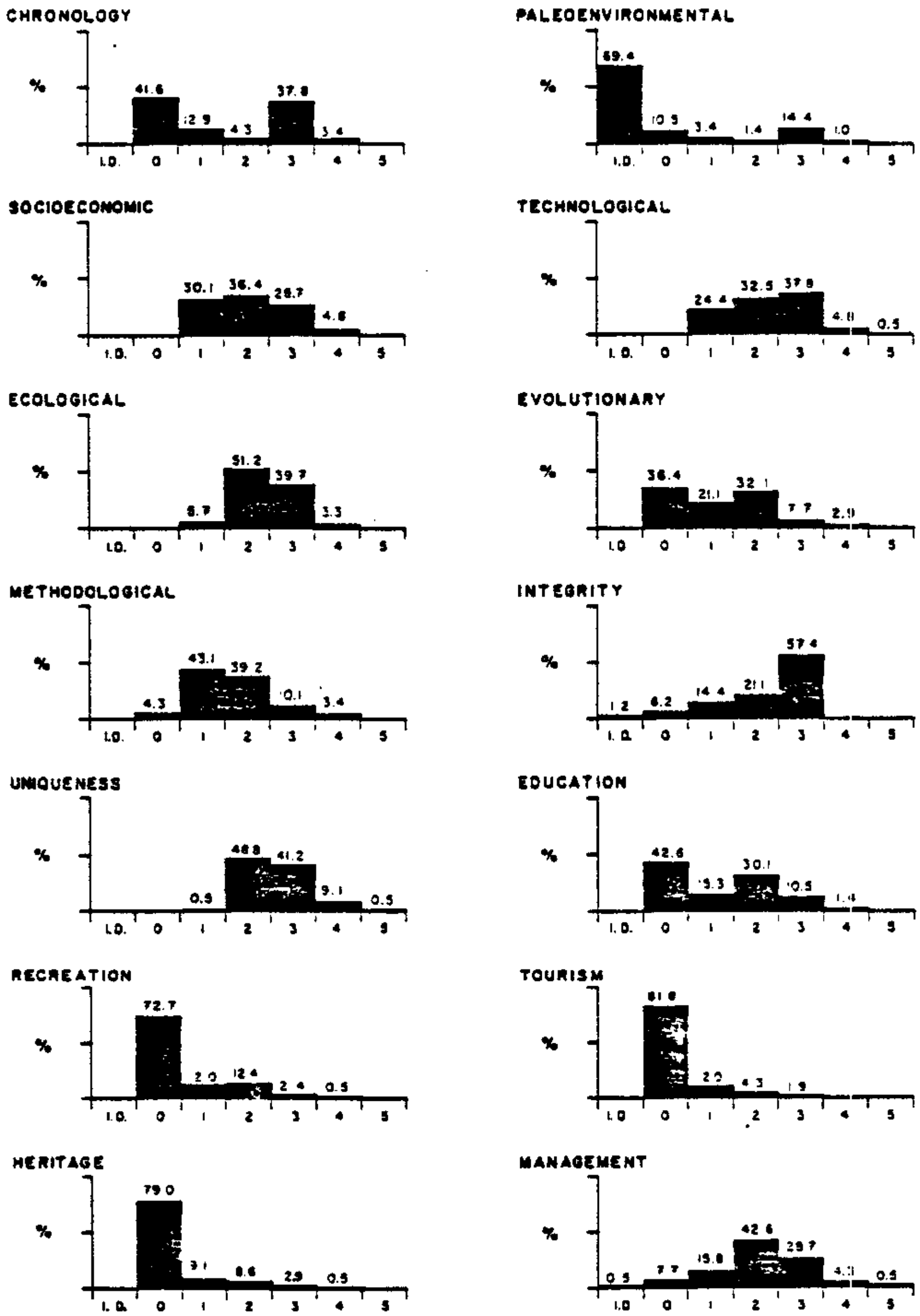
4.3 VALUES INHERENT IN THE CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA

After all the cultural heritage resources had been evaluated for each of the criteria discussed in Section 4.1, a value index was computed for each criterion. This value index has the following form:

$$\text{value index} = \frac{\text{No. of cultural heritage resources ranked 3, 4, or 5}}{\text{Total number of cultural heritage resources}} \times 100$$

In other words, the value index is the percentage of the resources which have a greater than average value for the criterion. Assuming that the constituent values of all the cultural heritage resources within the regional study area are distributed normally, one would expect a value index of approximately 33.0, if the resources in the site study area are representative of the regional study area (see Beirne 1979). A higher value index means that the resources of concern are more valuable by this criterion than the regional study area's resources; a lower value index, less valuable. Given that factors such as random error in the sampling may affect the index, greater than normal value was attributed to the resources if their value index exceeded 40.0, and less than normal value, if their value index did not exceed 25.0.

The following sub-sections discuss the value of the resources as a group for each criterion. Fig. 4-1 shows the distribution of value indices for prehistoric sites in the upper Hat Creek valley. Appendix A lists each cultural heritage resource and its value under each of the criteria.



Distribution of Constituent Values for Prehistoric Archaeological Sites in the Upper Hat Creek Valley

Figure 4-1

4.3 VALUES INHERENT IN THE CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

(a) Scientific Values

Table 4-1 lists the criteria of scientific values with value indices computed for prehistoric sites in the upper Hat Creek valley, for historic sites in the upper Hat Creek valley and for all 29 archaeological zones. Prehistoric sites have higher than average values for chronological, technological, and ecological criteria, for integrity and for uniqueness. High chronological value is primarily a result of the 90 cultural depression sites: excavations have shown that the probability of obtaining charcoal samples suitable for radiocarbon dating from these sites is very high. In addition, large chunks of wood are often associated with the charcoal, providing a good basis for developing a dendrochronological sequence for the region. However, the earliest date obtained so far is 2245 ±50 years B.P. (S-1642), which suggests that cultural depression sites may be restricted to the last 2000 to 2500 years.

Over 1600 microblades have been collected to date from prehistoric sites in upper Hat Creek valley. If a microblade technology is indeed associated with the Early Nesikep period, then more sites from the valley date to this period than are recorded for other locales in the regional study area (see Section 3.3). Investigation of these microblade sites would increase knowledge about the Early Nesikep period substantially. Lithic scatter sites are limited in their potential chronological value, though, by their generally shallow cultural deposits. Upper Hat Creek valley lithic scatter sites seem to average 15 to 30 cm (5.9 to 11.8 in) in depth. Therefore, the distribution of value indices for chronology is bimodal (see Fig. 4-1), reflecting the large number of sites with little chronological value, the large number with a lot of chronological value, and the small number with an average chronological value.

TABLE 4-1

VALUE INDICES FOR CRITERIA OF SCIENTIFIC VALUE

Value Criteria	Value Indices		
	UHCV prehistoric sites	UHCV historic sites	Archaeological Zones
Chronological	41.2	36.8	31.0
Palaeoenvironmental	15.4	5.3	34.5
Socioeconomic	33.5	36.8	41.4
Technological	43.1	47.4	51.7
Ecological	43.0	15.8	37.9
Evolutionary	10.6	21.1	17.2
Methodological	13.5	5.3	41.4
Integrity	57.4	42.1	44.8
Uniqueness	50.8	42.1	55.2

4.3 VALUES INHERENT IN THE CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

In addition, the presence of numerous microblades would allow various studies of this particular technology to answer questions about their manufacture and use. Also, a number of sites indicate local stone resource utilization (e.g. jasper from Medicine Creek and vitreous basalt nodules along the Trachyte Hills scarp). Data regarding prehistoric quarrying are available from these upper Hat Creek valley sites, as well as data regarding differential utilization of different lithic raw materials (see Magne 1979). Several sites have the remains of bipolar technology, currently a poorly understood method of stone tool manufacturing, which gives them a high potential for contributing to technological knowledge. Fig. 4-1 shows that most (75.6 percent) of the sites have an average or higher potential for technological value.

As a group, prehistoric archaeological sites in upper Hat Creek valley have a high constituent value for ecology because of their elevation: few archaeological sites have been recorded in the local study area above 3000 feet (914.4 m) asl (see Section 3.4). Most archaeological investigations have focused on major river valleys and lakes (see Section 2.5), while ethnographies indicate extensive utilization of uplands in ethnohistorical times (see Section 2.3). Prehistoric sites far from water were accorded higher constituent values for ecology than those near water, because sites are usually located near water (see Section 3.4). Also, sites with high potential for palaeoenvironmental data were given high constituent values for ecology. It should be noted that the low value index for potential palaeoenvironomental data derives from the large number of indeterminate sites. Evaluation of this criterion is difficult without test excavation or other investigations to determine whether organic materials have been preserved. Consequently, only those sites at which excavations had occurred or which had been damaged sufficiently to preclude organic preservation were evaluated for potential palaeoenvironmental data.

Upper Hat Creek valley has been removed from major development in the southern interior. Ranching, limited farming, and logging have been the major land-altering activities. Urban development, highway construction, tourism and intensive farming have subjected cultural heritage resources in lowland areas to pervasive disturbance. In comparison with lowland sites, which constitute most of the known sites, prehistoric sites in upper Hat Creek valley are relatively intact and undisturbed. High constituent values for integrity predominate in upper Hat Creek valley sites (see Table 4-1 and Fig. 4-1). Exceptions include sites located in the Hat Creek bottomlands where intensive farming has occurred and at the junction of upper and lower Hat Creek valleys, which has been disturbed by various horse shows, Highway 12, tourists and B.C. Hydro's Hat Creek site office.

High constituent values and an overall high value index for uniqueness (see Fig. 4-1 and Table 4-1) of prehistoric sites in upper Hat Creek valley may be attributed in part to their ecological context, an upland valley. Other factors contributing to their high value index include the large number of cultural depressions which are probably earth oven remains. The only other positive identification of earth ovens in the southern interior is in Botanie valley (Baker 1975), although they may also occur near Windermere and Columbia lakes (see Section 3.3). Few archaeological surveys in the southern interior have encountered as many prehistoric sites with microblades as exist in upper Hat Creek valley. Houth Meadows and Hat Creek junction are unusual in their site densities (.271 and .313 sites per hectare respectively), large numbers of artifacts and cultural depressions, and variety of artifact types. In addition, the housepit(s) at EeRj 1 are among the very few recorded in an upland valley.

Prehistoric sites in upper Hat Creek valley have a value index and distribution of constituent values for the socio-economic criterion (see Table 4-1 and Fig. 4-1) similar to what would be expected for the regional study area; in other words, their aggregate potential socio-economic data is neither outstandingly good nor outstandingly bad. However, 10 exceptional sites were ranked "4" for socio-economic value. As a whole, prehistoric sites in upper Hat Creek valley have less constituent value for the evolutionary and methodological criteria than prehistoric sites in the regional study area (see Table 4-1 and Fig. 4-1). Low evolutionary value is related to the small number of sites with chronological information and the limited time span of analyzed radiocarbon samples from the valley to date (less than 2500 years B.P.). Investigation of most upper Hat Creek valley prehistoric sites generally requires straightforward, traditional methods. Exceptions include development of methodology to: 1) locate sites in heavily forested areas accurately and efficiently; 2) analyze data from multi-component sites with shallow cultural deposits; and 3) determine the nature of cultural depressions without excavation.

Historic sites in upper Hat Creek valley have a high value index for integrity (see Table 4-1) for reasons similar to those for prehistoric sites: compared to other localities in the regional study area, upper Hat Creek valley has been relatively undisturbed. Comparison of historic sites within and outside the valley has been complicated by the lack of historical archaeological projects in the regional study area. Some information is known about sites connected with the Cariboo road (e.g. Ashcroft Manor, Hat Creek Hotel) and Indian churches (Veillette and White

1977), but there is scanty data on other historical architecture and less on historical artifact assemblages in the Fraser-Thompson area. Therefore, value indices for historic sites may be altered significantly when more historic archaeology has been done in the regional study area.

Average value indices for chronological and socio-economic criteria (see Table 4-1) were obtained for historic sites in upper Hat Creek valley. Donahue's (1979) analysis of historic artifacts indicates a moderate amount of chronological data. Several sites have additions tacked onto original structures, which may help document occupational sequences. Nearly all the historic sites are the remains of homesteads. A less common type of settlement is EeRj 211, the China Ranch (a large farm/ranch run by a Chinese businessman to supply his Cache Creek store with produce), which has a higher than average socio-economic constituent value.

As a group, upper Hat Creek valley historic sites were ranked high for technological constituent value (see Table 4-1), because they represent a successful adaptation of a ranching and farming economic system to a difficult ecological zone. Many sites retain items of farm machinery and tools dating back to the late 19th and early 20th centuries. Unusual architectural forms, such as semi-subterranean cabins and mixed log-frame structures, occur as well. The coal mine sites (EeRj 207, EeRj 210 and EeRj 213) and sawmill site EeRj 206 represent two ventures in industrial production for local consumption. The high value index for uniqueness is accounted for primarily by the high value index for technology (see Table 4-1).

Low value indices were obtained for palaeoenvironmental, ecological, evolutionary and methodological criteria (see

Table 4-1). Due to their recent occupation, historic sites in upper Hat Creek valley have little information regarding either the palaeoenvironment or cultural evolution. Exceptions for evolutionary value include the protohistoric housepit (EeRj 1) and remnants of Indian homesteads (EeRj 207, EeRj 214, EeRj 130 and EeRj 94), which document a poorly understood segment of local history: the adaptation of native peoples to the European-derived economy and society. While the technological aspect of upland ranching and farming has been preserved in the upper Hat Creek valley, evidence for the historic environoment is not present in the historic sites. Knowledge of upper Hat Creek valley's environment prior to the expansion of farming, ranching and logging by the use of gasoline-powered machinery comes from historical records (Graham 1977). Therefore, little ecological data can be gleaned from the historic sites by themselves. There is no apparent need to develop new methods in historical archaeology to investigate upper Hat Creek valley sites.

Archaeological zones in the site area have an overall high value index for integrity, but not as high as for prehistoric sites in upper Hat Creek valley. The zones include Semlin valley, Ashcroft, Cache Creek and Highways 1 and 97, which have been subject to more development, tourism, etc. than sites and zones in the upper Hat Creek valley. On the other hand, zones in the site study area have been disturbed less than intensive farming areas along the Fraser River or development areas near Kamloops.

Since the archaeological zones span a range of elevations and ecological zones, they contain the archaeological record of almost all aspects of past subsistence and settlement systems. As such, they have high value indices for both socio-economic and technological criteria (see Table 4-1). They have, however, average value indices for chronological, palaeoenvironmental and ecological criteria (see Table 4-1): the site study area's zones are typical, for these constituent values, of the regional study area. Similar developments in methodology are required by the archaeological zones as are required by the archaeological sites in upper Hat Creek valley, but on a larger scale. In addition, new methods of recovering data from disturbed and damaged sites are required for several of the zones, yielding a high value for the methodological criterion (see Table 4-1). Evolutionary constituent value has been limited in the zones (see Table 4-1) by average chronological and palaeoenvironmental constituent values, and lack of positively identified old prehistoric sites. In general, the zones represent a rather unique set of archaeological sites (see Table 4-1). Upper Hat Creek valley sites contribute to the zones' uniqueness as discussed in the preceding paragraphs. Other unique aspects include the famed root-gathering grounds near Ashcroft, the Cache Creek burial site (EeRh 1) and the buried cultural deposits with Bridge River tephra at EeRh 3, near Cache Creek.

European oral history and ethnography were ranked at better than average for many constituent values (see Appendix A, Table A6), because: 1) the community is basically intact with several long-time valley residents; 2) several traditional methods of ranching have not been replaced by newer methods as in other parts of the southern interior; 3) conversations with valley residents have indicated several persons remember historical events and lifeways in detail; and 4) everyday life on a ranch or a farm in the southern interior is not as well-documented as regional "events" and public transactions (e.g. land titles, elections, court trials). Little palaeoenvironmental data would be available through these sources. No methodological development would be required to obtain the data.

4.3 VALUES INHERENT IN THE CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

Native ethnography is expected to be less intact than European ethnography (see Appendix A, Table A6), because the native community has suffered more disruption and discontinuity between generations (see Teit 1900, 1906, 1909). High constituent values for the socio-economic, technological and ecological criteria were accorded for the expected knowledge of ethnohistorical subsistence-settlement systems in upland valleys such as the upper Hat Creek valley. Valuable chronological information is expected to exist in data which order the events of native acculturation. Current ethnographic methodology would be sufficient to recover the data.

Historical records have not been evaluated, as too little information had been obtained about them: more archival and library research is necessary before the records can be ranked for their constituent values. Taken together, the artifact collection and archaeological records of the Hat Creek Archaeological Project represent an excellent source of scientific information (see Appendix A, Table A6). The variety of the collection and thoroughness of the documentation makes them particularly suitable for answering a wide range of archaeological questions. Surveys by Weber and Seymour (1976) and ARESCO, LTD. have produced records of limited research applicability due to the nature and purpose of the surveys (i.e. transmission line corridors). The B.C. Site Inventory file is also limited: efficient storage has restricted data recording to 4 pages per cultural heritage resource. Local collections, such as Mr. I. Lehman's, suffer from scanty documentation, as compared to scientific collections. However, Mr. Lehman appears to remember more data about his collection than do many amateur collectors, which enhances his collection's integrity and overall value. A methodology for utilizing the value in amateur collections is currently being developed by the Archaeological Society of British Columbia (Clouthier 1978).

Constituent value rankings for local collections can be found in Appendix A, Table A6.

(b) Public Values

In general, prehistoric sites in upper Hat Creek valley have low value indices for public constituent values. An exception is cultural heritage resource management (see Table 4-2 and Fig. 4-1). These prehistoric sites have several high value indices for scientific constituent values (e.g. chronological, technological, ecological, integrity and uniqueness). These make management of the resources necessary for the conservation of these potential values for future scientists with improved archaeological methodology and theory. The high integrity of the prehistoric sites makes them especially suitable for long term management but not urgently in need of attention, as compared to low integrity sites whose potential value has been depreciated by damage and which may require salvage to prevent further unmitigated losses.

Most of the prehistoric sites in upper Hat Creek valley have potential educational value only at university level, yielding a low educational value index (see Table 4-2 and Fig. 4-1). Primary and secondary schools' curricula have little need for the detailed and esoteric knowledge that these resources are likely to provide (Clouthier 1979). Their social studies courses may be enriched by an overall gain in knowledge from upper Hat Creek valley resources or by teaching kits utilizing information derived from the resources (see Clouthier 1979), but there is little expected direct benefit. Some sites, however, do have high educational constituent value. Those with highly visible components, such as earth ovens, lend themselves to audio-visual programmes for social studies courses. Those with high ecological and/or technological value may provide concrete examples for the

TABLE 4-2

VALUE INDICES FOR CRITERIA OF PUBLIC VALUE

	Value Indices		
Criteria	UHCV Pre-historic Sites	UHCV Historic Sites	Archaeological Zones
Education	11.9	15.8	37.9
Recreation	2.9	10.5	10.3
Tourism	1.9	5.3	10.3
Heritage	3.4	10.5	17.2
Cultural Heritage Resource Management	33.5	42.1	48.3

changing relationship between people and their environment. A high heritage value may enrich school programmes about Canadian heritage.

Since prehistoric sites which are highly visible have recreational value in situ and many upper Hat Creek valley prehistoric sites are lithic scatters with low artifact densities, the value index for recreation is very low (see Table 4-2 and Fig. 4-1). Prehistoric sites in upper Hat Creek valley with high recreational potential in situ are cultural depression sites, lithic scatters with high artifact densities and/or lithic scatters with unusual artifacts. Information gathered from the prehistoric sites may be used for recreational purposes as well as the sites themselves. Examples include lecture series, exhibits, features in popular literature and presentations through mass media (see Clouthier 1979). To be suitable for such recreational programmes, the information must have general appeal (ibid.). Most prehistoric sites in upper Hat Creek valley are not especially suitable for these recreational programmes, although several of the sites contributed to the University of British Columbia's Museum of Anthropology's Four Seasons exhibit on prehistoric subsistence in B.C. (see Magne 1978).

A high value index for tourism is dependent upon: 1) highly visible resources; 2) uniqueness of the resources; and 3) accessibility of the resources. Many prehistoric sites in upper Hat Creek valley are, in some measure, unique, but few have highly visible components and even fewer are easily accessible to tourists. Hence, the value index for tourism is quite low (see Table 4-2 and Fig. 4-1). EeRj 1 is a notable exception: its ground surface is densely covered with artifacts of many varieties, 18 cultural depressions (both earth ovens and housepits) and a pictograph are included within its boundaries and it is located on Highway 12 near Pavilion Lake.

Prehistoric sites in upper Hat Creek valley contribute to knowledge about native peoples and their aboriginal culture(s) as much as most sites in the regional study area. However, since most of the sites have obscure connections with ethnohistorically recognized groups, their heritage constituent values are low (see Table 4-2 and Fig. 4-1) EeRj 1 is again an exception: further study of the protohistoric housepit and age determination of other features in the site may contribute substantially to the heritage of the local native peoples.

Historic sites in upper Hat Creek valley, like prehistoric sites, have basically low value indices for education, recreation, tourism and heritage (see Table 4-2). Unlike the prehistoric sites, they have a high value index for cultural heritage resource management (see Table 4-2). A number of the historic sites have some unusual feature or aspect that ought to be conserved for the future. For example, the sawmill and the coal mine buildings ought to be conserved as examples of local industrial enterprises producing for local consumption. Another example is the Indian homesteads, which should be conserved to illuminate that phase of B.C. history. These homesteads also have a high heritage value for the local Indian bands.

In the site study area, archaeological zones have a high value index for cultural heritage resource management because of their generally high value indices for scientific criteria. Their value index for education is average, indicating that they are no more nor no less suitable for incorporation into educational programmes than other zones in the regional study area. Value indices for recreation, tourism and heritage are low, though there are some exceptional zones (see Appendix A, Table A5).

4.3 VALUES INHERENT IN THE CULTURAL HERITAGE RESOURCES IN THE SITE STUDY AREA - (Cont'd)

European oral history, European ethnography and native ethnography have an average potential value for education, recreation and tourism. However, native ethnography is ranked three for education, as native culture is not as well represented in educational programmes as is European culture. All are ranked high for heritage, especially native ethnography, as they may provide information about aspects of Canadian heritage with which the public is generally unacquainted. No rank was given for cultural heritage resource management, as a policy regarding ethnographic resources could not be ascertained.

Artifact collections and archaeological records were given average ranks for education, recreation, tourism and heritage, except for the Hat Creek Archaeological Project's collection and records. Their comprehensive nature and detailed documentation make them excellent resources for educational programmes, whereas their research potential may provide contributions towards understanding European and native cultures, making them valuable heritage objects. All collections and records of cultural heritage resources in the upper Hat Creek valley have been accorded a high value for management: improper management can result in the loss of valuable information. Scientific collections and records need curation which allows them to be accessible to the scientific community and public. Amateur collections need to be documented so that their information and value can be utilized.

SECTION 5.0 - IDENTIFICATION OF EXPECTED ADVERSE AND BENEFICIAL IMPACTS

5.1 TYPES OF PROPOSED DEVELOPMENT - RELATED IMPACT, THEIR SOURCES, THEIR GEOGRAPHIC DISTRIBUTION AND SCHEDULE

The development of the Hat Creek Project can result in three basic types of impact on cultural heritage resources: direct, indirect, and potential (see Broilo and Reher 1977; McGinsey and Davis 1977 for similar impact classification schemes). These three types of impact are defined by their general sources, as follows:

> Direct impact is the demonstrable effect of those project actions that will result in modifications of cultural heritage resources.
>
> Indirect impact indicates those adverse and beneficial effects on cultural heritage resources which are secondary to, but clearly initiated by, project actions.
>
> Potential impact indicates adverse and beneficial effects on sub-surface cultural heritage resources which cannot be presently observed nor predicted and would likely be exposed only in the course of project actions.

Cross-cutting these types of impact are categories of effects. Categories of adverse effects on cultural heritage resources include: 1) eradication of the resource; 2) removal of the resource or its elements from its context; 3) spatial re-distribution of resources or their elements within their context; 4) destruction of the resource's context; 5) burial of the resource; 6) inundation of the resource; 7) damage to, or disruption of, the resource or its elements; and 8) loss of the resource or its elements.*

Categories of beneficial effects on cultural heritage resources include: 1) discovery of buried archaeological sites; 2) gains in scientific and/or public knowledge about cultural heritage;

---

* Loss differs from eradication in that the latter implies physical destruction whereas the former implies misplacement.

and 3) protection of resources from vandalism through the establishment of limited public access areas. Appropriate mitigative actions vary according to the category affecting the resource(s).

(a) Direct Impacts

All activities of the proposed Hat Creek Coal Development which alter land surfaces, change environmental features, limit public access to land areas and/or recover information from cultural heritage resources are predicted sources of direct impact to cultural heritage resources. The dispersal of local residents from the site study area is likely to result in the loss of some traditions, oral history and amateur artifact collections. Activities which may occur after the land surface has been removed to a depth of 3 m (approximately 9.8 feet) are not likely to incur any further impact to the resources. Table 5-1 lists the predicted sources of impact along with estimates of disturbed land surface area. Table 5-2 lists the predicted sources of direct impact along with their expected categories of adverse and beneficial effects. Figs. 5-1 and 5-2 illustrate the geographic distribution of predicted direct impacts, while Fig. 5-3 indicates the impacts' expected commencement date and duration.*

(b) Indirect Impacts

Most indirect impacts to cultural heritage resources attributable to the proposed development are associated with increases in local population. The presence of larger numbers of people in the area stimulates housing, transportation and other development as well as vandalism to cultural heritage resources.

---

* This schedule for expected direct impacts has been derived from the proposed construction schedule illustrated in B.C. Hydro Drawing No. 604H-Z30-X020001.

TABLE 5-1

AREA OF LAND DISTURBANCE FROM PREDICTED DIRECT IMPACTS

Source of Direct Impact	Hectares	Right-of-Way
Open Pit Mine - 35 year limit	606	
Houth Meadows Waste Embankment	628	
Medicine Creek Mine Waste and Ash Disposal Embankments	427	
Powerplant	116	
Station Reservoir	85	
Sedimentary Lagoons	35	
Creeks' Diversion Reservoirs	20	
Creeks' Diversions	43	30-60 m
Flood Runoff Canals	27	
Borrow Areas, A2 and B	125	
Topsoil Stockpiles	14	
Mine Surface Facilities	176	
Access and Perimeter Roads	120	30-100 m
Water Intake and Booster Stations	10	
Cooling Water Supply Pipeline	40	18 m
Conveyor Corridors	20	
69 kV Transmission Lines	70	20 m
Medicine Creek Low Grade Coal Dumping Area	128	
Airstrip	85	
Mine and Powerplant Camps	25	
Equipment Offloading Facilities	3	
Cultural Heritage Studies	4	

TABLE 5-2

PREDICTED SOURCES OF DIRECT IMPACT
AND THEIR CATEGORIES OF EFFECTS

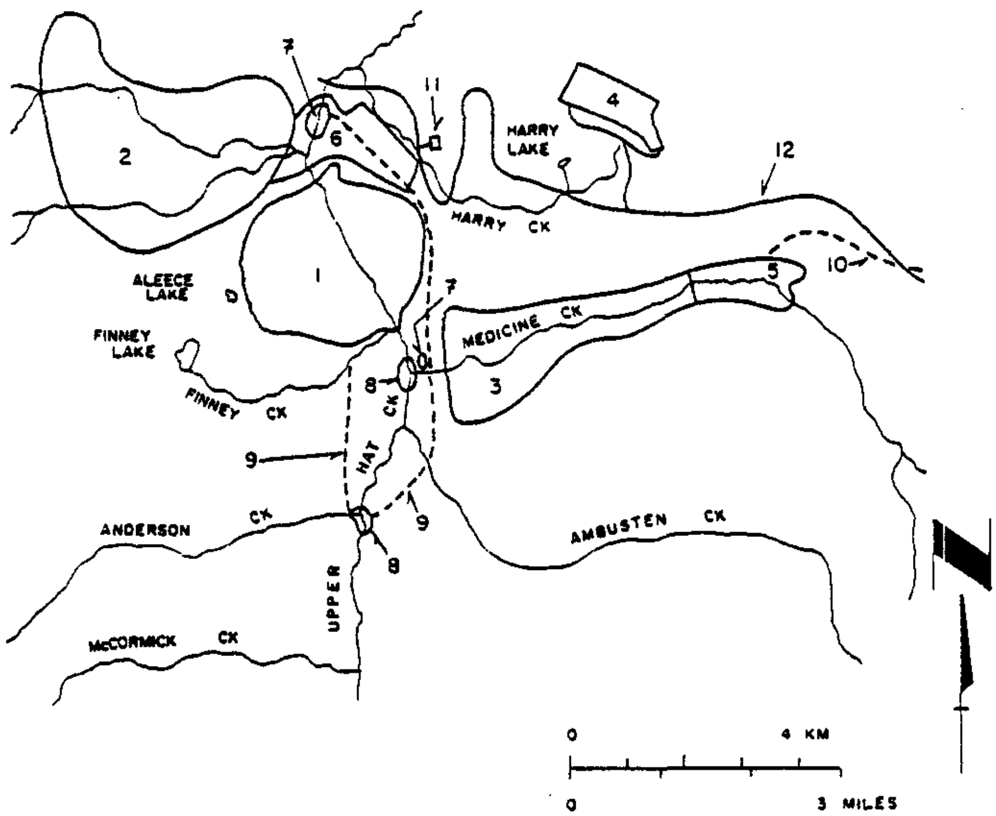
State of Assessment	Direct Impact	Activity	Categories of Effects: Eradication	Removal	Spatial Redistribution	Destruction of Context	Burial	Inundation	Damage or Disruption	Loss	Discovery	Gains in Knowledge	Protection
S	Open pit mine	Clearing and stripping	X			X					X		
S	Houth Meadows waste embankment	Dam construction and waste dumping				X	X						
S	Medicine Creek mine waste and ash disposal embankments	Dam construction, waste and ash dumping				X	X						
S	Powerplant	Clearing, construction and fencing	X						X		X		X
S	Station reservoir	Dam construction and filling				X		X					?
S&N	Sedimentary lagoons	Dam construction and filling				X		X					?
S&N	Creeks' diversion reservoirs	Dam construction and filling				X		X					?
N	Creeks' diversions	Clearing and construction	X					X	X		X		
N	Flood runoff canals	Clearing and construction	X					X	X		X		
S&N	Borrow areas	Excavation	X								X		
N	Topsoil stockpiles	Topsoil storage					X						
S	Mine surface facilities	Clearing and construction	X			X	X		X		X		X
R	Access and perimeter roads	Clearing and construction	X			X	X		X		X		X
N	Water intake and booster stations	Clearing and construction	X						X		X		
R	Cooling water supply pipeline	Clearing and construction	X						X		X		
N	Conveyor corridors	Clearing and construction	X						X		X		
N	69 kV and 60 kV transmission lines	Clearing and construction							X		X		
N	Airstrip	Clearing and construction	X				X		X		X		
S	Mine and powerplant camps	Clearing and construction	X						X		X		X
N	Equipment off-loading facilities	Clearing and construction	X				X		X		X		
-	Cultural heritage studies	Fieldwork and analysis		X					X		X	X	
-	Dispersal of local community	-								X			

LEGEND: s = Surveyed

r = Some Reconnaissance Survey

n = no survey

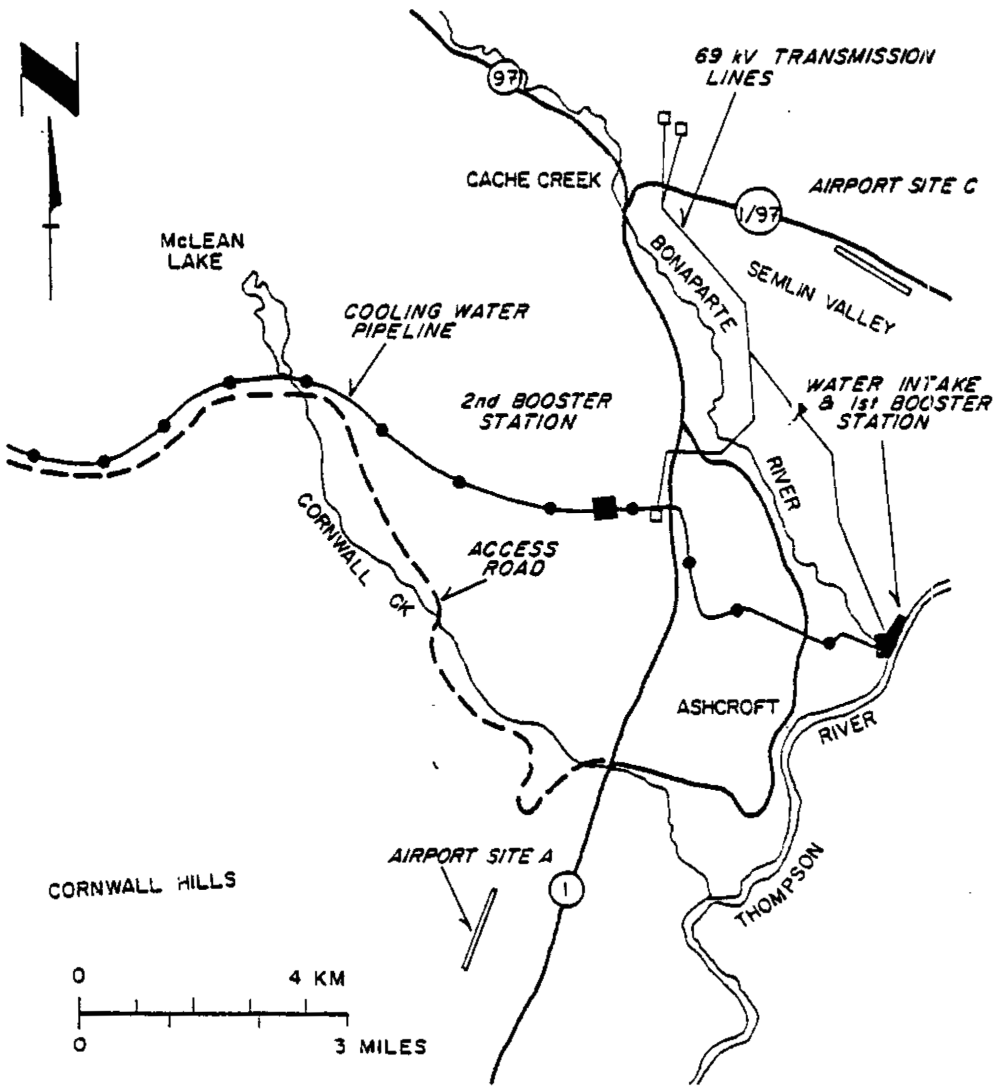
- = not applicable



1. Open Pit Mine
2. Houth Meadows Waste Embankment
3. Medicine Creek Mine Waste and Ash Disposal Embankments
4. Powerplant and Camp
5. Station Reservoir
6. Mine Surface Facilities
7. Sedimentary Lagoons
8. Diversion Reservoirs
9. Diversion Canals
10. Cooling Water Pipeline
11. Mine Camp
12. Access Road

Geographic Distribution of Predicted
Major Sources of Direct Impact within
Upper Hat Creek Valley

Figure 5-1



Geographic Distribution of
Predicted Sources of Direct Impact
Outside Upper Hat Creek Valley

Figure 5-2

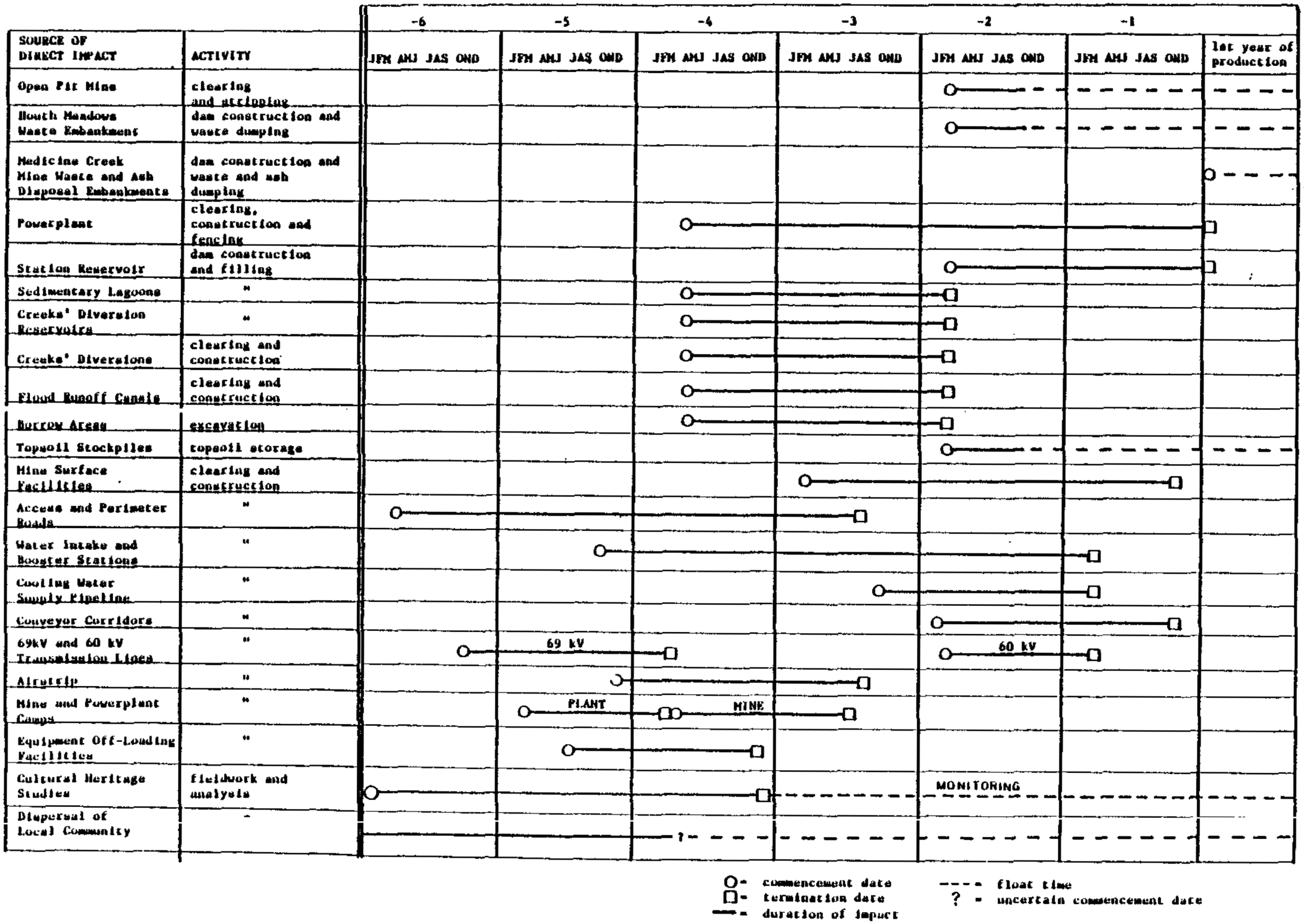


Figure 5-3

Schedule for Predicted Direct Impacts

5.1 TYPES OF PROPOSED DEVELOPMENT - RELATED IMPACT, THEIR SOURCES, THEIR GEOGRAPHIC DISTRIBUTION AND SCHEDULE - (Cont'd)

Possible expansion of tourist and recreational facilities might aggravate adverse effects. An indirect impact not related to population increases is the possible alteration of drainage and erosion patterns: cultural heritage resources may be eroded away and thus, destroyed. Table 5-3 lists the predicted sources of indirect impact along with their expected categories of adverse and beneficial effects. Fig. 5-4 illustrates the impacts' geographical distribution.

Increases in local population and work force ought to commence with construction and continue through production. Project-related development ought to follow a similar schedule. Tourism and recreation ought to increase at the beginning of production and continue throughout the mine operation. If drainage and erosion patterns are altered, the effects ought to begin during construction.

(c) Potential Impacts

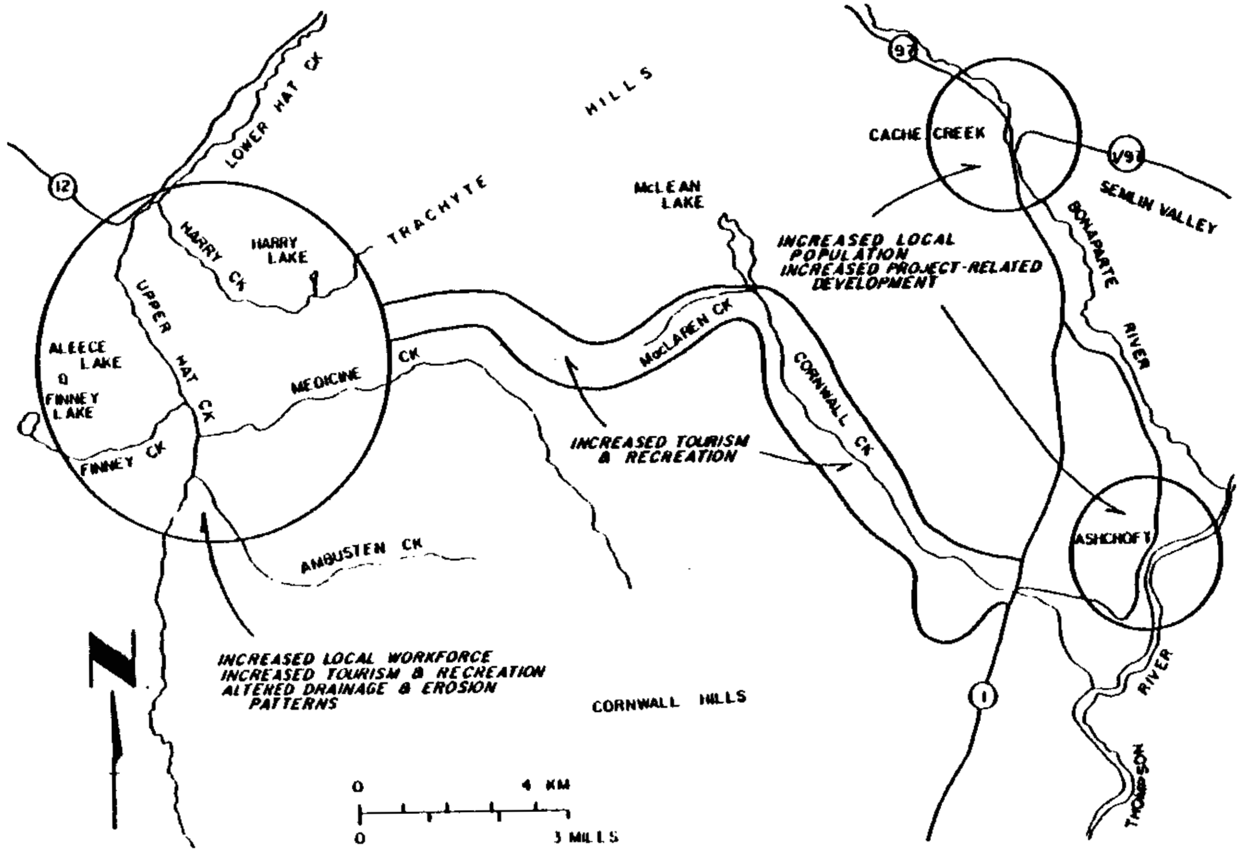
Potential impacts can be expected whenever a proposed project related activity exposes land surface previously covered by a forest litter or excavates sub-surface, post-Pleistocene deposits. These activities will require in-field monitoring (to an excavation depth of 3 m of 9.8 feet) to safeguard cultural heritage resources. Sources of direct impact whose beneficial effects include the discovery of buried archaeological sites are also sources of potential impact (see Table 5-1). In general, these impacts result in the removal of, or damage to, the resource or its elements, and possibly the eradication of the resource. The geographic distribution and schedule of potential impacts may be derived from Figs. 5-1 and 5-2.

TABLE 5-3

PREDICTED SOURCES OF INDIRECT IMPACT
AND THEIR CATEGORIES OF EFFECTS

SOURCE OF INDIRECT IMPACT	CATEGORIES OF EFFECTS										
	Eradication	Removal	Spatial Re-distribution	Destruction of Context	Burial	Inundation	Damage or Disruption	Loss	Discovery	Gains in Knowledge	Protection
Increased Local Population		x	x				x		x		
Increased Local Workforce		x	x				x		x		
Increased Tourism and Recreation		x	x				x		x		
Increased Housing, Transportation and other Development	x			x	x		x		x		
Altered Drainage and Erosion Patterns	x	x	x				x		x		

Figure 5-4



Geographic Distribution of
Predicted Indirect Impacts

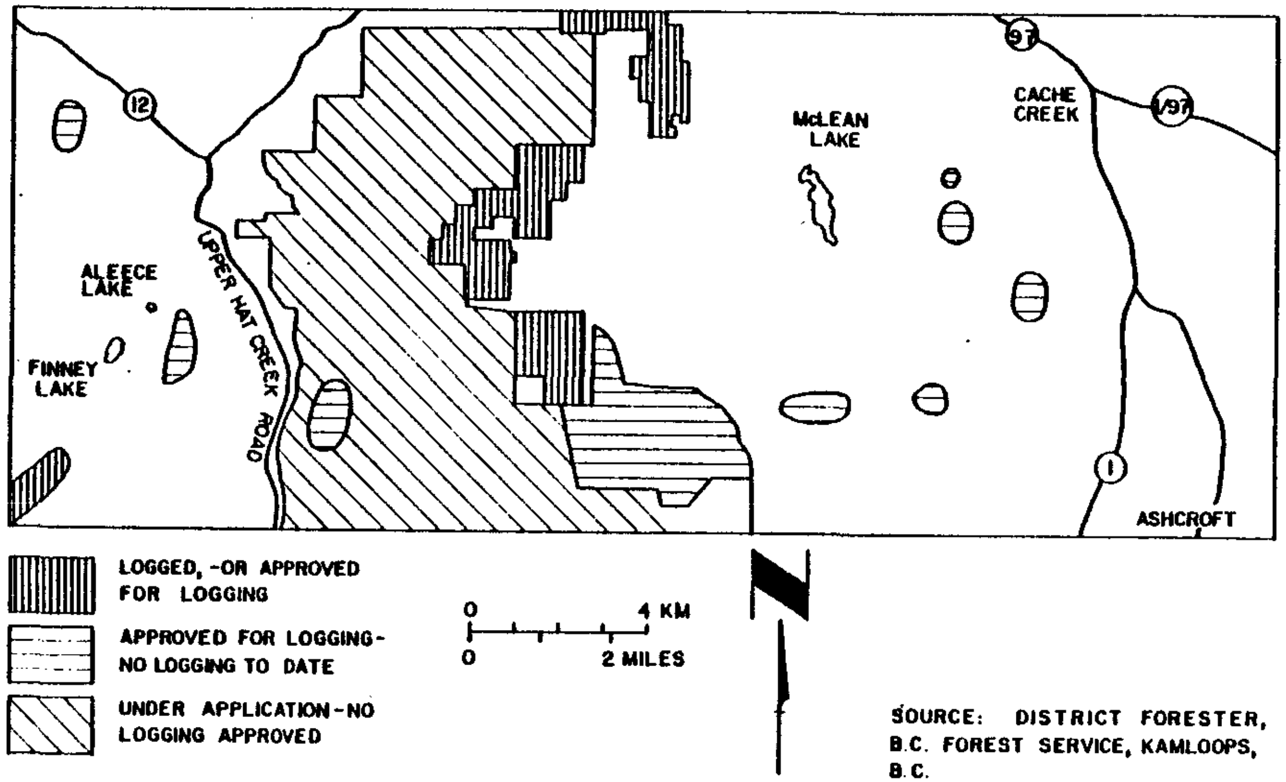
5.2 EXPECTED IMPACTS WITHOUT THE PROPOSED DEVELOPMENT

Compared to other tributary valleys in the southern interior plateau, upper Hat Creek valley has had minimal damage to its cultural heritage resources. The geographic situation of the valley has placed it outside areas experiencing economic growth and associated land modification activities (expansion of urban areas, roads, powerlines, rail corridors). Also the geographic location of the valley is removed from major road networks, thus reducing the potential for unscientific collection and excavation of sites.

While local inhabitants of the valley have made archaeological collections, these have been used as an information base for this study. Specifics regarding the contexts from which artifacts were collected have been provided willingly. If these artifacts had been removed by non-residents, the reclamation of this information would have been time-consuming and expensive, if not impossible.

Future activities anticipated in the absence of the proposed development include: the continuation of the present land-use pattern of open-range grazing and cultivation in valley bottomlands, the reinitiation of logging operations (see Fig. 5-5), and limited recreational use by tourists, hunters, and fishermen. The direct, indirect and potential impacts resulting from these activities are considered to be substantially less than those that would result from the proposed Hat Creek Project.

Figure 5-5



Logging Operations in the Study Area

SECTION 6.0 - EVALUATION OF POTENTIAL IMPACTS

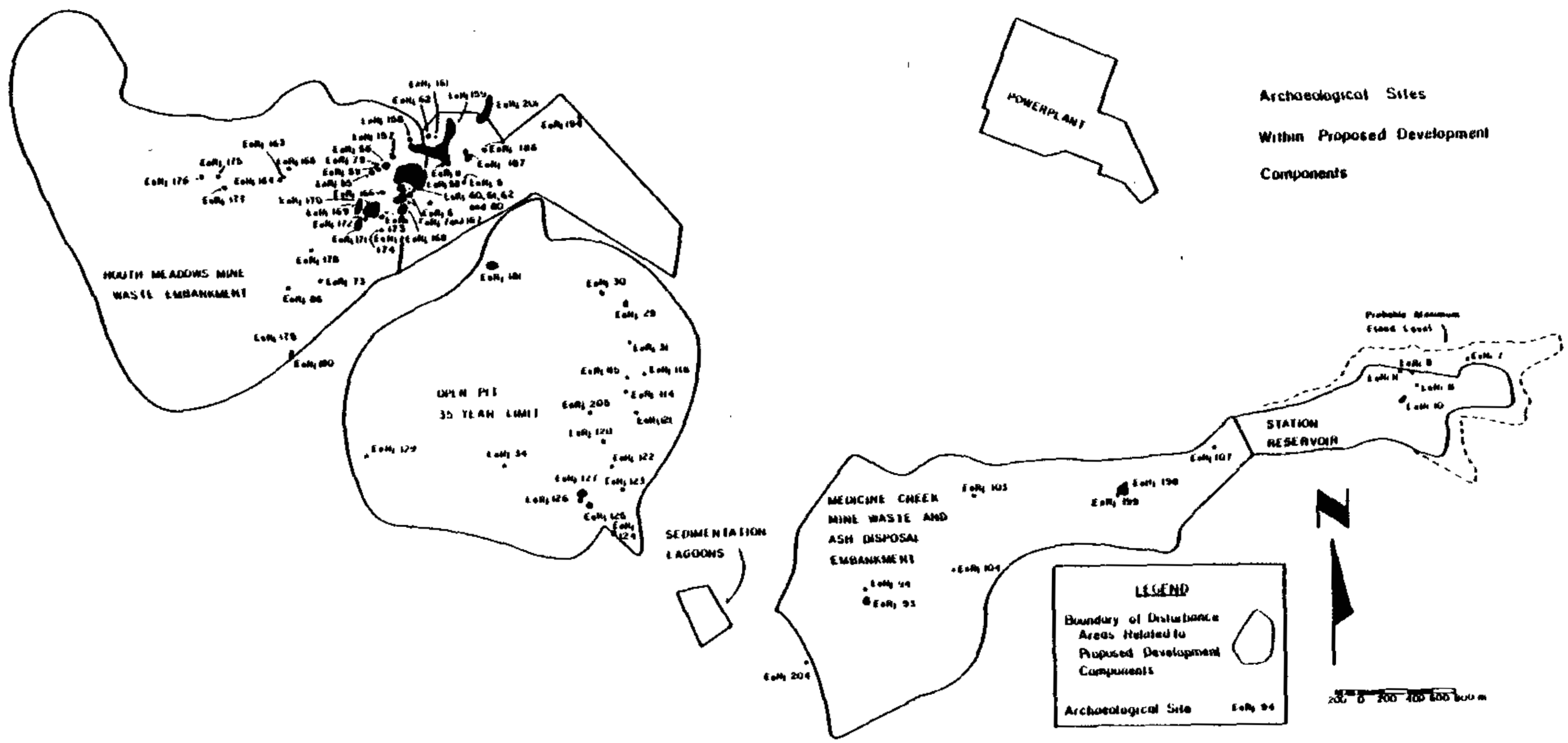
6.1 TYPES AND NAMES OF CULTURAL HERITAGE RESOURCES AFFECTED BY IMPACTS

Eighteen archaeological sites recorded by quadrat survey, and three historic sites recorded by historic structures survey will probably be eradicated when the proposed open pit mine is cleared and stripped (see Figs. 6-1 and 3-39). In addition, approximately 75 other archaeological sites are expected to be eradicated by the same activity (see Table 6-1). An unknown number of sites may be discovered by the clearing and stripping, and subsequently, eradicated. These sites' archaeological and environmental context will be destroyed as well. Adversely affected archaeological zones are 7, 9, 10 and part of 20.

No cultural heritage resources are expected within the clearing, construction and fencing zone of the proposed powerplant and its camp (see Fig. 6-1 and Table 6-1). Therefore, no direct impacts to resources are expected, except for the small possibility of buried archaeological sites being discovered during construction. The clearing and construction of the mine surface facilities, including the mine camp and settling pond, are expected to eradicate, damage and/or bury 22 archaeological sites (see Table 6-1). Thirteen of these sites have been recorded already (see Figs. 6-1 and 3-39). Context may be destroyed in zones 2, 7 and 17 by these activities. Some buried archaeological sites may be discovered by these activities; and some sites may be protected by fences limiting public access.

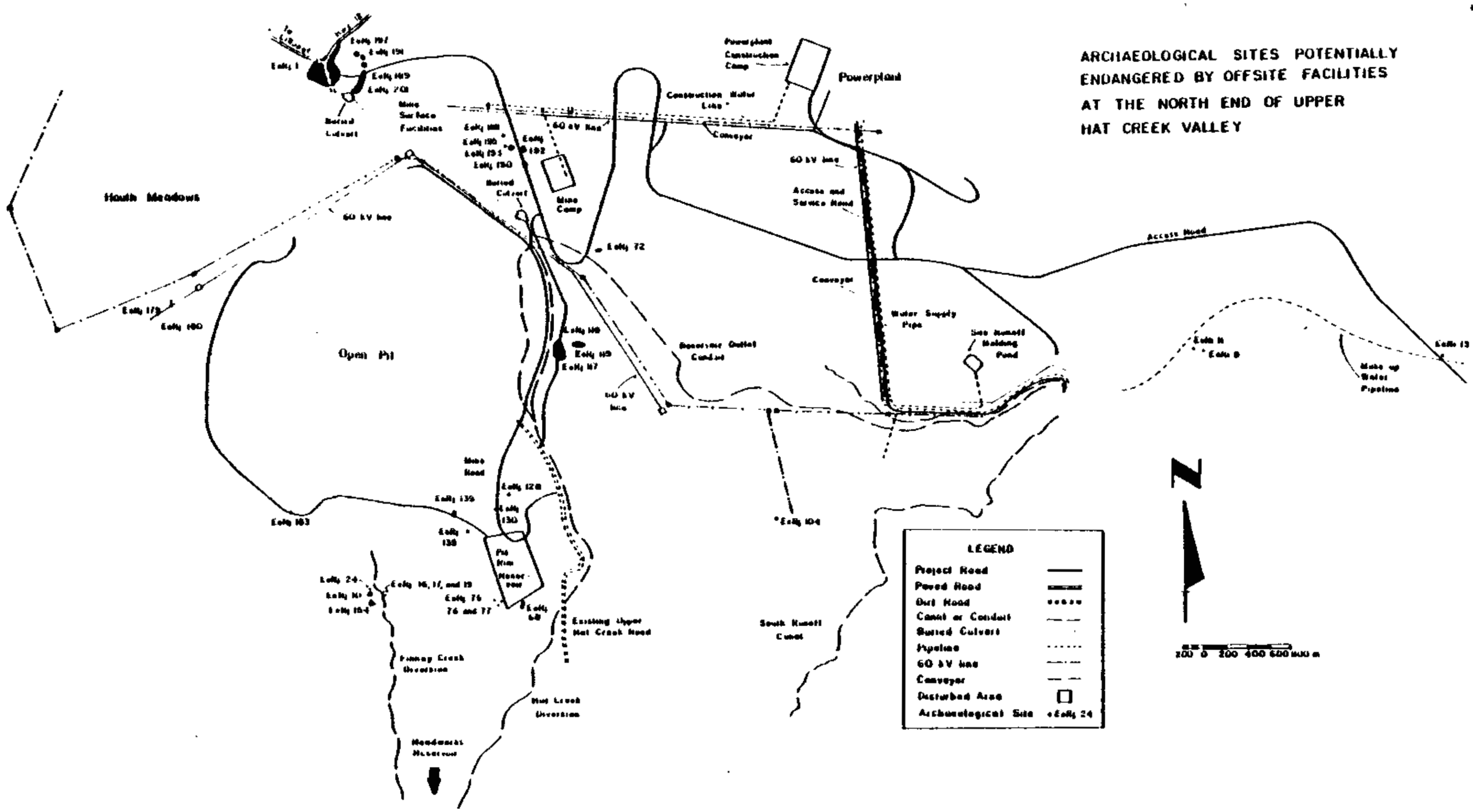
Constructing dams and dumping waste and ash ought to have similar adverse effects upon the resources: burial and destruction of context. In Houth Meadows, 65 sites are expected to be affected; in Medicine Creek, 16 sites (see Table 6-1). Thirty-six sites have been recorded in Houth Meadows to date; seven sites, in lower Medicine Creek (see Fig. 6-1). The context in zones 1, 4 and 5 may be affected.

Figure 6-1



Archaeological Sites Within Proposed Development Components

Figure 6-2



Archaeological Sites Potentially Endangered by Offsite Facilities at the North End of Upper Hat Creek Valley

TABLE 6-1

EXPECTED NUMBER OF PREHISTORIC ARCHAEOLOGICAL SITES IN THE MAJOR DEVELOPMENT ZONES

Development Component	Environmental Zone			
	Parkland	Open Forest	Closed Forest	Total
Open Pit - Year 35	64.4	8.5	2.3	75.2
Houth Meadows Mine Waste Embankment	39.0	14.0	12.1	65.1
Medicine Creek Mine Waste and Ash Disposal Embankment	8.3	3.0	4.4	15.7
Station Reservoir - Maximum Flood Level	11.6	-	1.4	13.0
Powerplant	0.0	0.0	0.0	0.0
Mine Surface Facilities (including settling pond and camp	8.0	12.2	2.0	22.2
Headworks Reservoir	5.0	-	-	5.0
Total	136.3	38.5	22.1	196.2

6.1 TYPES AND NAMES OF CULTURAL HERITAGE RESOURCES AFFECTED BY IMPACTS - (Cont'd)

As many as 13 sites may be inundated by the proposed station reservoir; and five sites, by the proposed headworks reservoir (see Table 6-1). No estimates have been made for the proposed Pit Rim reservoir or the sedimentation lagoons, but a number of sites have been recorded near their boundaries (see Figs. 6-1 and 6-2). Five sites are known to exist within the maximum flood level of the proposed station reservoir, and the same number, within the boundaries of the proposed headworks reservoir (see Fig. 6-1). These reservoirs may alter the context in zones 6, 7 and 8. Table 6-2 lists site groups affected by all the above activities.

Borrow areas A2 and B have been almost totally surveyed (see Fig. 3-39) and only two archaeological sites may be in danger of eradication. Buried sites, however, may be discovered when the borrow areas are excavated. Zones 5 and 16 may be affected. No definite locations were provided for the topsoil stockpiles, so that no estimates can be given for direct impact. The proposed access road has been surveyed between the turnoff for the proposed powerplant and Highway 12. Four sites were recorded along the route; seven other sites were recorded close to the route (see Fig. 6-2). Since other off-site facilities in the upper Hat Creek valley were not specifically surveyed, estimates have been computed for the expected number of sites per kilometer (.625 miles) of linear facility (see Table 6-3). These estimates are based upon right-of-way width and expected site densities for the zones within the valley. Fig. 6-2 shows the location of recorded sites which may be affected by the off-site facilities in the upper Hat Creek valley.

No exact numbers can be given for off-site facilities outside of the upper Hat Creek valley: none have been intensively surveyed. Data were garnered through a reconnaissance survey of the proposed cooling water pipeline's preliminary design between the proposed station reservoir and Highway 1, and through a search of the B.C. Site

TABLE 6-2

EXPECTED SITE GROUPS AND NUMBER OF
PREHISTORIC SITES WITHIN MAJOR PROPOSED DEVELOPMENT ZONES

Proposed Development Zones	Site Groups						
	1	2	3	4	5	6	7
Open Pit Mine-Year 35	23.6	2.9	5.9	10.2	5.9	26.5	0.0
Houth Meadows Mine Waste Embankment	2.4	0.0	12.2	20.3	4.9	11.4	13.9
Medicine Creek Mine Waste and Ash Disposal Embankment	5.7	0.8	1.6	2.9	0.8	3.5	0.5
Powerplant	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Station Reservoir	4.7	0.7	1.3	2.4	0.7	2.9	0.4
Headworks Reservoir	0.0	0.0	2.0	0.0	0.0	3.0	0.0

TABLE 6-3

EXPECTED NUMBER OF ARCHAEOLOGICAL SITES
PER KILOMETER OF LINEAR OFF-SITE FACILITIES

	Right-of-Way				
Zones	18m	20m	30m	60m	100m
Medicine-Harry Creek Drainages	.187	.208	.312	.624	1.04
Houth Meadows	.488	.542	.813	1.626	2.71
Hat Creek Bottom lands North of Finney Creek	.329	.366	.549	1.098	1.83
Hat Creek Bottom-lands South of Finney Creek	.266	.296	.444	.888	1.48

6.1 TYPES AND NAMES OF CULTURAL HERITAGE RESOURCES AFFECTED BY IMPACTS - (Cont'd)

Inventory file (see Section 3.4). In Appendix B, Fig. B1 shows the location of recorded sites in the local study area. Off-site facilities in archaeological zones 11, 23 and 28 ought to encounter few archaeological sites, whereas facilities in zones 26, 27 and 29 ought to encounter many sites. Facilities in zones 12, 13, 14, 15, 24 and 25 ought to encounter a moderate number of sites.

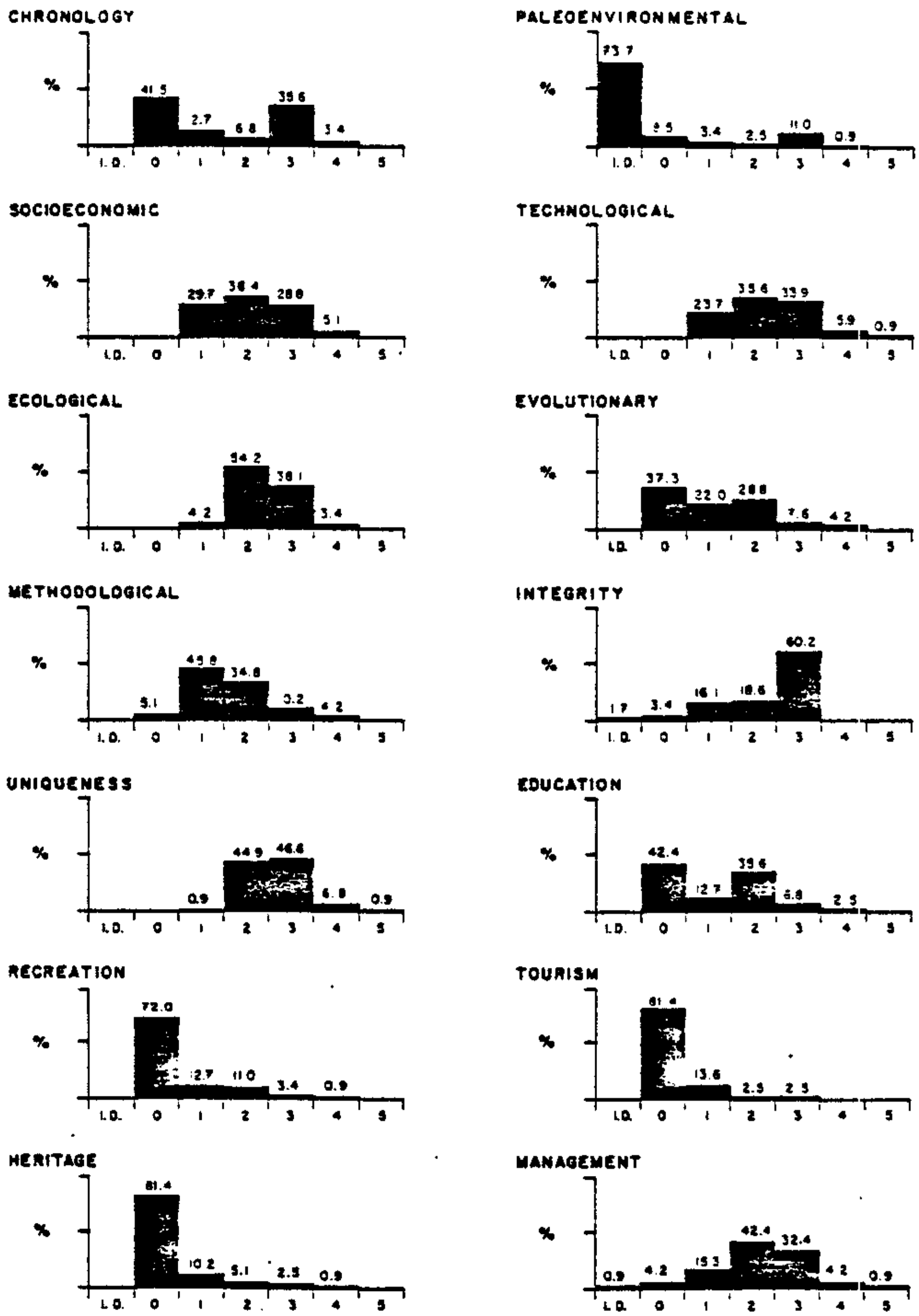
Adverse effects of cultural heritage resource studies include damage to archaeological sites through excavation and survey, and the removal of artifacts by collection. Expected numbers of affected sites can be found in recommendations for mitigation (Part 2). Beneficial effects include gains in knowledge and the acquisition of resources for educational and recreational purposes. Dispersal of the local community in the north end of upper Hat Creek valley may result in the loss of European oral history and ethnography, as well as amateur artifact collections.

In addition to the resources enumerated above, nearly 300 archaeological sites may be affected by indirect impacts in upper Hat Creek valley. Fig. B2 in Appendix B shows the locations of recorded sites in the upper Hat Creek valley, north of Ambusten Creek. The post-Pleistocene palynological record present in Finney and Aleece lakes' sediments may also be affected if creek diversions alter the drainage rate. Affected archaeological zones are 1 through 10, and 17 through 22. Indirect impacts ought to have little effect in zones 23 and 28: site density is expected to be low in these zones and heavy forest cover may protect the resource from increased tourism and recreation. Zones 24 and 25 may suffer more effects since their expected site densities are higher, and parkland areas exist along with forest. Numerous archaeological sites are recorded in the vicinity of Cache Creek and Ashcroft (see Fig. B1 in Appendix B). Their precarious existence near population centres and highways may be aggravated by the increase in local population and expanded development precipitated by the proposed Hat Creek Project.

Finally, the number of cultural heritage resources which may be subject to potential impact is an unknown quantity. Potential impacts are more likely in archaeological zones with high site densities and where deep post-Pleistocene sedimentary deposits exist. Buried sites discovered by construction have been reported in upper Hat Creek valley (Milner, personal communication) and have been observed during monitoring of land-altering activities (e.g. EeRj 204). Hence the probability of potential impact cannot be discounted.

6.2 CULTURAL HERITAGE RESOURCE VALUES AFFECTED BY IMPACTS

Fig. 6-3 displays the distribution of constituent values for prehistoric sites in upper Hat Creek valley subject to direct impact. Table 6-4 lists the value indices for all prehistoric sites in upper Hat Creek valley which may be subject to direct impact. Table 6-4 also lists the indices for all prehistoric sites in the valley which may not be subject to direct impact. By comparing the two sets of indices and by comparing Figs. 4-1 and 6-3, it will be possible to estimate the kinds and amounts of cultural heritage value which may be lost through direct impact to prehistoric sites. Loss of value may be indicated in two ways: 1) a high value index for sites subject to direct impact; and 2) a higher value index for sites subject to direct impact than for sites not subject to direct impact. In the former case, the lost value is measured in a regional perspective, i.e. the lost value is not easily matched by other resources in the region. In the latter case, the lost value is measured in a local perspective. Value inherent in all the prehistoric sites is embodied mostly in the sites subject to direct impact in the latter case. These two situations are illustrated in Figs. 4-1 and 6-3, when: 1) the histograms in Fig. 6-3 have a greater portion of their area over values 3, 4 and 5 than over the



Distribution of Constituent Values for Potentially Impacted Prehistoric Archaeological Sites in the Upper Hat Creek Valley

Figure 6-3

TABLE 6-4

VALUES INHERENT IN PREHISTORIC SITES SUBJECT TO DIRECT IMPACT AND NOT SUBJECT TO DIRECT IMPACT

Criteria	Prehistoric Sites in Upper Hat Creek Valley	
	Direct Impact	No Direct Impact
Chronological	39.0	44.0
Palaeoenvironmental	11.9	19.8
Socioeconomic	33.9	33.0
Technological	40.7	46.2
Ecological	41.5	45.1
Evolutionary	11.8	8.8
Methodological	14.4	12.1
Integrity	60.2	53.9
Uniqueness	54.3	46.2
Education	9.3	15.4
Recreation	4.3	1.1
Tourism	2.5	1.1
Heritage	3.4	3.3
Cultural Heritage Resource Management	37.3	28.6

values 0, 1 and 2; and 2) the histograms in Fig. 6-3 have a greater portion of their area over values 3, 4 and 5 than do the corresponding histograms in Fig. 4-1.

Absolutely high value indices for all prehistoric sites subject to direct impact were obtained for the following criteria: technological, ecological, integrity and uniqueness. The indices for integrity and uniqueness were also higher for these sites than for those not subject to direct impact. A high index for technological constituent value derives from the presence of all known upper Hat Creek valley quarry sites and many sites with numerous microblades within zones subject to direct impact. High ecological constituent value results primarily from the sites' location in an upland valley. Sites in upper Hat Creek valley are relatively intact compared to other sites in the region due to the lack of intensive agriculture and development in the valley. Unique aspects of the prehistoric sites subject to direct impact include numerous earth oven remains, numerous microblades, housepit(s) in an upland context and zones with high site and artifact densities coupled with great variety in artifact types. (See Section 4.3(a) for a more detailed discussion of these constituent values' manifestation in the prehistoric sites.)

Criteria for which higher value indices were obtained for prehistoric sites subject to direct impact than for the remaining sites are socio-economic, evolutionary, methodological, recreation, tourism, heritage and cultural heritage resource management. Lower value indices were obtained for chronological, palaeoenvironmental and education criteria. Value indices for palaeoenvironmental and education criteria are absolutely low, whereas the index for chronology is moderately high. Value indices for socio-economic and heritage criteria were only slightly higher for sites subject to direct impact. (See Sections 4.3(a) and 4.3(b) for examples of the values' manifestation in the prehistoric sites.)

6.2 <u>CULTURAL HERITAGE RESOURCE VALUES AFFECTED BY IMPACTS</u> - (Cont'd)

All historic sites recorded in upper Hat Creek valley are subject to direct impact except sites EeRj 130, EeRj 206, EeRj 211, EeRj 212 and EeRj 214. Since 75 percent of the recorded historic sites are subject to direct impact, then nearly all the inherent value may be lost. Some historic sites which have not been recorded lie in the south end of upper Hat Creek valley, however, their constituent values are unknown. Inherent constituent values of the historic sites are described in Sections 4.3(a) and 4.3(b), but are reiterated here: technological, integrity, uniqueness and cultural heritage resource management.

Similarly, all archaeological zones, except number 11, are subject to direct impact, so that the inherent constituent values discussed in Sections 4.3(a) and 4.3(b) apply here. High value indices were obtained for socio-economic, technological, methodological, integrity, uniqueness and cultural heritage resource management. Destruction of a zone's context inhibits reconstruction of the zone's palaeoenvironment, thereby depreciating the palaeoenvironmental value of some resources. High values which may be depreciated by the loss of European oral history and ethnography through local community dispersal are chronological, socio-economic, technological, ecological, evolutionary, integrity, uniqueness and heritage. Loss of local artifact collections may result in a loss of high value for ecological, methodological, integrity, uniqueness and cultural heritage resource management criteria. Improper curation of artifacts and records collected by the Hat Creek Archaeological Project for the Environmental Impact Report and/or mitigation would depreciate their high value for all criteria except recreation and tourism, which are of average value.

The values affected by indirect impacts can be summarized by referring to the values inherent in all 29 archaeological zones: the zones encompass the areas which may experience indirect impact. Particular note should be made of the palynological record in the Finney

Lake sediments: Altered drainage may result in the eradication of an important source of palaeoenvironmental information. Evaluation of potential impacts is impossible at this time.

Table 6-5 lists the value indices obtained for prehistoric sites subject to direct impact by proposed major development component. Mine surface facilities are expected, in general, to affect low to average values. Notable exceptions are the criteria for palaeoenvironment and uniqueness. Also, EeRj 1, which has high cultural heritage value (see Addendum A, Table A2), may be adversely affected by the proposed mine surface facilities. The proposed Headworks reservoir is also expected to affect generally low to average values. Slightly higher than average values were obtained for chronology, technology, ecology and integrity. EeRj 92 may be inundated by the proposed reservoir and, as noted in Sections 3.5 and 3.6, may be one of the oldest sites in upper Hat Creek valley. Examples of various lithic technologies have been found at the sites near the Hat Creek-Anderson Creek confluence: microbades, macroblades, bipolar implements and utilization of local cherts and jasper in addition to the widespread flaking techniques.

The proposed Medicine Creek waste and ash embankment and Station reservoir are examined together because few sites were found in each and their archaeological zones (Nos. 4, 5 and 6) are quite similar. High value indices were obtained for ecological, integrity, uniqueness and cultural heritage resource management criteria. Low to average values were obtained for the remaining criteria (especially low for methodology, education, recreation and tourism). Exceptional sites include EeRj 94 (a late 19th century Indian homestead) and EeRi 10 (a single-component site with microblades and microblade cores, and excellent potential for isolating manufacturing stages for stone tools).

TABLE 6-5

VALUES INHERENT IN PREHISTORIC SITES SUBJECT TO
DIRECT IMPACT FROM PROPOSED MAJOR DEVELOPMENT COMPONENTS

Criteria	Mine Surface Facilities	Houth Meadows Waste Embankment	Open Pit	Medicine Creek Waste and Ash Embankment - Station Reservoir	Headworks Reservoir
Chronological	14.3	59.4	22.2	33.3	35.3
Palaeoenvironmental	50.0	63.6	0.0	33.3	16.7
Socio-economic	14.3	46.9	33.3	25.0	23.5
Technological	28.6	56.3	16.7	33.0	35.3
Ecological	14.3	34.4	50.0	50.0	35.3
Evolutionary	14.3	15.6	5.6	16.7	11.8
Methodological	28.6	18.8	11.1	0.0	17.7
Integrity	33.3	71.9	61.1	58.3	35.3
Uniqueness	42.9	59.4	61.1	50.0	29.4
Education	14.3	6.3	5.6	0.0	17.7
Recreation	14.3	9.4	0.0	0.0	0.0
Tourism	14.3	6.3	0.0	0.0	0.0
Heritage	14.3	3.1	0.0	8.3	0.0
Cultural Heritage Resource Management	33.3	43.8	55.6	41.7	23.5

6.2 CULTURAL HERITAGE RESOURCE VALUES AFFECTED BY IMPACTS - (Cont'd)

High value indices for chronological, palaeoenvironmental, socio-economic, technological, integrity, uniqueness and management were computed for prehistoric sites which are expected to be affected by the proposed Houth Meadows waste embankment. A diversity of archaeological components are concentrated in Houth Meadows yielding high value indices for nearly every criterion. Low values were obtained for education, recreation and tourism primarily. These sites are not especially visible and, therefore, susceptable to educational nor recreational development. However, the several earth oven sites in Houth Meadows would have higher value for these purposes.

Prehistoric sites which are predicted to be affected by the proposed open pit have high value indices for ecological, integrity, uniqueness and management criteria. These prehistoric sites in which a high percentage of artifacts has been manufactured from locally available cherts and jasper have a higher technological constituent value than do other sites within the boundaries of the proposed open pit. Most of these sites are located near the Hat Creek-Medicine Creek confluence. Also, many historic sites are located in this area. Particular note should be made of the sites associated with early coal mining (see Section 3.5(b)).

6.3 OVERALL VALUE OF THE CULTURAL HERITAGE RESOURCES

Prior to 1976, knowledge about the prehistory of the southern interior plateau was basically restricted to activities which had occurred in lowland river and lake valleys, i.e. below 3000 feet asl. Stryd (1974) had reported one site in the Clear Range above 6000 feet asl; and Baker (1975) had reported several sites at higher elevations in Botanie valley. However, no substantial research had been completed in the uplands of the southern interior plateau before the Hat Creek Archaeological Project. Three years of studies have demonstrated the existence in the upper Hat Creek valley of many cultural heritage resources, whose nature and distribution differ substantially from lowland sites. Yet these resources in the upland and lowland areas are linked through an often complex set of past human behaviour.

Prehistoric sites in upper Hat Creek valley appear to represent spring, early summer and autumn subsistence activities, in which native peoples exploited upland resources (roots, game, berries) as described in ethnographies (see Section 2.3). Studies of these sites complement our present knowledge of late summer, winter and some early spring subsistence activities, as evidenced in lowland archaeological sites (i.e. salmon fishing-processing stations, housepits, freshwater fishing camps, low valley root-gathering camps). The high density of prehistoric sites in upper Hat Creek valley attests to the importance of upland valleys for prehistoric peoples: neglect of these sites by archaeologists would lead to biased interpretations of past lifeways in the southern interior akin to the distorted view one would get of modern Canadian culture, if one were to study only large cities.

Besides differing in the kinds of socio-economic activities represented, upper Hat Creek valley's prehistoric sites differ from other sites recorded in the regional study area in the time periods represented as well. Most archaeological research in the southern interior has investigated Late Nesikep period sites (2800 B.P.-historic period); and, in fact, archaeological surveys have found mostly late sites in the regional study area. Contrary to this pattern, twice as many sites in upper Hat Creek valley can be assigned an Early Nesikep period occupation as can be assigned a Late Nesikep period occupation (see Section 3.6). In addition, a handful of sites in the valley may date to an even earlier time period, the Old Cordilleran Culture. As yet, the Lochnore complex at EdRk 7 along the Fraser River is the only substantially documented archaeological component from this period (Sanger 1970) (see Sections 3.3 and 3.6).

6.3 OVERALL VALUE OF THE CULTURAL HERITAGE RESOURCES - (Cont'd)

Analyses of pollen cores from Finney Lake indicate that the upper Hat Creek valley may have been ice-free as early as 13 000 B.P. and certainly ice-free by about 10 000 B.P. (Hebda 1979). Local environmental conditions may have precluded human habitation until approximately 9500 B.P. (Vance 1979). A period of hot, dry climatic conditions commenced at this time, which may have made cooler, wetter upland areas such as the upper Hat Creek valley more attractive to prehistoric peoples than lowlands (cf. Frison 1978). Further investigations would be required to ascertain the extent and nature of Palaeo-Indian occupations in the upper Hat Creek valley. Unfortunately, research into this and other questions about chronology is hampered by the shallow cultural deposits and lack of organic remains suitable for radiocarbon dating which characterize most prehistoric sites in the valley.

In addition to ecological and chronological values, prehistoric sites in upper Hat Creek valley have technolgical value relevant to current research interests. No other locale in the southern interior plateau is known at this time to comprise as complete a range of microblade and macroblade technology as does Hat Creek. Other aspects of lithic tool technology best represented in the upper Hat Creek valley include bipolar techniques and quarrying. Studies of cultural depressions in the valley have provided the best documentation so far for earth oven technology in the southern interior plateau. Similar information may be available from sites in Botanie valley, but the comparability of the cultural heritage resources is not assured at this time.

Historic sites in upper Hat Creek valley are not easily evaluated due to lack of comparable data within the regional study area. Taken together, though, these sites constitute material documentation of the adaptation of homesteading-farming economy to an upland valley. Specific sites also document the acculturation of native peoples to European lifeways. A few sites even represent local

6.3 OVERALL VALUE OF THE CULTURAL HERITAGE RESOURCES - (Cont'd)

industrial and commercial enterprises which extended beyond subsistence farming. Upper Hat Creek valley's historic sites provide insight unto the day-to-day lives of European and native peoples from ca. 1880 to 1940 in a southern interior rural community.

Both historic and prehistoric sites have benefitted from their remote location in the upper Hat Creek valley. Both intensive development and tourism have bypassed the valley, leaving its cultural heritage resources basically intact. Some damage has occurred through agricultural and logging activities, but compared to many locales in the regional study area, upper Hat Creek valley's archaeological sites have high integrity. Thus, there is a high probability of realizing their full scientific and public value if properly managed.

Adverse effects expected from the proposed development would concentrate in the Medicine Creek-Harry Creek area and in the upper Hat Creek valley north of Ambusten Creek. While two thirds of the total number of archaeological sites in the valley would most likely be unaffected by the proposed development, these sites do not duplicate the cultural heritage values which would be lost with the destruction and damage to sites in the proposed development zones. Loss of cultural heritage values would be greatest for the criteria of technology, ecology, integrity and uniqueness. In addition, those few sites in the valley which are especially suitable for educational, recreational and tourism development are located in areas of direct impact. Given its ecological context, its proximity to the core area of the Nesikep Tradition, its situation between boundaries of ethnographic social groups, the range and diversity of archaeological resources and the near pristine condition of its resources, upper Hat Creek valley provides key insights into the prehistory of the southern interior plateau.

SECTION 7.0 - REFERENCES CITED

Baker, J. 1973. Site Survey in the Lytton Region, B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Baker, J. 1975. Report on the Archaeological Research done in the Lytton Region, May to August 1974. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Balf, M. 1969. Kamloops: A History of the District up to 1914. Kamloops Museum, Kamloops.

Balf, M. 1978. Early Days. The Kamloops News, 21 June 1978; 28 June 1978; 5 July 1978; 12 July 1978.

Begbie, M.B. 1861. Journey into the Interior of British Columbia. Journal of the Royal Geographical Society. Vol. 31, pp. 237-248.

Beirne, P. 1979. Statistical Notes for the Analysis of Hat Creek Archaeological Materials. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Beirne, P.D., D.L. Pokotylo and R.G. Matson. 1978. A Proposal for the Concluding Studies of Cultural Heritage Resources Assessment, Phase II, for the Proposed Hat Creek Project. MS. on file, Office of Contract Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Binford, L.R. 1964. A Consideration of Archaeological Research Design. American Antiquity. Vol. 29, pp. 425-441.

Blake, T.M. 1974. Ollie Site (EeRk 9), Final Report. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Blake, T.M. 1975. Report on the Wild Horse River Archaeological Salvage Project, Site DjPv 14, in the East Kootenay Region of B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Blake, T.M. 1976. The Rocky Point Site (EdQx 20): Spacial Analysis and Descriptive Report. Occasional Papers of the Archaeological Sites Advisory Board of British Columbia, No. 2.

Blake, T.M. and M. Eldridge. 1971. Pithouse on S. Thompson River. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Boas, F. 1890. The Shuswap. Sixtieth Report of the British Association for the Advancement of Science. pp. 632-647.

Borden, C.E. 1952. A Uniform Site Designation Scheme for Canada. Anthropology in British Columbia. Vol. 3, pp. 44-48.

Borden, C.E. 1956. Results of Two Archaeological Surveys in the East Kootenay Region of B.C. Research Studies, State College of Washington. Vol. 24, pp. 73-104.

Bouchard, R. 1973a. How to Write the Thompson Language (Lytton Dialect). MS. on file, British Columbia Indian Language Project, Victoria.

Bouchard, R. 1973b. How to Write the Shuswap Language (Kamloops Dialect). MS. on file, British Columbia Indian Language Project, Victoria.

Bouchard, R. 1973c. How to Write the Lillooet Language (Fraser River Dialect). MS. on file, British Columbia Indian Language Project, Victoria.

Bouchard, R. 1968-77. Notes on Linguistic and Ethnographic Fieldwork among the Lillooet Indians, British Columbia. MS. on file, British Columbia Indian Language Project, Victoria.

Bouchard, R. and D.I.D. Kennedy. 1977. Lillooet Stories. Sound Heritage. Vol. 6, pp. 1-78.

British Columbia Hydro and Power Authority. 1977. Proposed Hat Creek Development Detailed Environmental Studies: Terms of Reference. British Columbia Hydro and Power Authority, MS., Vancouver, B.C.

Broilo, F.J. and C.A. Reher. 1977. An Evaluation of Archaeological Resources and a Recommended Program of Mitigation. In Settlement and Subsistence along the Lower Chaco River: The CGP Survey. Edited by C.A. Reher. University of New Mexico Press, Albuquerque. pp. 457-468.

Butler, B.R. 1961. The Old Cordilleran Culture in the Pacific Northwest. Occasional Papers of the Idaho State Collections Museum, No. 5.

Caldwell, W.W. 1954. An Archaeological Survey of the Okanagan and Similkameen Valleys of British Columbia. Anthropology in British Columbia. Vol. 4, pp. 10-25.

Carl, G.C., W.A. Clemens and C.C. Lindsay. 1973. The Fresh-water Fishes of British Columbia. British Columbia Provincial Museum Handbook No. 5.

Charlton, A. 1979. Provincial Archaeologist's Report. Paper presented at 1979 Meeting of British Columbia Archaeologists, Victoria.

Choquette, W.T. 1971a. Results of Archaeological Reconnaissance near Fairmont Hot Springs. MS. on file, British Columbia Provincial Archaeologist's Office.

Choquette, W.T. 1971b. Archaeological Salvage Operation within the Libby Dam Pondage. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1972. Preliminary Report on Libby Reservoir Archaeological Salvage Project. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1973. Archaeological Survey in the Middle Elk River Drainage, Southeastern B.C.: Interim Report. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1974a. Heritage Impact Assessment - Proposed Inland Natural Gas - East Kootenay Transmission Line Link - Salmo to Rossland Section (Milepost 69-101). MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1974b. Kootenay Archaeological Survey. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1974c. Libby Pondage Archaeological Salvage Project. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1975. Archaeological Site Inventories in the East Kootenay Region, Summer 1975. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1976a. Heritage Resource Assessment of the Proposed Hosmer-Wheeler Coal Development. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Choquette, W.T. 1976b. Heritage Resource Assessment of the Proposed Line Creek-Corbin Coal Development. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Clouthier, S.L. 1978. Report Detailing Administrative Duties of the Archaeological Society of British Columbia Private Collections Project. MS. on file, Archaeological Society of British Columbia, Vancouver.

Clouthier, S.L. 1979. Report on the Public Appreciation and Educational Potential of Upper Hat Creek Valley Cultural Heritage Resources. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Copp, S. 1974. An Archaeological Site Survey of the Okanagan-Similkameen Regions in the Interior of British Columbia, 1974. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Copp, S. 1975. An Excavation and Site Survey in the South Okanagan Valley. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Corner, J. 1969. Pictographs in the Interior of B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Cowan, I. McT. and C.J. Guiguet. 1975. The Mammals of British Columbia. British Columbia Provincial Museum Handbook No. 11.

Crockford-Dawson, S. 1979. Faunal Analysis of EeRj 55, Area A, Feature 9. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Dawson, G.M. 1891. Notes on the Shuswap People of British Columbia. Royal Society of Canada Transactions. Section I, pp. 3-44.

Davidson, J. 1915. Botanical Exploration of the Bitter-root Grounds and "Three Sisters" Valley, between Spences Bridge and Ashcroft. Third Annual Report of the Botanical Office of the Province of British Columbia, 1915. Vol. 1, pp. 134-136.

Donahue, V.J. 1979. A Description and Analysis of Archaeological, Archival and Oral Resources for the Historic Period in the Upper Hat Creek Valley. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Eldridge, M. 1974. Recent Archaeological Investigations near Chase, B.C. Cariboo College Papers in Archaeology, No. 2.

Eldridge, M. 1975. Survey Sampling on the Fraser Plateau: Preliminary Report. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Elmore, O. 1974. Thompson-Nicola Regional District Archaeological Survey. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Environment Canada. 1974. Land Capability for Wildlife Ungulates, Ashcroft 92I.

Environmental and Land Use Committee, British Columbia. 1976. Guidelines for Coal Development. MS. on file, Parliament Buildings, Victoria.

Fladmark, K. 1969. Archaeological sites in the Shuswap South Thompson River Area, B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Fraser, S. 1966. Simon Fraser: Letters and Journals, 1806-1808. Edited by W.K. Lamb. MacMillan, Toronto.

Fried, M.H. 1967. The Evolution of Political Society. Random House, New York.

Frison, G.C. 1978. Prehistoric Hunters of the High Plains. Academic Press, New York.

Gehr, K.D. 1976. The Archaeology of the Hihium Lake Locality, B.C. MS. on file, Department of Archaeology, Portland State University.

Godfrey, W.E. 1966. The Birds of Canada. National Museum of Canada, Bulletin No. 203, Biological Series No. 73.

Grabert, G.F. 1971. Some Implications of Settlement Variations in the Okanagan Region. In Aboriginal Man and Environments on the Plateau of Northwest America. Edited by A.H. Stryd and R.A. Smith. The Student's Press, University of Calgary, Calgary. pp. 153-167.

Grabert, G.F. 1974. Okanagan Archaeology, 1966-1967. Syesis 7, Supplement 2.

Graham, R. 1977. Report on Upper Hat Creek Valley History based on Oral History and Archival Sources. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Guiguet, C.J. 1955. Birds of British Columbia (4), Upland Game Birds. British Columbia Provincial Museum Handbook No. 10.

Guiguet, C.J. 1958. The Birds of British Columbia (6). Waterfowl. British Columbia Museum Handbook No. 15.

Gumerman, G.J. (Editor). 1971. The Distribution of Prehistoric Population Aggregates. Prescott College Anthropological Reports, No. 1.

Haggett, P. 1965. Locational Analysis in Human Geography. Edward Arnold, London.

Ham, L.C. 1975. Shuswap Settlement Patterns. Unpublished M.A. thesis, Department of Archaeology, Simon Fraser University.

Ham, L.C. 1979. Hat Creek Faunal Analysis. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Harrison, P.D. 1961. Report on the Archaeological Survey of the High Arrow Reservoir. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Hebda, R.J. 1979. Pollen Analysis of Finney Lake Core, Hat Creek Valley, B.C. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Hills, L.V. 1961. Preliminary Archaeological Survey on the Fraser River from Lillooet to Big Bar. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Hill-Tout, C. 1899. Notes on the N'Tlaka' Pamuq of British Columbia, a Branch of the Great Salish Stock of North America. Report of the British Association for the Advancement of Science. Vol. 69, pp. 500-585.

Hill-Tout, C. 1905. Report on the Ethnology of the Stlatlumh of British Columbia. Journal of the Anthropological Institute of Great Britain. Vol. 35, pp. 126-218.

Hitchcock, C.L. and A. Cronquist. 1974. Flora of the Pacific Northwest. University of Washington Press, Seattle.

Howe, G. 1978. Long Time Coming, Site EeRj 55: A Micro-wear Analysis of an Excavated Lithic Scatter in the Upper Hat Creek Valley, British Columbia. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia.

Idler, D.R. and W.A. Clemens. 1959. The Energy Expenditures of Fraser River Sockeye during the Spawning Migration. International Pacific Salmon Fisheries Commission, Progress Report No. 6.

Johnson, E.P. 1970. The Early Years of Ashcroft Manor. B.C. Studies. Vol. 5, pp. 3-23.

Johnson-Fladmark, S. 1973. Report: Shuswap Lakes Archaeological Project. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Jorgensen, J.G. 1969. Salish Language and Culture. Indiana University Publications, Language Science Monographs, Volume 3.

Keddie, G. 1972. Chilcotin Archaeological and Ecological Survey Project. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Kennedy, D.I.D. 1971-77. Notes on Linguistic and Ethnographic Fieldwork among the Lillooet Indians, British Columbia. On file, British Columbia Indian Language Project, Victoria.

Kennedy, D.I.D. and R. Bouchard. 1975. Utilization of Fish by the Mount Currie Lillooet Indian People of British Columbia. MS. on file, British Columbia Indian Language Project, Victoria.

Kennedy, D.I.D. and R. Bouchard. 1978. Fraser River Lillooet: An Ethnographic Summary. In Reports of the Lillooet Archaeological Project: Number 1, Introduction and Setting. Edited by A.H. Stryd and S. Lawhead. Archaeological Survey of Canada, Mercury Series Paper No. 73. pp. 22-55.

Kenny, R.A. 1972. Preliminary Report Deep Creek Site (FbRn 13). MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Ketcheson, M.V. 1979. Floral Analysis of Archaeological Sites EeRj 1, CF9 and HP1; EeRj 46; EeRj 55A and 55D, EeRj 71; EeRj 92; EeRj 101. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Kew, M. 1976. Salmon Abundance, Technology and Human Populations on the Fraser River Watershed. MS. on file, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Kish, L. 1965. Survey Sampling. John Wiley and Sons, New York.

Krajina, V.J. 1965. Biogeoclimatic Zones and Biogeocoenoses of British Columbia. Ecology of Western North America. Vol. 1, pp. 1-17.

Lamb, W.K. 1960. Simon Fraser Letters and Journals. MacMillan, Toronto.

Lawhead, S. and K. McAleese. 1976. Interior Lakes Archaeological Inventory. Okanagan Lake Survey. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Ludowicz, D.G. 1979. Reduction Strategies of Stone Tool Manufacturing in the Medicine Creek Region of Upper Hat Creek, B.C. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia.

Lundy, D. 1977. Petroglyphs of the B.C. Interior. Paper presented at the Fourth Biennial International Conference of the Canadian Rock Art Research Associates, Victoria.

McCullough, P.T. 1979. Postglacial Geomorphic Features Related to Archaeological Studies in the Upper Hat Creek Valley. MS. on file, System Engineering Division, B.C. Hydro and Power Authority, Vancouver.

McGimsey, C.R. III and H.R. Davis (Editors). 1977. The Management of Archaeological Resources: The Airlie House Report. Special Publication of the Society of American Archaeology.

McMurdo, J. 1974. A Preliminary Report on Excavations at the Juniper Beach Site, EeRg 13. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Magne, M. 1978. Flora, Fauna and More Food. MS. on file, Museum of Anthropology, University of British Columbia, Vancouver.

Magne, M. 1979. Lithic Technological Resources of the Upper Hat Creek Valley Region, B.C. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Matson, R.G. and L.C. Ham. 1975. Report to ASAB: Shuswap Settlement Pattern Project. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Melcombe, L.E. 1979. A Description of Prehistoric Archaeological Sites in the Local Study Area based upon B.C. Site Inventory File. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Mitchell, D.H. 1970. Excavations on the Chilcotin Plateau: Three Sites, Three Phases. Northwest Anthropological Research Notes. Vol. 4, pp. 99-116.

Mitchell, D.H. 1972. An Archaeological Survey in Kootenay National Park. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Mitchell, D.H. and W. Choquette. 1973. Archaeological Survey of Kootenay National Park, the Second Season. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Mitchell, D.H. and W. Choquette. 1974. An Archaeological Survey of the Prehistoric and Historic Resources of Kootenay National Park. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Mitchell, D.H. and C.J. Turnbull. 1968. Archaeological Investigations, Summer 1967. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Mitchell, D.H. and C.J. Turnbull. 1969. Archaeological Investigations, Summer 1968. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Odell, G.H. 1979. Site EeRj 92: Excavation Report. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia.

Palmer, G. 1975a. Cultural Ecology in the Canadian Plateau: Precontact to Early Contact Period in the Territory of the Southern Shuswap Indians of British Columbia. Northwest Anthropological Research Notes. Vol. 9, pp. 199-245.

Palmer, G. 1975b. Shuswap Indian Ethnobotany. Syesis. Vol. 8, pp. 29-81.

Pokotylo, D.L. 1975. An Analysis of Sources of Information on Fraser Drainage Aboriginal Population. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Pokotylo, D.L. 1976. A Research Proposal for Archaeological Survey in the Upper Hat Creek Valley, B.C. MS. on file, Office of Contract Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Pokotylo, D.L. 1977. Archaeological Resources in the Clinton-Ashcroft Area, B.C.: An Initial Evaluation. In Annual Report for the Year 1975: Activities of the Archaeological Sites Advisory Board of British Columbia and Selected Research Reports. B.O. Simonsen, Ed. Victoria Queen's Printer. pp. 10-45.

Pokotylo, D.L. 1978. Lithic Technology and Settlement Patterns in Upper Hat Creek Valley, B.C. Unpublished Ph.D. Dissertation, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Pokotylo, D.L. and P.D. Beirne. 1978. Hat Creek Project: Preliminary Inventory, Assessment and Evaluation of the Cultural Heritage Resources. MS. on file, British Columbia Hydro and Power Authority, Vancouver.

Pokotylo, D.L. and R.G. Matson. 1977. A Proposal for Extension of the Hat Creek Archaeological Impact Assessment Contract. MS. on file, Office of Contract Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Pokotylo, D.L. and R.J. Pearson. 1977. A Proposal for Phase II Archaeological Impact Assessment in Upper Hat Creek Valley, B.C.: Stage I. MS. on file, Office of Contract Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Ray, V.F. 1939. Cultural Relations in the Plateau of Northwestern America. Publications of the Frederick Webb Hodge Anniversary Publication Fund, 3.

Ray, V.F. 1942. Culture Element Distribution: XXII Plateau. Anthropological Records. Vol. 8, pp. 99-262.

Roberts, G.W. 1973. The Osoyoos Indian Band Reservation No. 1. MS. on file, British Columbia Provincial Archaeologist's Office, Vancouver.

Roberts, G.W. 1974. The Inkameep Archaeology Project. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Robinson, J.L. and W.G. Hardwick. 1973. British Columbia: One Hundred Years of Geographical Change. Talon, Vancouver.

Sandwell. 1977. Make-up Cooling Water Supply System. In Hat Creek Project, Project Description, Section 5, Offsite Facilities. System Engineering Division, B.C. Hydro and Power Authority, Vancouver.

Sanger, D. 1963. Excavations at Nesikep Creek (EdRk:4), a Stratified Site near Lillooet, British Columbia: Preliminary Report. In Contributions to Anthropology, 1961-62, Part 1. National Museum of Canada Bulletin No. 193. pp. 130-161.

Sanger, D. 1966. Excavations in the Lochnore-Nesikep Locality, British Columbia. National Museum of Canada, Anthropology Papers No. 12.

Sanger, D. 1968. The Texas Creek Burial Site Assemblage, British Columbia. National Museum of Canada Anthropology Papers No. 17.

Sanger, D. 1969. The Chase Burial Site, EeQw:1. Contributions to Anthropology VI. Archaeology and Physical Anthropology. National Museums of Canada Bulletin 224. pp. 86-185.

Sanger, D. 1970. The Archaeology of the Lochnore-Nesikep Locality, British Columbia. Syesis 3, Supplement 1.

Schiffer, M.B. 1975. Archaeological Research and Contract Archaeology. In the Cache River Archaeological Project: An Experiment in Contract Archaeology. Arkansas Archeological Survey, Research Series, No. 8. Assembled by M.B. Schiffer and J.H. House. pp. 1-7.

Service, E.R. 1966. Primitive Social Organization: An Evolutionary Perspective. Random House, New York.

Siemens, A.H. 1972. Settlement. In British Columbia. Edited by J.L. Robinson. University of Toronto Press, Toronto. pp. 9-31.

Smith, H.I. 1899. Archaeology of Lytton, British Columbia. American Museum of Natural History, Jesup North Pacific Expedition, Memoirs. Vol. 8, Part 3, pp. 129-161.

Smith, H.I. 1900. Archaeology of the Thompson River Region, British Columbia. American Museum of Natural History, Jesup North Pacific Expedition, Memoirs. Vol. 2, Part 6, pp. 401-442.

Sneed, P. 1970. Cariboo Survey. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Snell, J. and P. Beirne. 1979. An Initial Investigation into the Cultural Depressions in the Upper Hat Creek Valley. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Steedman, E.V. 1930. Ethnobotany of the Thompson Indians of British Columbia. Bureau of American Ethnology, 46th Annual Report, 1927-28. pp. 443-552.

Struever, S. 1968. Problems, Methods and Organization: A Disparity in the Growth of Archaeology. In Anthropological Archaeology in the Americas. Edited by B.J. Meggars. Anthropological Society of Washington, Washington. pp. 131-151.

Stryd, A.H. 1971. 1971 Archaeological Excavation at Lillooet, B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Stryd, A.H. 1973. The Later Prehistory of the Lillooet Area, British Columbia. Unpublished Ph.D. Dissertation, Department of Archaeology, University of Calgary.

Stryd, A.H. 1974. The Divide Site (EeRk 17): A Report to the Fountain Indian Band. MS. on file, Laboratory of Archaeology, Cariboo College, Kamloops.

Stryd, A.H. 1978. An Introduction to the Lillooet Archaeological Project. In Reports of the Lillooet Archaeological Project: Number 1: Introduction and Setting. Archaeological Survey of Canada Mercury Series Paper No. 73. Edited by A.H. Stryd and S. Lawhead. pp. 1-21.

Stryd, A.H. and J. Baker. 1968. Salvage Excavations at Lillooet, British Columbia. Syesis 1, pp. 47-56.

Stryd, A.H. and L.V. Hills, 1972. An Archaeological Site Survey of the Lillooet-Big Bar Area, British Columbia. Syesis 5, pp. 191-209.

Teit, J.A. 1900. The Thompson Indians of British Columbia. American Museum of Natural History, Jesup North Pacific Expedition. Vol. 2, Part 4, pp. 163-392.

Teit, J.A. 1906. The Lillooet Indians. American Museum of Natural History, Jesup North Pacific Expedition. Vol. 2, Part 5, pp. 193-300.

Teit, J.A. 1909. The Shuswap. American Museum of Natural History, Jesup North Pacific Expedition. Vol. 2, Part 7, pp. 447-789.

Tilden, F. 1977. Interpreting Our Heritage. Revised edition. University of North Carolina Press, Chapel Hill.

Turnbull, C.J. 1977. Archaeology and Ethnohistory in the Arrow Lakes, Southeastern British Columbia. Archaeological Survey of Canada Mercury Series Paper No. 65.

Turner, N.J. 1972. Lillooet Ethnobotany (Fountain Dialect). MS. on file, British Columbia Indian Language Project, Victoria.

Turner, N.J. 1974. Plant Taxonomic Systems and Ethnobotany of Three Contemporary Indian Groups of the Pacific Northwest (Haida, Bella Coola and Lillooet). Syesis 7, Supplement 1.

Turner, N.J. 1978. Food Plants of British Columbia Indians: Part II -Interior Peoples. British Columbia Provincial Museum Handbook No. 36.

Vance, R. 1979. Reconstruction of the Paleoenvironmental Conditions in the Upper Hat Creek Valley. MS. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Veillette, J. and G. White. 1977. Early Indian Village Churches. University of British Columbia Press, Vancouver.

Weber, C. and B. Seymour. 1976. Archaeological Survey Along Two Proposed Hydro Transmission Lines Routes in the South-Central Interior of B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Whitlam, R.G. 1976. Archaeology in the Williams Lake Area, British Columbia: Part 1 - The Descriptive Analysis of Three Sites. Part 2 -The FaRm 8 Symap Project. Occasional Papers of the Archaeological Sites Advisory Board of B.C. No. 1.

Whitlam, R.G. 1978. 1977 Cache Creek Project: Report of Investigations and Management Plan for EeRh 3, Permit 1977-26. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Wilson, R.L. 1973. Salvage Excavations in the Vicinity of Kamloops, B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Wyatt, D. 1968. Archaeological Excavations in the Nicola Valley, B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Wyatt, D. 1969a. Archaeological Survey of the Nicola Valley, B.C.: Summary Report. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Wyatt, D. 1969b. Archaeological Survey of the Nicola Valley, B.C. MS. on file, British Columbia Provincial Archaeologist's Office, Victoria.

Wyatt, D. 1972. The Indian History of the Nicola Valley, British Columbia. Unpublished Ph.d Dissertation, Department of Anthropology, Brown University.

PART TWO - RECOMMENDATIONS FOR THE MITIGATION OF ADVERSE IMPACTS GENERATED BY THE PROPOSED HAT CREEK COAL DEVELOPMENT

CONTENTS

TABLES

CONTENTS - (Cont'd)

FIGURES

SECTION 1.0 - SUMMARY

Recommendations are presented for mitigating adverse impacts, enhancing beneficial effects and compensating for depreciation or loss of cultural heritage value. Four categories of mitigation are recognized in this study: 1) preservation; 2) information recovery; 3) information dissemination; and 4) no mitigative action. Mitigative actions for the first three categories are specified; no mitigative action is assumed for cultural heritage resources not included in these recommendations. Alternatives have been provided for uncertain impacts and uncertain recommendations. Costs are estimated for most mitigative actions based upon 1979 University of British Columbia prices, but circumstances prevented estimating certain costs; therefore, no total cost of mitigation has been computed. Financial responsibility for mitigation has not been addressed in this study.

Prior to implementing a mitigation programme, assessment studies should be completed for the unsurveyed offsite facilities and for historic archaeological sites within the site study area. Mitigation recommendations are outlined below.

(a) <u>Avoidance</u>

1. Relocation of offsite facilities where they conflict with archaeological sites.

2. Redesigning the mine surface facilities, Houth Meadows waste embankment and the headworks reservoir to avoid destroying valuable cultural heritage resources.

3. Addition of bulwarks at reservoirs and lagoons to protect cultural heritage resources.

4. Establishment of a programme to monitor impacts to the cultural heritage resources.

5. Enhancement of resources, whose environmental context is disturbed, by either: a) highway stops-of-interest signs; or b) exhibits at the project's visitors' centre.

6. Designation of EeRj 1.

7. Establishment, for the surveillance of possible vandalism, at EeRj 1, of either: a) a visitors' centre; b) the site office; or c) an archaeological park.

8. Fencing of cultural heritage resources within high activity areas, such as construction camps.

9. Proper curation of the Hat Creek Archaeological Project's artifact and archaeological records collection.

10. Encouragement of advertising campaigns for conserving cultural heritage resources.

(b) Information Recovery

1. A field work and analysis programme (2 to 3 years) including: a) excavation; b) survey; c) environmental studies pertinent to archaeological reconstructions; d) artifact collection; and e) resurvey of a sample of heavily forested quadrats with new methods.

2. Removal of unusual and representative historic structures and large artifacts to an unendangered locale.

3. Recording of local oral history.

4. Recording of local amateur artifact collections.

5. If erosion occurs at either Finney Lake or Aleece Lake, recovery of sample pollen-laden sediment core(s).

6. If inundation adversely affects valuable resources, development and implementation of an underwater information recovery programme.

(c) Information Dissemination

1. Preparation of press releases.

2. Preparation of a documentary for: a) newspapers/magazines; b) radio; and/or c) television.

3. Preparation of a popular account of upper Hat Creek valley history and prehistory to be published in either: a) a separate volume; or b) a larger, general account of the southern interior plateau.

4. Preparation of a summary of the studies' scientific results in either: a) a monograph series; or b) a book.

5. Preparation of several academic papers based upon specific results for either: a) scholarly journals; or b) professional meetings.

6. Preparation of either: a) an educational film; or b) an educational slide show package.

7. Preparation of one to three teaching kits.

8. Preparation and display of a temporary museum exhibit.

9. Presentation of a lecture series.

10. Preparation of one to four small, permanent exhibits for display in the local study area.

Endangered cultural heritage resources of considerable value for one or more criteria should constitute the set of resources from which the research sample for the information recovery programme should be selected.

Avoidance measures and information recovery programmes should be implemented prior to most construction. A 2 to 3-year information recovery programme with a 1-year programme to produce scientific papers is suggested. Monitoring should be coincidental with construction. The clearing of the proposed open pit may present many monitoring problems due to its sporadic occurrence over a 35-year span.

SECTION 2.0 - INTRODUCTION

As discussed in detail in Section 6.3 of Part I, studies conducted by the Hat Creek Archaeological Project have demonstrated the existence in the upper Hat Creek valley of a large and varied cultural heritage resource base, which has considerable value in its potential for explicating key points in southern interior plateau prehistory. This value is constrained somewhat by the shallowness of most of the archaeological sites' cultural deposits and poor preservation of organic material: potential chronological value is thereby lessened. Despite this drawback, study of these resources have so far examined, heretofore, poorly understood aspects of upland subsistence adaptation (e.g. earth ovens); and broaden our knowledge about Early Nesikep period occupations.

The most pressing objective of more scientific studies of prehistoric archaeological sites in upper Hat Creek valley would be the establishment of the local chronology. Other important research objectives would include: 1) determination of earth ovens' precise function in prehistoric economy; 2) explication of differences between prehistoric and ethnohistoric earth ovens; 3) explication of the existence of housepits in an upland valley; 4) determination of socio-economic implications of microblade, macroblade and bipolar technologies; 5) determination of the existence and nature of very early occupations in the valley; 6) description of non-housepit, Late Nesikep period occupations; 7) description of lithic raw material quarrying; 8) description of upland, specific-activity occupations; and 9) explication of recurrent occupation of particular locales. Few statements can be made concerning the cultural heritage value of historic resources given the limited nature of their studies to date.

Part I of this report has documented the impacts related to the proposed development which are expected to affect the cultural heritage resources either adversely or beneficially (see Sections 5.0, 6.1 and 6.2). Beneficial effects, which include discovery of buried archaeological sites and commissioning of cultural heritage studies, are, in general, outweighed by adverse effects wherein more resources are eradicated or damaged within a short time span than can be fully researched and understood by present scientific methodology. In addition, what recreational value exists in the endangered resources would be effectually eliminated. It has also been shown in Section 6.2 that the cultural heritage values that would be affected adversely by the proposed development are not duplicated in the unendangered resources.

The loss of these resources by direct, indirect and potential impacts can be ameliorated to some degree through a programme of mitigation. Phase II presents a recommended programme with alternatives for the mitigation of adverse impacts to cultural heritage resources in the vicinity of upper Hat Creek valley. These recommendations should be considered in conjunction with two points. First, most mitigation efforts constitute a commitment of cultural heritage resources to research, which, by its very nature, damages or destroys resources. Most of this research would probably not occur if the project were not implemented. Thus, from a conservation perspective, a mitigation programme cannot fully preserve values of cultural heritage resources: considerable loss is inevitable, making judicial management essential. Second, the recommendations pertain only to the content of the mitigation programme and its approximate cost, not to the designation of financial responsibility for implementing the programme. The decision of financial responsibility is the provincial government's prerogative (cf. Heritage Conservation Act, 1977).

SECTION 3.0 - TYPES OF MITIGATIVE ACTIONS

This report divides mitigative actions into four general categories: 1) preservation; 2) information recovery; 3) information dissemination; and 4) no mitigative action. These categories are divided further in the succeeding subsections into specific types of mitigative action.

3.1 PRESERVATION

A mitigative action that preserves a cultural heritage resource keeps it safe from damage and/or keeps it in existence. Four types of preservation are recognized in this report: 1) avoidance; 2) protection; 3) removal; and 4) enhancement.

A resource's safety can be ensured by either: 1) altering the source of adverse impact such that impact to the resource is avoided; 2) protecting the resource from adverse impact; 3) removing the resource from the influence of the adverse impact; or 4) enhancing the resource's value to counteract the adverse impact. Examples include rerouting a portion of the access road to avoid destroying a cultural depression, fencing off an easily accessible archaeological site with attractive artifacts lying on its surface to prevent vandalism, dismantling a homesteaders cabin situated within the proposed open pit's perimeter and reassembling the cabin at a safe location, and erecting a highway stop-of-interest sign describing the environmental context of a nearby archaeological zone whose environment has been disturbed by the proposed development.

3.2 INFORMATION RECOVERY

Data is recovered from cultural heritage resources primarily by means of archaeological survey and excavation, archival searches, 3.2 INFORMATION RECOVERY - (Cont'd)

informant interviews, preparing photographic essays, and collecting artifacts and other portable cultural heritage resources. To transform these data into information, they must be subsequently analyzed and/or interpreted. Thus, a mitigative action which seeks to recover information has two essential parts: 1) data recovery; and 2) data analysis and/or interpretation.

3.3 INFORMATION DISSEMINATION

After the information has been recovered, it should be disseminated among both the scientific community and the public so that its full worth is actualized. Information dissemination is viewed in this report as a means of compensating for the loss of, and/or damage to, cultural heritage resources and their constituent values.

Scholarly publications, lectures, papers presented at professional meetings, and university and college curricula are the primary media through which information can be disseminated among the scientific community. The public would benefit best from the information after it has been interpreted into such media as popular publications, museum exhibits, public school's extracurricular programmes and lecture series.

3.4 NO MITIGATIVE ACTION

No mitigative action implies allowing an adverse impact to happen without an attempt to ameliorate its effect on a cultural heritage resource. Recommending that no mitigative action be implemented was considered appropriate in instances where: 1) a cultural heritage resource was deemed to have little or no value; or when 2) a large number of the affected resources had similar constituent value(s). In the second instance, the inclusion of all those resources in a mitigative action from the other three categories is unnecessary for the

3.4 NO MITIGATIVE ACTION -(Cont'd)

conservation of the constituent cultural heritage value(s): a representative sample sufficed.

SECTION 4.0 - RECOMMENDATIONS AND ALTERNATIVES FOR MITIGATIVE ACTIONS

Generally, the preservation of cultural heritage resources is preferred over the recovery of their information. This is in keeping with the conservation ethic of cultural heritage resource management since information is only one aspect of cultural heritage value. Whenever possible, preservation has been recommended for endangered cultural heritage resources. In circumstances where preservation was not feasible, information recovery and dissemination have been recommended to conserve the constituent value(s) of adversely affected resources.

More than one type of mitigative action from these categories (preservation, information recovery and information dissemination) has been recommended for a specific resource in some cases. These categories are not mutually exclusive: mitigative actions from more than one category are occasionally required to ameliorate an adverse impact satisfactorily. When little or no value exists within a cultural heritage resource or when sufficient information for conserving constituent cultural heritage value(s) has been recovered, it was deemed appropriate to recommend that no mitigative action be implemented.

In circumstances where an impact or its effect are uncertain, or where the feasibility of a mitigative action is uncertain, alternative recommendations have been provided in addition to the primary recommendations for mitigative actions. Specifically, an uncertain impact is one which:

1. may or may not occur,

2. may or may not be adverse,

3. whose effects, severity or extent cannot be determined absolutely, or

4. commencement or duration is uncertain.

Uncertain feasibility of preferred mitigative action has arisen when:

1. the feasibility of altering the proposed development's design is unknown,

2. a cultural heritage value or resource may or may not be suitable for the preferred mitigative action,

3. cultural heritage resource management plans for the region are uncertain, or

4. the scientific and/or public appraisement of the mitigative action is uncertain.

4.1 PRESERVATION

Preservation of cultural heritage resources mitigates potential adverse effects to high constituent values for integrity, i.e. intact resources have high integrity. For most resources endangered by the proposed development, preservation is unfeasible. However, the following offsite facilities are amenable to relocation, either entirely or in part, to avoid direct impact which may have adverse effects upon cultural heritage resources: access roads, transmission lines and substations, pipelines and booster stations, canals, camp buildings (including temporary storage areas for construction materials and parking lot), air-strip, conveyor belts, topsoil stockpiles, borrow areas and equipment offloading facilities. Since few of these facilities have been surveyed, avoidance measures cannot be specified for instances other than those listed in Table 4-1. Table 5-2 of Part One lists the project components which have not yet been surveyed. A reconnaissance survey in conjunction with finalization of these facilities' design would provide information for avoiding cultual heritage resources on an interactive basis. In as many as 50 percent of all conflicts, a relocation of approximately 10 to 20 m (32.8 to

TABLE 4-1

POTENTIAL CONFLICTS BETWEEN OFF-SITE FACILITIES AND CULTURAL HERITAGE RESOURCES

Source of Direct Impact	Potentially Affected Cultural Heritage Resources
Access Roads	EeRj 1, EeRj 201, EeRj 189, EeRj 191, EeRj 197, EeRj 188, EeRj 195, EeRj 193, EeRj 190, EeRj 192, EeRj 72, EeRj 117, EeRj 118, EeRj 119, EeRj 130, EeRj 128, EeRj 139, EeRj 135, EeRj 183, EeRi 13, EeRh 25.
Transmission Lines	EeRj 179, EeRj 180, EeRh 3, EeRh 52, EeRh 53, EeRh 1, EeRh 22.
Cooling Water Pipeline	EeRi 9, EeRi 11, EeRi 13, EeRi 1, EeRi 2, EeRi 4.
Finney Creek Diversion	EeRj 10, EeRj 16, EeRj 17, EeRj 19, EeRj 24, EeRj 154.
Conveyor	EeRj 104
Buried Culvert	EeRj 201
Hat Creek Diversion	EeRj 117

65.6 ft) should suffice, since up to 50 percent of sites in the upper Hat Creek valley are expected to be less than 100 m^2 (328 ft^2) in area. In addition, adverse effects to cultural heritage values through direct impact by proposed project-related housing, transportation and other development may be avoided if community development agencies are in communication with the Provincial Archaeologist's Office, which can advise the agencies about probable impacts.

Special consideration should be given to redesigning: 1) the access road and mine surface facilities to avoid EeRj 1, a unique resource at the Highway 12 junction; 2) the Houth Meadows waste embankment to avoid the valuable cultural heritage resources concentrated in Houth Meadows; and 3) the headworks reservoir to avoid the potentially very early occupation remains at EeRj 92. In instance No. 3, a bulwark positioned to prevent the flooding of EeRj 92 may be a suitable avoidance measure in lieu of relocating the reservoir. Bulwarks may also be employed with the station reservoir and sedimentation lagoons to minimize damage to cultural heritage resources though their values may not warrant such endeavours as do the values present at EeRj 92.

If avoidance measures cannot be implemented or are not practical for a particular conflict, then other mitigative action(s) must be recommended on the basis of the resource's value(s). If the resource has not yet been evaluated, then it must be surveyed; a representative sample of artifacts, collected; an analysis, performed, and an evaluation, made. A recommendation for mitigative action(s) consistent with the tenets of the overall mitigative programme is preferred. Specific alternatives are not given here for most components due to incomplete information concerning conflicts and the feasibility of avoidance measures. However, alternatives are given in Section 4.2 for cultural heritage resources expected to be adversely affected by the Houth Meadows waste embankment, mine surface facilities and reservoirs.

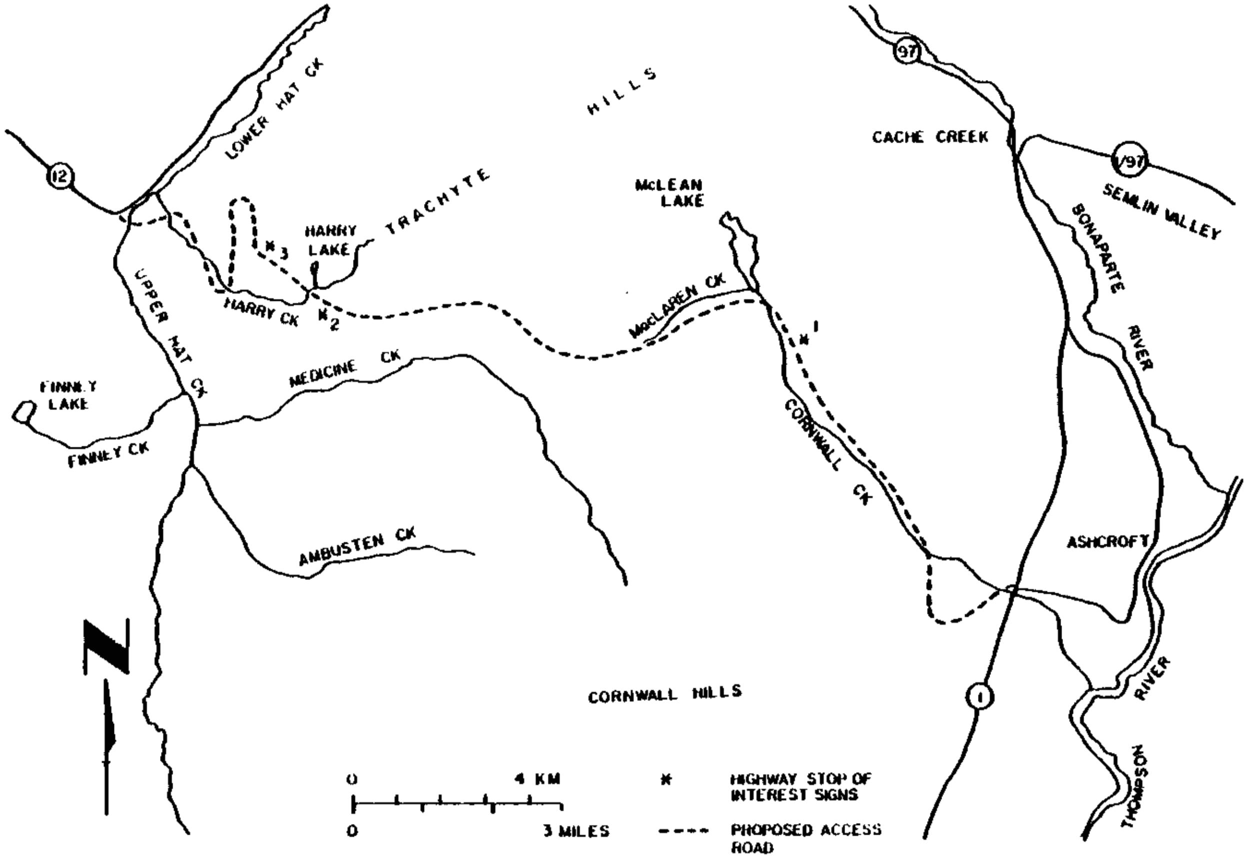
4.1 PRESERVATION - (Cont'd)

A comprehensive monitoring programme is recommended to assure the protection of cultural heritage values, especially integrity. The programme's major responsibilities should include: 1) monitoring all proposed land-altering activities of the development, generally, to a depth of 3 m (9.8 ft); 2) informing developers and the Provincial Archaeologist's Office when potentially valuable cultural heritage resources are discovered by proposed project activities; 3) suggesting mitigative action(s) for discovered resources; and 4) executing the recommended mitigative action(s) for discovered resources. Proper mitigation of discovered resources maximizes the discovery's beneficial effects. To increase the programme's effectiveness, an educational programme should be conducted for the proposed project's work force explaining the nature of cultural heritage resources, the Heritage Conservation Act, 1977, and the procedures to be followed when proposed project activities uncover a resource.

Additional aspects of the monitoring programme include inspecting cultural heritage resources inundated by the proposed station reservoir, headworks reservoir, etc. for damage from ponded water. Pollen-bearing sediments in Finney and Aleece lakes should be monitored as well for possible erosion due to drainage alterations caused by proposed creek diversions. If erosion occurs, appropriate information should be recovered as outlined in Section 4.2. Another aspect of the programme should be the establishment of a heritage advisor for the region encompassing upper Hat Creek valley. This person should at regular and frequent intervals, monitor sites for damage caused by erosion and/or vandalism directly or indirectly related to the proposed project. If this voluntary position cannot be filled, then a paid position with equivalent responsibilities should be established.

Prehistoric sites and archaeological zones whose environmental context may be damaged by the proposed project could be enhanced by a series of highway stops-of-interest signs along the main access

Figure 4-1



Suggested Locations for Highway Stops-of-Interest Signs road. These signs would also partially compensate the public for loss of high constituent ecological, socio-economic and technological values. Erection of three signs at the locations depicted in Fig. 4-1 are recommended. Recommended themes are: 1) upland vs. lowland subsistence activities of native peoples; 2) edible root gathering and roasting activities in ethnohistorical and prehistoric times; and 3) quarrying for raw material for chipped stone tools in ethnohistorical and prehistoric times. Signs Nos. 1 and 3 could be small (33 x 24 in or 84 x 61 cm) and entirely text; sign No. 2 should be large (8 x 12 ft or 2.4 x 3.7 m) and include illustrations with the text.

EeRj 1, an exceptional cultural heritage resource in the regional study area, ought to be designated and so come under the protection afforded by the Heritage Conservation Act, 1977. If a visitors' centre is established for the Hat Creek Coal Development Project, building the centre on the location of the current site office for the proposed project would be desirable.* This location would provide surveillance for vandalism of EeRj 1, while incurring no further damage to the resource. A small exhibit explicating archaeology in upper Hat Creek valley at the visitors' centre would enhance all the resources and EeRj 1, in particular. Models of the valley's environmental and archaeological nature prior to the proposed development could be exhibited at the visitors' centre in lieu of the highway stops-of-interest signs recommended above. If a segment of the exhibit were devoted to cultural heritage resource conservation, then a measure of protection against vandalism would be added to the enhancement.

If feasible, EeRj 1 ought to be further enhanced and protected by inclusion in the provincial park system. Many of EeRj 1's

---

* If a visitors' centre is not constructed, then it is recommended that the proposed development's site office be located on EeRj 1 or some equivalent surveillance arrangement be made.

4.1 PRESERVATION - (Cont'd)

components are highly visible (e.g. historic structures, earth ovens, housepits, numerous artifacts on the ground surface) and lend themselves to recreational development. An open-air museum with a catwalk could be constructed like that at Olorgesailie, Kenya (Isaac 1977); and earth oven(s) and housepit(s) may be partially excavated and stabilized, or reconstructed, for visitors' benefit. The nearby camping facilities at Marble Canyon Provincial Park could possibly serve visitors to this proposed archaeological park as well.

Miscellaneous mitigative actions for preservation include protecting the integrity of cultural heritage resources within high activity areas by fencing in the resources. Known archaeological sites which may require this protection include nine sites within the perimeter of the mine surface facilities (see Fig.6-1 in Part I) which may not be eradicated or inundated by proposed project activities. Similar measures may be necessary within the perimeters of the proposed powerplant, construction camps and equipment offloading facilities, if archaeological sites are discovered in these zones. It is also recommended that the high scientific value of the Hat Creek Archaeological Project's artifact collection and archaeological records be protected through proper curation. This entails storage which allows items to be retrieved easily for scientific analysis or educational and recreational programmes. Finally, support should be provided for advertising campaigns in the local study area advising tourists to conserve cultural heritage resources, in order to ameliorate adverse effects from proposed project-related increases in tourism.

4.2 INFORMATION RECOVERY

In regional and/or local perspective, potentially endangered prehistoric sites and archaeological zones have high constituent values for technological, ecological, uniqueness, socio-economic, evolutionary and methodological criteria. Information recovery should seek to mitigate the depreciation of these values. It is suggested that the research design (which guides information recovery from these resources) examine problems concerning technological and ecological aspects of the Nesikep Tradition in upland valleys, in terms of both cultural continuity and evolution. This research design should not, however, be regarded as the only possible one to be implemented during mitigation. The overall design should be flexible enough to allow for advances in archaeological method and theory, and additional knowledge of the regional prehistory. The research design may also benefit from skills and interests of the investigator(s) hired to carry out the mitigation research. Specific problems for organizing the research may include: 1) relationships between microblade technology and Early Nesikep cultural adaptations; 2) relationships between changes in post-Pleistocene environment and cultural adaptations; 3) technological and ecological characteristics of subsistence activities and resource utilization; and 4) relationships between subsistence-settlement systems and non-housepit, Kamloops phase sites.

The population of cultural heritage resources from which samples should be selected for information recovery programmes is the set of endangered resources for which no preservation measure is feasible and which manifest high values for the criteria which structured the research design. It is assumed that those endangered resources which do not manifest these high cultural heritage values and those endangered resources which do manifest the values, but were not selected for the research sample, will receive no mitigative action.

To execute this general research design, data must be gathered through survey, excavation and environmental field studies, and subsequently analyzed. The survey programme should include a reconnaissance survey of areas where resources are expected to be eradicated, buried or inundated (see Table 5-3, Part I) for potentially unique sites. When the reconnaissance has been completed, the unique sites should be recorded and mapped in detail; and a representative sample of artifacts, collected. Samples of artifacts and artifact assemblages representative of the potentially endangered resource base as a whole should be obtained and documented as well. The Hat Creek Archaeological Project's extant artifact collection and records are a nearly complete representative sample. Addition of at least the following items to the collection is needed to assure its representativeness: 1) more bipolar artifacts; 2) complete range of macroblade technology (i.e. blades and cores);* 3) complete range of non-basalt microblade technology (i.e. blades and cores);* 4) more ground stone tools; 5) more assemblages from site group No. 2; 6) complete range of nodules-preforms-artifacts indicating quarrying activities for basalt and chert; and 7) more examples of possibly heat-treated cherts.

Additionally, a sample of heavily forested quadrats in the Phase II survey should be resurveyed using more appropriate techniques for areas with heavy ground cover (cf. Spurling 1978, Lovis 1976). The rationale for this resurvey is to determine the reliability of the original quadrat survey's results in heavily forested areas. If resurvey indicates that previous results may be unreliable, adjustments should be made in the recommended mitigation programme. A sample of nine to 12 quadrats distributed among the development zones would be large enough to determine reliability.

Both survey and excavation techniques need to be combined in a testing programme for deep cultural deposits in lithic scatter sites. Finding these sites is crucial to linking technology with chronology and ecology: deep cultural deposits have a higher probability of preserving organic remains suitable for radiocarbon dating and/or species identification than do shallow deposits. A sample for testing should be selected to include all potentially endangered sites with high probabilities of having deep cultural deposits and a random sample

---

* No macroblade cores nor non-basalt cores have been found in upper Hat Creek valley, despite the numerous basalt and non-basalt macroblades and non-basalt microblades, which have been found.

4.2 INFORMATION RECOVERY - (Cont'd)

of potentially endangered sites which possibly have deep deposits. Each site should be tested by excavating approximately one to six 1 m x 1 m units downs to sterile sediments. Testing approximately 20 sites would be adequate.

Utilizing information gained through the above programmes as well as the assessment study should enable the designing of an excavation programme which addresses the specific problems of the research design adequately. With the presently available data, the programme is expected to include excavations of both cultural depressions and lithic scatters with deep cultural deposits to recover organic remains and to document technological and ecological variability. Test excavations at approximately eight to 12 sites would be sufficient to satisfy the suggested research design. Data analyses should examine both artifacts and organic remains (i.e. floatation, species identification). If suitable comparative collections for species identification are not available, they should be obtained.

The environmental field studies should comprise a description of the modern pollen rain and the modern vegetation communities (cf. Beil 1974; Brayshaw 1970) in archaeological zones whose environmental context may be disrupted or destroyed by the proposed development. Reclamation is unlikely to duplicate the current vegetation and pollen rain exactly, and these data are necessary prerequisites to reconstructing palaeoenvironments based upon palynological analysis for these zones. TERA Consultants Ltd.'s (1978) study is not detailed enough to determine the distributions and densities of edible plant species nor relationships between vegetation communities, climate and physiography in the upper Hat Creek valley. No study of the modern pollen rain has been done.

At present, only minimal archaeological investigations have been conducted at potentially endangered historic sites. Before a final recommendation for these sites can be made, a survey with test

4.2 INFORMATION RECOVERY - (Cont'd)

excavations should be conducted at a representative sample of sites. Approximately four to six sites should be selected randomly for further investigations, as well as at least one potential Indian homestead site and one coal mine site. Detailed notes should be made concerning historic architecture at these sites and a sample of surface artifacts should be collected in a manner suitable for subsequent analysis (see Donahue 1979). Where warranted by historic cultural deposits, limited excavations should be conducted at the sites within the survey sample.

Unless contradicted by the results of the recommended investigations, mitigative actions to preserve the constituent technological and unique values of the historic sites should include removal of representative historic farm machinery and implements to a nearby park. If EeRj 1 is established as an archaeological park or a developed visitors' centre, it would be the preferred location. Otherwise, if parks are established at either the Hat Creek Hotel or the Ashcroft Manor, the machinery should be moved to either of these locations. Similarly, the barn at EeRj 170 and the frame/log house at EeRj 210 should be relocated, if physically possible, as examples of homestead and local industrial architecture. Public architecture (e.g. churches, forts) are often preserved, while private architecture is neglected. These material components of every day life in rural British Columbia are equally worthy of preservation as cultural heritage items as are larger structures. These two buildings appear to be stable enough to withstand removal.

Mitigative actions to recover information of high technological value from historic sites should focus upon obtaining data concerning variations in agricultural technology necessitated by farming and/or ranching in an upland valley and data documenting the technological changes accompanying the shift from farming to ranching. Potentially unique information should be recovered from the coal mine sites (EeRj 207, EeRj 210, EeRj 213); and the extent of protohistoric deposits at EeRj 159 should be determined. These mitigative actions

4.2 INFORMATION RECOVERY - (Cont'd)

may be combined with the investigations recommended above to confirm tentative assessments of historic sites.

Dispersal of the local community is a direct impact of the proposed development which may have adverse effects upon local amateur artifact collections and upon local European oral history and ethnography. These resources have several high constituent values (see Table A6, Appendix A). Before the community is disrupted, I. Lehman's artifact collection should be documented and the locational data verified as much as possible. Also, data pertinent to European oral history and ethnography should be gathered from valley residents leaving the valley because of the proposed project and synthesized. These data should be curated so that they are accessible to the public and the scientific community.

If erosion develops, due to proposed project actions, at either Finney Lake or Aleece Lake which endangers the palynological record, then at least one complete core from each lake should be taken and stored for future analysis. Duplicate samples are desirable as checks on previous analyzes and as analyzable material for improved techniques which may be developed in the future. If resources inundated by reservoirs are observed to be adversely affected by the flooding, an information recovery programme should be designed for the highly appraised cultural heritage values.

4.3 INFORMATION DISSEMINATION

As compensation for cultural heritage values depreciated by the proposed development (as described in Part I of this study), valuable information should be disseminated to both the public and the scientific community. Minimally, press releases should be made available to various media throughout the duration of Phase III, the mitigation programme. At the conclusion of Phase III, consideration may be given to preparing a documentary for newspapers, magazines, radio and/or television which explicates the motivation for the assessment and mitigation studies, the methodology employed in the fieldwork and analyses, the substantive results and their value to the public's cultural heritage.

In addition, a general account of upper Hat Creek valley prehistory and history should be written in layman's language for the public and reproduced as a brochure or a similar soft-bound volume (cf. Bunyan 1978). These publications should be readily accessible to educational and recreational groups as well as individual members of the general public. If an account of the prehistory and/or history of the southern interior plateau is being prepared for the public by some individual(s) or agency, a substantial contribution to assure the inclusion of the upper Hat Creek valley in the general account may be an acceptable alternative to a separate publication.

A scholarly book or monograph series summarizing the scientific results of the investigations should be published. Several papers examining research problems concerning specific cultural heritage values of the potentially endangered resources should also be published in scholarly journals and/or presented at professinal meetings. To compensate further the depreciation of cultural heritage values, and to enhance the educational value of potentially endangered resources, a short (15 to 20 min) film or a packaged slide show with script should be made for use in university courses, and amateur and professional archaeological society meetings. The film or slide show should explicate archaeological methodology employed by the assessing and/or mitigating agencies for the Hat Creek Project and describe substantive results with their scientific and public values.

Depreciation of cultural heritage values can also be compensated, along with enhancement of values inherent in the Hat Creek Archaeological Project's artifact collection and archaeological records, through exhibits and teaching kits and/or guides. Three

4.3 INFORMATION DISSEMINATION - (Cont'd)

teaching kits are recommended so that each of the high constituent values depreciated by the proposed project are addressed (i.e. prehistoric technology, prehistoric ecology and historic technology as exemplified in the upper Hat Creek valley), though the three themes could possibly be condensed into one kit. These kits should be stored at an institution which can make them available to educational programmes upon request. A temporary exhibit should be developed on theme(s) suggested by the high cultural heritage values of the endangered resources, presented at least once in the Vancouver-Victoria population centre and once in the local study area, and stored for future presentations. The size and complexity of the exhibit may be determined by anticipated public interest.

In conjunction with the two initial presentations, public lectures on topic(s) relevant to the exhibit should also be sponsored. Finally, small permanent exhibits based upon the archaeology of upper Hat Creek valley should be prepared upon request from community groups in the local study area (e.g. local Indian bands, museums, community centres). A limit of four exhibits is suggested. (See Clouthier 1979 for details about information dissemination media for cultural heritage resources in B.C.)

SECTION 5.0 - SCHEDULE, STRUCTURE AND ESTIMATED COSTS OF RECOMMENDED MITIGATION PROGRAMME

Completion of assessment for unsurveyed proposed development components and unevaluated cultural heritage resources should have priority in scheduling: their results may demand alterations in the proposed mitigation recommendations. Monitoring should commence with construction and information recovery must precede activities which may have adverse effects upon the resources. Mitigative actions which enhance resources or which compensate depreciation of cultural heritage value may be initiated whenever sufficient information has been recovered to permit detailed designing of the actions. Most preservation measures should be concurrent with final design and construction of the proposed development components.

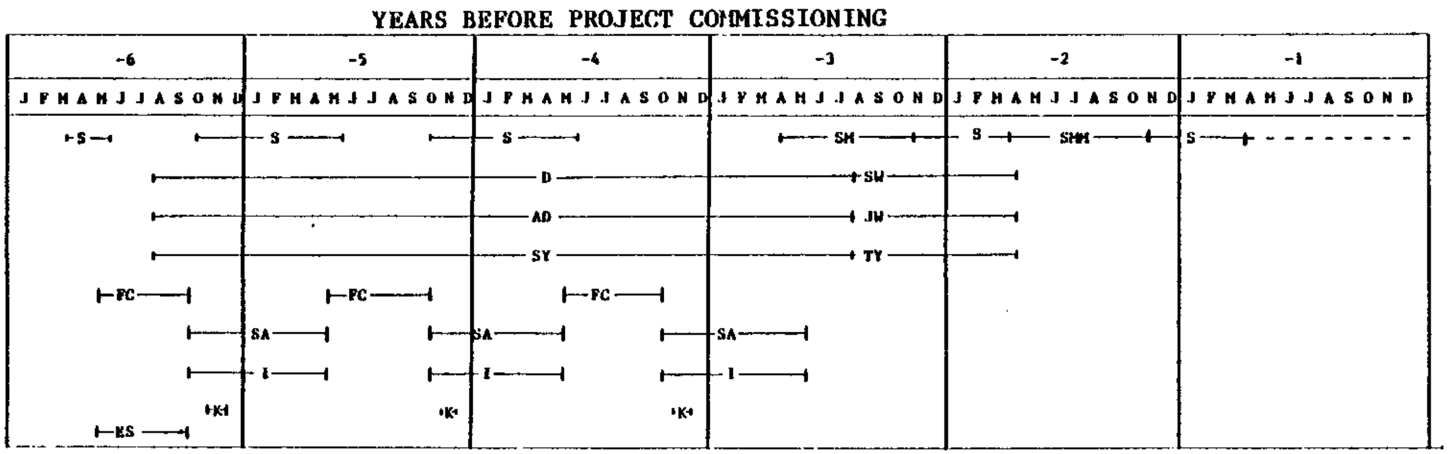
A 3-year information recovery programme coupled with a 1-year programme to produce a scientific monograph series and a series of scientific papers is recommended. Table 5-1 gives the suggested personal structure; and Fig. 5-1, the suggested schedule. Between 15 May and 30 September of each of the programme's 3 years, the field crew would assume monitoring responsibilities. In year 1, the following should be included in the field programme: 1) offsite facilities reconnaissance; 2) historic sites survey with test excavations; 3) forest quadrats resurvey; 4) reconnaissance for unique sites; 5) testing programme for deep cultural deposits; 6) intensive survey of unique sites; and 7) intensive survey and collection to complete representative sample. In years 2 and 3, the offsite facilities reconnaissance may be continued and the excavation programme, executed. Two years of excavation are recommended to allow thorough analysis and interpretation of initial results to assure the best selection of endangered archaeological sites to complete the excavation programme. This schedule may be compressed into 1 year of excavation, but a shortened schedule increases the risk of mismanaging the resources in

TABLE 5-1

PERSONNEL STRUCTURE FOR INFORMATION RECOVERY PORTION
OF RECOMMENDED MITIGATION PROGRAMME

	April 1-March 31	May 15-September 30	24 wks. between October 1-March 31	1 month between October 1-March 31
Year 1	1 Director 1 Asst. Director 1 Secretary (20hrs/wk)	3 Crew Leaders 12 Crew Members 1 Lab Manager 3 Lab Assistants 1 Cook 1 Camp Manager (20hrs/wk)	2 Student Assistants (10hrs/wk) 1 Illustrator (10hrs/wk)	1 Keypuncher
Years 2 and 3	1 Director 1 Asst. Director 1 Secretary (20hrs/wk)	2 Crew Leaders 6 Crew Members 1 Lab Manager 2 Lab Assistants 1 Cook 1 Camp Manager (20hrs/wk)	2 Student Assistants (10hrs/wk) 1 Illustrator (10 hrs/wk)	1 Keypuncher
Year 4	1 Senior Writer 1 Junior Writer 1 Typist (10hrs/wk)	---	---	---

Figure 5-1



LEGEND:

------ = Episodic Monitoring
S = Supervisory Monitor
SM = Supervisory Monitor plus 1 Assistant
SMM = Supervisory Monitor plus 2 Assistants
D = Director
AD = Assistant Director
SW = Senior Writer
JW = Junior Writer

SY = Secretary
TY = Typist
FC = Field Crew
ES = Environmental Studies (2 Botanists)
SA = 2 Student Assistants
I = Illustrator
K = Keypuncher

(cf. B.C. Hydro drawing no. 604H-Z30-X020001)

Suggested Schedule for Information Recovery and Monitoring Portions of Recommended Mitigation Programme the information recovery programme. A progress report should be issued at the close of each year detailing the programme's activities and substantive results.

A separate monitoring programme should be established for the times when the information recovery field crew is not available. Personnel should include a supervisor with previous archaeological and supervisory experience, and one or two monitoring assistants during periods of peak construction activity (see Fig. 5-1 for suggested schedule). The supervisor should be responsible for designing and implementing the educational programme for the proposed project's work force, under the guidance of the information recovery programme director. The heritage advisor post should be filled as quickly as possible.

No specific recommendations have been made for monitoring clearing of the proposed open pit mine: its sporadic, unpredictable and near-continuous schedule for 35 years makes constant monitoring unwieldy. A satisfactory solution may be found through coupling periodic checks by archaeologist(s) with "self-monitoring" by the construction crew. Archaeologists can be called in when a cultural heritage resource has been discovered, if the construction crew has been instructed upon recognizing the resources and implementing monitoring procedures.

Table 5-2 lists the estimated costs of salaries for the proposed information recovery programme and monitoring programme (excluding monitoring of clearing for the proposed mine).* Table 5-3 lists the estimated non-salary costs of the programmes. If a heritage advisor could not be found, it may be possible to pay a local resident of upper Hat Creek valley for similar part-time services. No estimates

---

* All costs based upon 1979 prices at the University of British Columbia. Prices vary among contractors.

TABLE 5-2

EXPECTED SALARIES FOR MONITORING AND INFORMATION RECOVERY
PORTIONS OF RECOMMENDED MITIGATION PROGRAMME

	# of Months Employed	Monthly Salary	Total Salary
1 Director/Sr. Writer	48	$2,017	$ 96,816.
1 Asst. Director/Jr. Writer	48	1,541	73,968.
1 Secretary (20 hrs/wk)	36	671	24,156.
1 Typist (10 hrs/wk)	12	290	3,480.
1 Supervisory monitor	40.5	1,203	48,722.
1-2 Monitoring Assistant(s)	21	1,047	21,987.
2 Student Assistants (10 hrs/wk)	36	250	9,000.
1 Illustrator (10 hrs/wk)	18	321	5,778.
1 Keypuncher	3	1,067	3,201.
3 Crew Leaders	31.5	1,203	37,895.
12 Crew Members	108	1,047	113,076.
1 Lab Manager	13.5	1,203	16,241.
3 Lab Assistants	31.5	1,047	32,981.
1 Cook	13.5	1,155	15,593.
1 Camp Manager (20 hrs/wk)	13.5	642	8,667.
2 Botanists	5	1,203	6,015.
		Sub Total	$ 517,576.
		10% Employee Benefits	51,758.
		Sub Total	$ 569,334.
		15% Overhead	85,400.
		Total	$ 654,734.

TABLE 5-3

NON-SALARY EXPENSES FOR INFORMATION RECOVERY AND MONITORING PORTIONS OF RECOMMENDED MITIGATION PROGRAMME

Subsistence		Equipment	
$5.00/person/day	$35,100		$3,000
2% overhead	702	15% overhead	450
	$35,802		$3,450
Vehicle Rental		Supplies	
	$48,666		$6,500
7% Sales Tax	3,407	15% overhead	975
	52,073		$7,475
2% overhead	1,041		
	$53,114		
Vehicle Operation		Travel Expenses	
$10/vehicle/day	$13,500		$4,000
15% overhead	2,025	2% overhead	80
	$15,525		$4,080
Services		Consulting and Analysis (no overhead)	
Duplicating/copying	$2,400		
Telephone/communications	1,700	Radiocarbon dating (15 samples @ $175)	$2,625
Shipping/postal costs	700	Computing time/magnetic tapes	6,000
	$4,800	Floral Analyses	3,500
15% overhead	720	Faunal Analyses	2,000
	$5,520		$14,125
		TOTAL = $139,091	

are made for recovering resources if they are endangered from the proposed reservoirs. Costs of retrieving and analyzing pollen cores from Finney and Aleece lakes, if the sediments are endangered, should be about $12 000.

Local artifact collections may be documented through a programme sponsored by the Archaeological Society of British Columbia. A crew of three persons could complete the task in 1 week. Their expenses would total approximately $1700. One researcher could recover and synthesize the endangered European oral history and ethnography into a typed, publishable report in approximately 1 month for about $1500.

No estimates are given for developing EeRj 1 into an archaeological park, since there is no precedent in British Columbia. Any plans for archaeological parks being designed by the Provincial Archaeologist's Office are in their incipient stages: no cost estimates are currently available. It is suggested that the Provincial Archaeologist's Office include EeRj 1 in their plans for future parks, and provide both design and cost estimates. Costs of miscellaneous information dissemination/enhancement measures for compensation are estimated in Table 5-4.

TABLE 5-4

ESTIMATED COSTS FOR MISCELLANEOUS ITEMS
IN RECOMMENDED MITIGATION PROGRAMME

Item	Source	Estimated Cost
1. Small archaeology exhibit at visitors' centre	R. Pearson, Museum of Anthropology, University of B.C.	$3,000 - $5,000
2. Moving structures #4 from EeRj 170 and #17 from EeRj 210 to EeRj 1	Nickel Brothers House Moving, Ltd., New Westminster	$7,500
3. Highway stop-of-interest signs Large Small	Provincial Archaeologist's Office Ministry of Transportation, Communication & Highways	$2,000 Materials- @ $30 Labour- ?
4. General account of UHCV archaeology for public		$1,200
5. Educational film of UHCV archaeology (20 minutes)	Eric Ellington, independent film-maker, Vancouver	$22,500
6. Temporary exhibit: 2 showings plus storage	R. Pearson, Museum of Anthropology, University of B.C.	$17,000
7. Small, permanent exhibits (4) for local study area	R. Pearson, Museum of Anthropology, University of B.C.	$13,500 - $21,5000
8. Two lectures		$475
9. Teaching kits/guides (3)		$1,500

SECTION 6.0 - REFERENCES CITED

Beil, C.E. 1974. Forest Associations of the Cariboo Zone, British Columbia. Syesis 7: 201-33.

Bunyan, D.E. 1978. Pursuing the Past: A General Account of British Columbia Archaeology. UBC Museum of Anthropology, Museum Note No. 4.

Brayshaw, T.C. 1970. The Dry Forests of British Columbia. Syesis 3: 7-43.

Clouthier, S.L. 1979. Report on the Public Appreciation and Educational Potential of Upper Hat Creek Valley Cultural Heritage Resources. Ms. on file, Laboratory of Archaeology, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Heritage Conservation Act 1977. Bill No. 77. Minister of Recreation and Conservation, Government of British Columbia.

Isaac, G.Ll. 1977. Olorgesailie: Archaeological Studies of a Middle Pleistocene Lake Basin in Kenya. Chicago: University of Chicago Press.

Lovis, W.A. 1976. Quarter Sections and Forest: An Example of Probability Sampling in the Northeastern Woodlands. American Antiquity 41:364-372.

Spurling, B.E. 1978. The Site C Heritage Resource Inventory and Assessment. Department of Archaeology, Simon Fraser University, Burnaby. Report submitted to B.C. Hydro and Power Authority.

TERA Environmental Resource Analyst Limited, 1978. B.C. Hydro and Power Authority, Hat Creek Project, Detailed Environmental Studies, Land Resources Subgroup, Physical Habitat and Range Vegetation Report. Report submitted to B.C. Hydro and Power Authority.

APPENDIX A

CONSTITUENT VALUES OF CULTURAL HERITAGE RESOURCES IN THE UPPER HAT CREEK VALLEY STUDY AREA

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 4	EeRj 9	EeRj 11	EeRj 12	EeRj 13	EeRj 14	EeRj 15	EeRj 18	EeRj 20	EeRj 21	EeRj 22	EeRj 23	EeRj 25	EeRj 26	EeRj 27	EeRj 28	EeRj 32	EeRj 33	EeRj 47	EeRj 48	EeRj 49	EeRj 50	EeRj 51	EeRj 52	EeRj 53	EeRj 54
Chronological information	1	1	3	3	0	0	0	1	3	3	0	1	0	1	1	0	0	3	0	0	3	3	0	1	1	0
Palaeoenvironmental information	-	-	-	-	0	0	0	-	-	-	0	-	-	-	-	0	-	3	-	0	1	-	-	-	-	-
Socioeconomic information	2	2	2	3	1	1	1	2	3	2	1	2	2	1	2	1	1	3	1	2	2	2	1	3	2	1
Technological information	4	2	3	3	2	2	2	2	2	3	3	2	2	2	2	1	2	4	2	3	3	3	1	3	2	2
Ecological *information*	3	3	3	3	1	1	1	3	3	3	3	3	2	2	2	2	2	3	2	2	3	3	2	3	3	3
Evolutionary information	2	2	2	2	0	0	0	1	2	2	0	1	0	0	0	0	1	2	1	0	2	1	0	1	1	1
Methodological development	3	2	2	2	3	3	3	2	2	2	3	2	1	2	1	1	1	4	1	3	1	1	0	3	1	2
Integrity	1	3	2	2	0	0	0	3	3	3	0	3	3	1	3	1	3	2	3	0	2	3	3	3	3	3
Uniqueness of resource	4	3	3	3	2	2	2	3	3	3	2	2	2	2	2	2	3	4	2	4	3	3	2	4	2	3
Education	2	3	2	3	1	1	1	1	3	2	1	2	0	0	0	0	0	2	0	0	1	1	0	3	1	1
Recreation	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0
Tourism	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Heritage	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Cultural heritage resource management	3	2	2	2	0	0	0	1	2	2	0	2	2	2	2	1	2	3	2	0	2	2	[illegible]	4	2	2

Constituent Values of Impact-Free Prehistoric Sites in Upper Hat Creek Valley

Table A1

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 57	EeRj 63	EeRj 64	EeRj 65	EeRj 66	EeRj 67	EeRj 69	EeRj 70	EeRj 71	EeRj 78	EeRj 80	EeRj 81	EeRj 82	EeRj 83	EeRj 84	EeRj 85	EeRj 95	EeRj 96	EeRj 97	EeRj 98	EeRj 99	EeRj 100	EeRj 101	EeRj 102	EeRj 105	EeRj 106
Chronological information	0	3	3	1	0	0	3	3	4	3	3	0	3	3	3	3	3	3	0	3	0	1	4	3	3	3
Palaeoenvironmental information	–	1	–	–	–	–	–	1	3	3	–	–	3	3	3	3	3	–	–	–	–	–	4	–	3	–
Socioeconomic information	1	3	3	2	1	1	3	2	4	3	2	3	4	3	3	3	3	2	1	4	1	2	3	2	3	2
Technological information	1	3	3	1	1	2	2	1	4	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3
Ecological information	2	3	3	2	1	1	3	3	4	3	3	3	4	3	3	3	3	3	2	3	2	2	3	3	3	2
Evolutionary information	1	3	2	1	0	0	2	2	4	2	2	1	3	2	2	2	2	2	1	2	1	1	3	2	2	2
Methodological development	1	2	2	1	0	0	2	4	3	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2
Integrity	1	1	3	3	2	2	1	1	3	3	2	2	2	3	3	3	3	3	3	3	3	0	1	2	3	3
Uniqueness of resource	2	4	4	2	2	2	3	3	4	3	3	3	4	3	3	3	3	2	2	4	2	2	3	2	4	3
Education	0	2	3	1	0	0	1	3	3	3	0	0	2	3	3	3	2	1	0	2	0	0	3	1	3	2
Recreation	0	0	1	0	0	0	0	0	3	1	0	0	1	2	2	2	2	1	0	1	0	0	2	0	1	0
Tourism	0	0	0	0	0	0	0	0	3	1	0	0	0	2	2	2	1	1	0	0	0	0	1	0	0	0
Heritage	0	0	3	1	0	0	0	0	3	2	0	0	2	2	2	2	2	0	0	2	0	0	2	0	2	0
Cultural heritage resource management	1	1	4	2	1	1	2	1	4	3	2	2	3	3	3	3	3	2	2	3	2	0	3	1	3	2

Table A1 - continued

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 108	EeRj 109	EeRj 110	EeRj 111	EeRj 112	EeRj 113	EeRj 131	EeRj 132	EeRj 133	EeRj 134	EeRj 136	EeRj 137	EeRj 138	EeRj 140	EeRj 141	EeRj 142	EeRj 143	EeRj 144	EeRj 145	EeRj 146	EeRj 147	EeRj 148	EeRj 149	EeRj 150	EeRj 151	EeRj 152
Chronological information	0	3	1	3	3	0	0	0	0	0	3	0	0	3	0	1	3	0	3	0	3	0	3	0	0	0
Palaeoenvironmental information	-	3	-	3	3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0
Socioeconomic information	3	3	2	3	3	1	1	1	1	2	3	2	1	2	2	2	3	2	2	2	2	2	2	1	1	1
Technological information	2	3	2	3	3	1	1	1	1	1	3	1	1	3	1	1	3	3	3	2	3	2	3	1	1	1
Ecological information	3	3	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
Evolutionary information	1	3	1	2	2	0	0	0	0	0	3	0	0	3	0	1	2	0	2	0	2	0	2	0	0	0
Methodological development	1	2	1	2	2	1	1	1	1	1	2	1	1	2	1	1	2	2	2	3	2	1	1	1	1	1
Integrity	3	3	2	2	3	0	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	0	3	3	3	1
Uniqueness of resource	3	3	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2
Education	2	2	0	2	2	1	0	0	0	0	1	0	0	0	0	0	2	0	1	2	0	0	1	0	0	0
Recreation	0	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Tourism	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heritage	0	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cultural heritage resource management	3	3	2	3	3	0	2	1	1	2	2	1	1	2	2	2	3	2	2	3	2	0	2	1	1	0

Table A1 - continued

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES												
	EeRj 153	EeRj 155	EeRj 156	EeRj 182	EeRj 184	EeRj 185	EeRj 196	EeRj 202	EeRj 203	EdRj 2	EdRj 3	EeRk 35	EeRi 12
Chronological information	3	0	0	2	0	0	0	3	3	3	3	4	0
Palaeoenvironmental information	0	-	-	-	0	0	-	3	3	3	3	3	-
Socioeconomic information	3	1	1	2	1	1	1	3	3	3	3	4	2
Technological information	3	1	1	2	2	1	1	3	3	3	3	3	1
Ecological information	3	2	2	2	1	2	2	2	3	3	3	4	2
Evolutionary information	2	0	0	1	0	0	0	2	2	2	2	3	0
Methodological development	2	1	1	1	2	1	1	2	2	2	2	2	1
Integrity	2	3	3	2	0	1	3	3	2	3	3	3	1
Uniqueness of resource	2	2	2	2	3	2	2	2	3	3	3	4	2
Education	2	0	0	0	0	0	0	2	2	2	2	3	0
Recreation	0	0	0	0	0	0	0	1	2	2	2	2	0
Tourism	0	0	0	0	0	0	0	0	1	1	1	1	0
Heritage	0	0	0	0	0	0	0	2	2	2	2	2	0
Cultural heritage resource management	3	2	2	2	0	0	2	3	3	3	3	4	1

Table A1 - continued

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 1	EeRj 5	EeRj 6	EeRj 7	EeRj 8	EeRj 10	EeRj 16	EeRj 17	EeRj 19	EeRj 24	EeRj 29	EeRj 30	EeRj 31	EeRj 34	EeRj 35	EeRj 36	EeRj 37	EeRj 38	EeRj 39	EeRj 40	EeRj 41	EeRj 42	EeRj 43	EeRj 44	EeRj 45	EeRj 46
Chronological information	4	1	3	3	2	3	0	2	1	3	1	0	1	0	0	0	0	0	3	3	0	2	3	0	0	3
Palaeoenvironmental information	3	–	–	–	–	–	0	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–	1	1	–	2
Socioeconomic information	4	2	1	2	2	3	1	2	2	2	2	1	1	1	2	2	1	1	2	2	1	3	2	1	2	3
Technological information	3	4	3	3	2	3	2	2	2	3	4	1	1	1	2	1	1	1	3	3	1	2	3	2	2	3
Ecological information	3	1	1	2	2	3	1	3	3	3	2	2	2	2	3	3	2	2	2	2	2	3	2	2	2	3
Evolutionary information	4	1	1	2	2	2	0	2	1	2	1	0	1	0	0	0	0	0	2	2	0	2	2	0	1	3
Methodological development	3	4	2	2	2	2	3	2	2	2	4	1	1	0	1	1	1	1	2	2	0	3	2	0	2	3
Integrity	2	2	2	3	2	3	0	3	3	3	1	2	1	0	3	3	1	1	3	2	1	2	2	1	2	2
Uniqueness of resource	5	4	3	3	2	3	2	3	3	3	4	2	2	2	3	3	2	2	2	2	2	3	2	2	2	3
Education	4	2	2	2	2	3	1	2	2	2	2	0	0	0	3	3	0	0	0	0	0	2	0	0	0	2
Recreation	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Tourism	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
Heritage	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cultural heritage resource management	5	3	2	2	2	2	0	2	2	2	1	2	2	0	2	2	1	1	2	2	1	3	1	1	2	3

Constituent Values of Potentially Impacted Prehistoric Sites in Upper Hat Creek Valley

Table A 2

CRITERIA EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 114	EeRj 115	EeRj 116	EeRj 117	EeRj 118	EeRj 119	EeRj 120	EeRj 121	EeRj 122	EeRj 123	EeRj 124	EeRj 125	EeRj 126	EeRj 127	EeRj 128	EeRj 129	EeRj 135	EeRj 139	EeRj 154	EeRj 157	EeRj 158	EeRj 159	EeRj 161	EeRj 162	EeRj 163	EeRj 164
Chronological information	3	1	0	0	0	0	2	0	0	0	3	2	1	3	0	0	0	0	3	0	1	4	0	1	3	3
Palaeoenvironmental information	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	3	0	-	3	3
Socioeconomic information	2	2	1	3	3	3	3	2	3	1	3	3	3	4	2	1	2	2	3	1	4	4	2	2	3	3
Technological information	3	1	1	4	4	3	2	2	2	1	3	2	2	2	1	1	3	2	3	1	2	5	1	1	3	3
Ecological information	3	2	2	3	3	3	3	3	3	2	3	3	3	3	2	3	2	2	3	2	3	3	2	2	3	3
Evolutionary information	2	0	0	0	0	0	1	0	0	0	2	2	1	3	0	0	0	0	3	0	0	4	0	0	2	2
Methodological development	2	1	1	3	2	2	2	2	1	1	2	1	1	3	1	1	2	3	2	1	1	3	1	1	2	2
Integrity	3	3	3	3	3	2	3	3	2	1	3	3	3	3	3	3	3	3	3	3	3	2	0	-	3	3
Uniqueness of resource	3	3	3	4	3	3	2	3	3	2	3	3	3	3	2	3	2	3	3	2	4	4	2	2	3	3
Education	2	2	1	3	1	1	1	0	2	0	2	2	2	3	0	0	1	2	3	0	2	4	0	0	2	2
Recreation	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	2	0	0	4	0	0	2	2
Tourism	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	1	1
Heritage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	1
Cultural heritage resource management	3	3	3	4	3	2	3	2	3	1	3	3	3	3	2	2	2	3	3	2	3	4	0	-	3	3

Table A2 - continued

CRITERIA EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 55	EeRj 56	EeRj 58	EeRj 59	EeRj 60	EeRj 61	EeRj 62	EeRj 68	EeRj 72	EeRj 73	EeRj 74	EeRj 75	EeRj 76	EeRj 77	EeRj 79	EeRj 86	EeRj 87	EeRj 88	EeRj 90	EeRj 91	EeRj 92	EeRj 93	EeRj 94	EeRj 103	EeRj 104	EeRj 107
Chronological information	4	3	3	1	3	0	3	0	1	0	2	0	0	3	0	3	0	0	3	0	4	3	2	0	0	0
Palaeoenvironmental information	3	-	-	-	-	-	-	-	-	-	-	0	-	-	-	3	-	0	-	0	4	-	2	-	-	-
Socioeconomic information	4	3	4	1	3	1	3	2	2	1	2	1	1	1	2	3	2	1	3	1	3	2	3	1	1	2
Technological information	4	3	4	1	3	1	3	2	2	2	2	2	2	2	2	3	2	2	3	2	3	3	3	2	2	2
Ecological information	4	4	4	2	3	2	3	2	3	2	2	2	2	2	2	4	2	2	3	2	3	3	2	2	3	2
Evolutionary information	4	4	3	1	3	0	2	0	1	1	1	1	1	2	1	2	1	1	2	1	4	2	3	1	1	1
Methodological development	4	3	4	1	2	0	2	0	2	1	2	1	1	1	2	2	1	1	1	1	4	2	2	1	1	1
Integrity	3	2	3	1	3	3	3	2	2	3	3	1	1	-	2	3	3	1	3	1	3	3	3	1	3	1
Uniqueness of resource	4	3	4	1	3	2	2	2	2	3	2	2	2	3	2	3	2	2	2	2	4	3	3	2	3	2
Education	4	2	3	0	1	0	1	0	1	0	1	0	0	0	0	2	0	0	2	0	3	2	2	0	0	1
Recreation	3	2	3	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0
Tourism	3	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Heritage	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3	0	0	0
Cultural heritage resource management	4	3	4	1	2	2	2	1	2	2	2	1	1	2	2	3	2	1	3	1	4	3	3	1	2	1

Table A2 - continued

CRITERIA EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES																									
	EeRj 165	EeRj 166	EeRj 167	EeRj 168	EeRj 169	EeRj 170	EeRj 171	EeRj 172	EeRj 173	EeRj 174	EeRj 175	EeRj 176	EeRj 177	EeRj 178	EeRj 179	EeRj 180	EeRj 181	EeRj 183	EeRj 186	EeRj 188	EeRj 189	EeRj 190	EeRj 191	EeRj 192	EeRj 193	EeRj 194
Chronological information	0	1	3	1	3	1	3	3	3	3	0	2	3	3	0	3	3	0	0	0	3	3	3	3	3	0
Palaeoenvironmental information	-	-	-	-	-	1	0	3	-	-	0	0	3	3	-	-	-	-	-	-	3	-	3	-	-	-
Socioeconomic information	1	1	3	2	2	2	3	3	2	2	1	1	3	3	1	3	2	1	1	2	3	2	3	2	2	1
Technological information	1	1	3	2	3	2	3	3	3	3	1	1	3	3	1	2	2	1	2	2	3	3	3	3	3	1
Ecological information	2	2	2	2	2	2	3	3	2	2	1	1	2	2	2	2	2	2	2	3	3	2	3	2	2	2
Evolutionary information	0	0	3	1	2	1	1	2	2	2	0	0	2	2	0	2	2	0	0	0	3	1	2	2	2	0
Methodological development	1	1	3	1	2	2	3	3	2	1	1	0	2	2	1	1	1	1	1	1	2	1	2	1	1	1
Integrity	3	3	3	2	2	2	3	3	3	3	0	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Uniqueness of resource	2	2	3	2	2	2	3	3	3	3	2	2	3	3	2	3	2	2	3	3	3	2	3	3	3	2
Education	0	0	2	1	1	2	2	2	2	2	0	0	2	2	0	2	2	0	0	0	2	1	2	0	0	0
Recreation	0	0	2	0	0	3	1	2	1	1	0	0	2	2	0	1	1	0	0	0	2	0	1	0	0	0
Tourism	0	0	0	0	0	2	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0
Heritage	0	0	0	0	0	2	0	1	0	0	0	0	1	1	0	2	2	0	0	0	1	0	1	0	0	0
Cultural heritage resource management	2	2	3	2	2	3	3	3	2	2	0	0	3	3	2	3	3	2	2	2	3	2	3	2	2	2

Table A2 - continued

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES													
	EeRj 195	EeRj 197	EeRj 198	EeRj 199	EeRj 200	EeRj 201	EeRj 204	EeRj 205	EeRi 7	EeRi 8	EeRi 9	EeRi 10	EeRi 11	EeRi 13
Chronological information	1	3	3	0	1	3	0	0	0	0	3	3	0	0
Palaeoenvironmental information	-	3	3	-	-	3	-	-	-	-	-	1	-	-
Socioeconomic information	2	3	3	1	3	3	1	1	2	2	2	3	1	1
Technological information	1	3	2	1	2	3	2	1	2	2	3	4	2	1
Ecological information	2	2	2	2	3	3	3	2	3	3	3	3	2	2
Evolutionary information	0	2	2	0	1	2	0	0	0	0	2	3	0	0
Methodological development	1	2	2	1	2	2	1	1	1	1	1	2	1	1
Integrity	3	3	3	3	3	3	1	1	1	3	3	2	1	2
Uniqueness of resource	2	3	3	2	3	3	3	2	2	2	3	3	2	2
Education	0	2	2	0	2	2	0	0	0	0	1	2	0	0
Recreation	0	1	2	0	0	2	0	0	0	0	0	1	0	0
Tourism	0	1	1	0	0	1	0	0	0	0	0	0	0	0
Heritage	0	1	1	0	0	1	0	0	0	0	0	0	0	0
Cultural heritage resource management	2	3	3	2	2	3	2	1	1	2	3	3	1	2

Table A2 - continued

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES								
	EeRl 1	EeRl 2	EeRl 4	EeRh 1	EeRh 3	EeRh 22	EeRh 25	EeRh 52	EeRh 53
Chronological information	0	0	0	3	4	-	3	-	-
Palaeoenvironmental information	-	-	-	1	4	-	3	-	-
Socioeconomic information	2	2	2	4	3	-	4	2	2
Technological information	2	2	2	4	3	-	3	-	-
Ecological information	3	3	3	2	3	-	3	3	3
Evolutionary inform information	0	0	0	2	3	-	2	-	-
Methodological development	1	1	1	3	3	-	2	-	-
Integrity	2	2	2	-	2	-	2	3	3
Uniqueness of resource	3	3	3	5	5	-	3	-	-
Education	2	2	2	3	3	-	3	-	-
Recreation	0	0	0	0	2	-	3	-	-
Tourism	0	0	0	0	2	-	3	-	-
Heritage	0	0	0	4	2	-	2	-	-
Cultural Heritage resource management	2	2	2	-	4	-	4	3	3

Constituent Values of Potentially Impacted Prehistoric Sites Situated Outside Upper Hat Creek Valley

Table A 3

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES												
	EeRj 89	EeRj 130	EeRj 160	EeRj 187	EeRj 206	EeRj 207	EeRj 208	EeRj 209	EeRj 210	EeRj 211	EeRj 212	EeRj 213	EeRj 214
Chronological information	1	3	0	2	2	2	3	2	3	3	2	2	3
Palaeoenvironmental information	2	2	0	1	1	1	1	1	1	1	1	1	1
Socioeconomic information	2	3	3	2	3	2	2	2	3	3	2	3	2
Technological information	2	2	3	2	3	3	3	3	3	3	2	2	2
Ecological information	2	2	3	2	2	2	2	2	2	2	2	2	2
Evolutionary information	1	1	0	1	2	2	2	2	3	3	2	2	3
Methodological development	2	2	2	2	2	2	2	2	2	2	2	2	2
Integrity	2	3	1	3	3	3	4	2	2	3	3	2	2
Uniqueness of resource	2	2	2	2	3	3	3	2	4	4	2	3	2
Education	1	2	1	2	2	2	2	2	2	3	2	3	2
Recreation	0	1	0	1	1	1	2	1	2	2	1	2	1
Tourism	0	0	0	0	0	0	2	0	2	2	1	2	1
Heritage	1	2	2	2	2	2	2	2	2	3	1	2	2
Cultural heritage resource management	2	2	3	2	2	2	3	2	3	3	2	3	2

Constituent Values for Historic Sites in Upper Hat Creek Valley

Table A4

CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES														
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15
Chronological information	4	4	1	2	1	2	2	2	1	1	2	1	1	1	3
Palaeoenvironmental information	3	4	1	2	1	2	2	2	1	2	2	2	1	1	3
Socioeconomic information	4	4	2	2	2	2	3	2	1	2	2	1	2	2	3
Technological information	4	3	1	3	2	3	3	3	2	3	2	1	2	2	3
Ecological information	2	3	2	2	2	3	2	2	2	2	3	1	2	2	4
Evolutionary information	3	4	2	2	1	2	1	1	1	1	1	1	1	1	2
Methodological development	4	3	3	3	3	3	2	2	2	3	3	2	2	2	2
Integrity	3	2	2	3	3	3	2	2	1	3	2	1	1	1	-
Uniqueness of resource	4	5	3	2	2	3	3	3	2	3	3	2	2	2	4
Education	3	4	2	2	2	2	3	3	1	2	2	1	1	1	3
Recreation	2	4	0	1	0	1	2	2	0	0	1	0	0	2	1
Tourism	1	3	0	1	0	1	2	2	0	0	0	0	0	2	1
Heritage	3	4	0	3	1	1	2	2	1	1	1	1	1	1	3
Cultural heritage resource management	4	5	2	2	2	2	3	3	1	2	2	1	2	3	3

Constituent Values of Archaeological Zones in the Local Study Area

Table A 5

CULTURAL HERITAGE RESOURCES														
CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	Zone 16	Zone 17	Zone 18	Zone 19	Zone 20	Zone 21	Zone 22	Zone 23	Zone 24	Zone 25	Zone 26	Zone 27	Zone 28	Zone 29
Chronological information	3	1	1	2	4	3	3	1	2	-	3	2	1	4
Palaeoenvironmental information	3	1	1	1	4	3	3	1	3	-	3	1	2	4
Socioeconomic information	3	3	3	2	1	3	3	2	4	-	2	3	2	4
Technological information	3	2	4	2	1	3	3	2	3	-	3	2	2	4
Ecological information	4	3	3	2	3	2	2	2	4	-	2	3	2	3
Evolutionary information	2	1	2	1	3	2	2	1	2	-	3	2	1	4
Methodological development	2	2	3	2	2	2	2	3	3	3	2	2	3	2
Integrity	3	3	3	2	3	3	3	3	2	-	1	1	3	1
Uniqueness of resource	3	2	4	2	3	2	2	3	4	-	2	3	2	4
Education	2	1	3	2	3	3	3	1	3	-	2	2	1	3
Recreation	2	0	1	1	0	2	2	0	2	-	3	1	0	3
Tourism	1	0	0	0	0	1	1	0	1	-	3	0	0	3
Heritage	2	1	1	1	0	2	2	1	2	-	2	2	1	4
Cultural heritage resource management	3	2	3	2	3	3	3	2	3	-	3	2	2	4

Table A 5 - continued

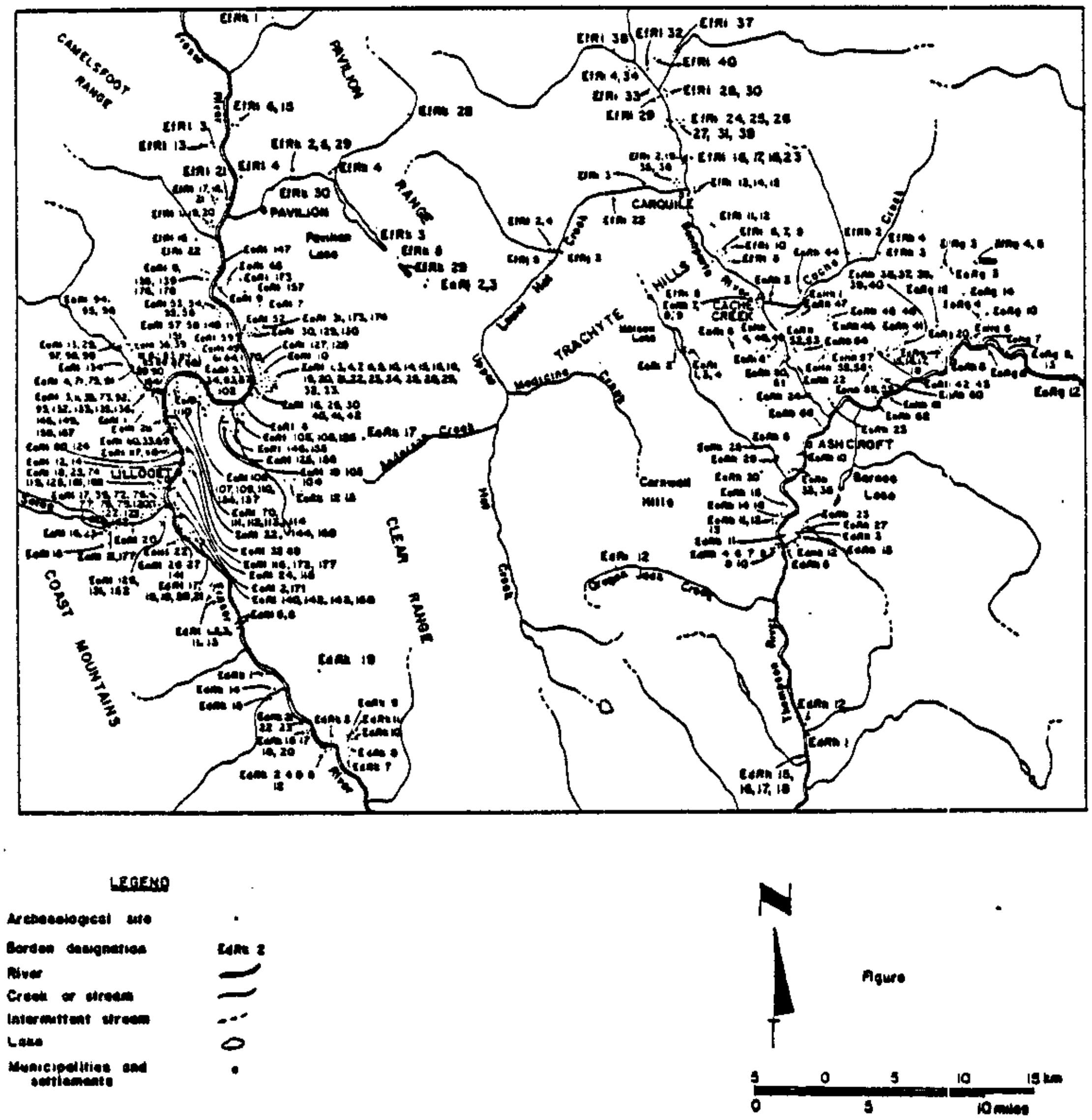
CRITERIA FOR EVALUATING CULTURAL HERITAGE RESOURCES	CULTURAL HERITAGE RESOURCES				
	European oral history	European ethnography	H.C.A.P. artifacts & records	Local artifact collections	Native ethnography
Chronological information	3	3	4	2	3
Palaeoenvironmental information	1	1	4	0	1
Socioeconomic information	3	3	4	2	3
Technological information	3	3	3	2	3
Ecological information	3	2	4	3	3
Evolutionary information	3	2	3	0	2
Methodological development	2	2	3	3	2
Integrity	3	3	4	3	2
Uniqueness of resource	3	3	3	3	3
Education	2	2	3	2	3
Recreation	2	2	2	2	2
Tourism	2	2	2	2	2
Heritage	3	3	3	2	4
Cultural heritage resource management	-	-	3	3	-

Constituent Values for General Categories of Cultural Heritage Resources

Table A6

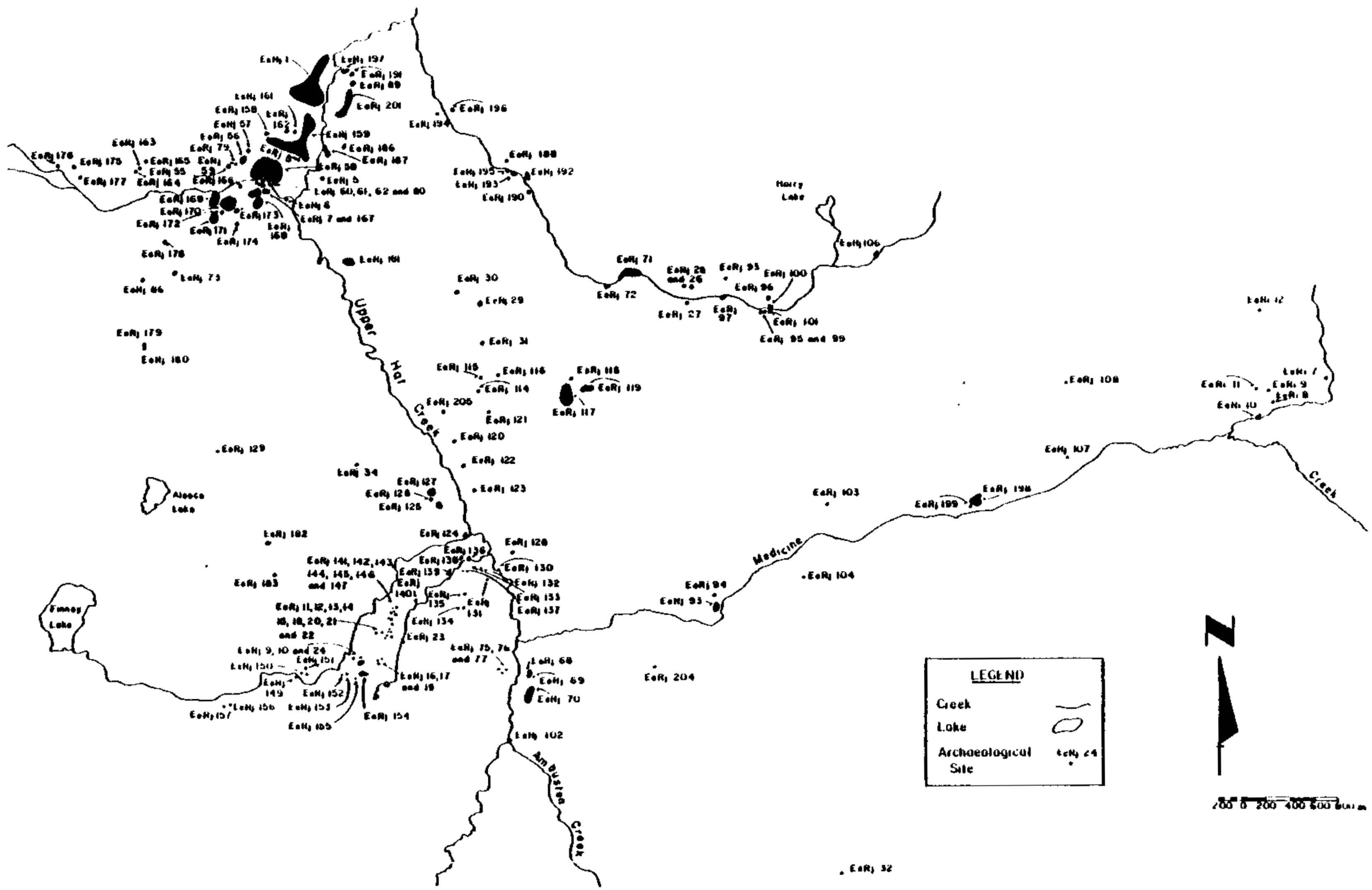
APPENDIX B

GEOGRAPHIC DISTRIBUTIONS OF CULTURAL HERITAGE RESOURCES IN THE HAT CREEK STUDY AREA



Distribution of Cultural Heritage Resources in the Local Study Area

Figure B1



Archaeological Sites Recorded in the North End of Upper Hat Creek Valley

Figure B2

APPENDIX C

1977 QUADRATS: PREDOMINANT VEGETATION

APPENDIX C

1977 QUADRATS : PREDOMINANT VEGETATION

P : parkland
OF: open forest
CF: closed forest

	Quadrat	Vegetation	Quadrat	Vegetation
Stratum A	1	OF	10	P
P = 5	2	CF	11	CF
OF = 3	3	OF	12	CF
CF = 10	4	P	13	P
	5	CF	14	P
	6	CF	15	CF
	7	OF	16	CF
	8	P	17	CF
	9	CF	18	CF
Stratum B	1	CF	10	P
P = 15	2	P	11	P
OF = 0	3	P	12	P
CF = 3	4	P	13	P
	5	P	14	P
	6	P	15	P
	7	P	16	P
	8	CF	17	P
	9	P	18	CF
Stratum D	1	CF	5	CF
P = 0	2	CF	6	CF
OF = 0	3	CF	7	CF
CF = 8	4	CF	8	CF
Stratum E	1	CF	14	P
P = 11	2	P	15	P
OF = 5	3	CF	16	P
CF = 30	4	OF	17	CF
	5	CF	18	CF
	6	CF	19	P
	7	CF	20	P
	8	P	21	P
	9	P	22	CF
	10	P	23	CF
	11	CF	24	CF
	12	CF	25	CF
	13	CF	26	P

P : parkland
OF: open forest
CF: closed forest

	Quadrat	Vegetation	Quadrat	Vegetation
Stratum E (cont.)	27	CF	37	CF
	28	CF	38	OF
	29	CF	39	OF
	30	CF	40	CF
	31	CF	41	OF
	32	CF	42	CF
	33	CF	43	CF
	34	CF	44	CF
	35	OF	45	CF
	36	CF	46	CF
Stratum H	1	CF	32	CF
P = 13	2	CF	33	OF
OF = 17	3	CF	34	OF
CF = 42	4	CF	35	CF
	5	CF	36	CF
	6	CF	37	P
	7	CF	38	P
	8	CF	39	CF
	9	CF	40	CF
	10	CF	41	OF
	11	CF	42	CF
	12	CF	43	P
	13	CF	44	P
	14	CF	45	OF
	15	CF	46	CF
	16	OF	47	CF
	17	CF	48	P
	18	CF	49	P
	19	P	50	P
	20	CF	51	CF
	21	OF	52	CF
	22	OF	53	CF
	23	OF	54	CF
	24	CF	55	CF
	25	CF	56	CF
	26	CF	57	CF
	27	OF	58	OF
	28	CF	59	OF
	29	CF	60	P
	30	CF	61	P
	31	CF	62	CF

P : parkland
OF: open forest
CF: closed forest

	Quadrat	Vegetation	Quadrat	Vegetation
Stratum H (cont.)	63	OF	68	OF
	64	OF	69	OF
	65	OF	70	P
	66	CF	71	OF
	67	P	72	P
Stratum I	1	OF	36	OF
P = 35	2	OF	37	OF
OF = 26	3	OF	38	OF
CF = 16	4	OF	39	OF
	5	OF	40	P
	6	OF	41	P
	7	OF	42	P
	8	OF	43	P
	9	OF	44	P
	10	P	45	OF
	11	P	46	CF
	12	P	47	CF
	13	OF	48	CF
	14	OF	49	OF
	15	OF	50	CF
	16	P	51	OF
	17	P	52	OF
	18	P	53	P
	19	P	54	CF
	20	P	55	CF
	21	OF	56	CF
	22	CF	57	CF
	23	P	58	CF
	24	P	59	OF
	25	P	60	P
	26	P	61	P
	27	P	62	CF
	28	P	63	CF
	29	OF	64	CF
	30	CF	65	OF
	31	P	66	P
	32	P	67	P
	33	P	68	P
	34	P	69	CF
	35	OF	70	CF

P : parkland
OF: open forest
CF: closed forest

	Quadrat	Vegetation	Quadrat	Vegetation
Stratum I (cont.)	71	P	75	OF
	72	P	76	P
	73	P	77	P
	74	P		
Stratum J	1	OF	22	OF
P = 9	2	CF	23	OF
OF = 14	3	OF	24	P
CF = 18	4	P	25	P
	5	CF	26	OF
	6	OF	27	CF
	7	OF	28	CF
	8	P	29	CF
	9	P	30	CF
	10	CF	31	CF
	11	CF	32	P
	12	OF	33	CF
	13	OF	34	OF
	14	OF	35	CF
	15	OF	36	CF
	16	P	37	OF
	17	P	38	CF
	18	P	39	CF
	19	CF	40	CF
	20	CF	41	CF
	21	OF		
Stratum K	1	P		
P = 3	2	P		
OF = 0	3	P		
CF = 0				

APPENDIX D

GROUP ASSIGNMENTS FOR ARCHAEOLOGICAL SITES RECORDED IN 1977

APPENDIX D

Group Assignments for Archaeological

Sites Recorded in 1977

Group 1

B13: I
B13: III
B13: IV
B14: II
B15: I
E15: IV
H22: I
I22: I
I22: II
I44: II
I47: I
I53: IV
I53: VI
I53: VIII
I57: I
I57: II
I57: III
I60: III
I73: III
I74: I
I74: IV
I76: I
I76: II
J4 : V

Group 2

E15: II
I45:I

Group 3

A8 : I
B14: III
I44: IV
I53: VII
I60: IV
I74: II
J4 : I
J4 : IV
J18: II
J18: IV
J18: VI
K2 : I
K3 : I

Group 5

B7 : I
I20: I
I60: VI
I60: VIII
I73: I
J18: VIII
J18: IX

Group 4

B13: II
B14: I
E15: III
H40: I
I10: I
I20: II
I28: I
I28: II
I36: I
I60: I
J4 : III
J4 : VI
J15: III
J18: I
J18: III
J18: V
J38: I
J38: II

Group 7

D6 : I
J15: I
J15: II
J18: VII
J22: III
J25: I
J33: II

Group 6

A1 : I
A6 : I
A8 : II
E10: I
E36: I
I20: III
I22: III
I23: I
I36: II
I44: III
I53: II
I53: III
I53: V
I53: IX
I53: X
I60: II
I60: V
I60: VII
I60: IX
I73: II
I73: IV
I73: III
J3 : I
J4 : VII
J22: I
J22: II
J33: I
K1 : I
K1 : II
K2 : II

APPENDIX E

GLOSSARY

archaeological site	-	Any area or location occupied as a residence or utilized by humans for a sufficient length of time to leave physical remains or traces of occupancy.
archaeology	-	A scientific discipline responsible for recovering, analyzing, interpreting and explaining the unwritten portion of the historic and prehistoric past.
artifact	-	A portable item modified by human action(s).
artifact location	-	An archaeological site whose artifacts do not attain the density of six items per 4 m^2.
assemblage	-	All those artifacts originating from the same archaeological site.
band society or social organization	-	A group of individuals whose social relationships emphasize egalitarianism and flexibility.
biface	-	A stone tool producted by removing flakes from both of its sides.
bipolar technology	-	A methods of manufacturing stone tools in which a nodule is placed on a stone anvil and struck with a stone hammer.

blade	-	A thin, parallel-sided flake whose length is usually more than twice its width and produced by a special technique of removal from the core.
borden designation	-	A site designation which ties the site into a nation-wide geographical location system.
cachepit	-	A pit dug into the ground in which to store goods or other materials; generally lined and covered.
chert	-	A conchoidally fracturing siliceous rock.
chronology	-	An ordering of artifacts and/or cultural features analogous to their inferred occurrence through time; often divided into named periods.
collection unit	-	In this study, a 2 m x 2 m square within a grid or transect which is the smallest unit of provenience for artifacts obtained by surface collection.
compensation	-	Renumeration for the depreciation or loss of cultural heritage value.
core	-	A piece of stone from which flakes are removed with the intention of using the flakes as tools.
cultural depression	-	A non-natural depression, often with a mounded rim, usually thought to be the remains of occupation or processing/storage structures.

cultural feature	-	The archaeological remains of a non-portable product of human activity, such as a structure, garbage dump or hearth.
debitage	-	The residual pieces of stone produced in stone tool manufacture, use and maintenance, which are not subsequently used.
Early Nesikep period	-	A period in the southern interior plateau chronology dated at 5000 B.C. to 8000 B.C.
earth oven or roasting pit	-	A pit dug into the ground, filled with stones and heated by fires to bake or roast food.
ethnography	-	A descriptive account of a modern-day or historically known society or a culture.
ethnohistory	-	An ethnography of a non-extant but historically known society or culture.
excavation	-	The scientifically controlled recovery of subsurface materials and information from an archaeological site.
faunal remains	-	The parts of animals preserved as archaeological remains, e.g. bones, teeth, antler.
floral remains	-	The parts of plants preserved as archaeological remains, e.g. pollen, charred wood, charred seeds.
graver or graving tools	-	Stone tools used to work wood, bone or antler.

grid - In this study, a 20 m x 20 m square superimposed upon an archaeological site for surface collection.

grinding stones - Stones used to process plant foods by grinding; generally have flat, abraded surfaces.

ground stone tools - Stone tools originally formed by removing flakes, but whose edges were finished by abrasion.

history - Those portions of the past for which there are written records and/or informants.

hunting and gathering economy - An economy based on the procurement rather than the production of food.

intentionally modified tools - Tools purposefully modified by their users, as opposed to tools accidentally modified during use.

judgemental sample - A method of sampling which is neither systematic nor random; also called purposive sample.

Kamloops phase - A phase in the Late Nesikep period dated at A.D. 800 to A.D. 1750.

Late Nesikep period - A period in the southern interior plateau chronology dated at 800 B.C. - the historic period.

lithic scatter	-	An archaeological sites which consists of stone tools and debitage strewn on the land surface.
macroblades	-	Large blades (greater than 10 mm in width).
mat lodge	-	A surface dwelling consisting of mats covering a wooden frame.
microblades	-	Small blades (less than or equal to 10 mm in width).
midden	-	Refuse heap from a past human occupation.
mitigation	-	Actions which reduce or eliminate the severity of adverse impacts.
Old Cordilleran Tradition	-	A period in the Pacific Northwest chronology dated at 8000 B.P. to 5000 B.P.
palynology, pollen analysis	-	A branch of science dealing with pollen and spores which provides a method of reconstructing Quaternary and post-Pleistocene vegetation successions in a region.
pithouse	-	A semi-subterranean dwelling with the excavated floor a few inches to a couple of feet below the ground surface.
prehistory	-	Those portions of the past for which there are no written records nor informants.
probability sampling or random sampling	-	A method of taking the sample which uses probability theory.

profile	-	A vertical cut made into a deposit of unconsolidated sediments to determine the stratigraphy of the deposit(s) and/or the development of soil horizons.
projectile point	-	A stone biface thought to head an arrow, dart or spear.
provenience	-	The two or three-dimensional coordinates of an artifact found during survey or during excavation.
quadrat	-	A square of topographic space derived from an arbitrarily defined grid system; in this study, each quadrat is 400 m x 400 m.
radiocarbon dating, C-14 dating	-	A method for determining the absolute age of dead organic materials by measuring the amount of low-level radio-activity of the remaining carbon.
reconnaissance	-	An initial survey of a general area which often does not involve artifact collection.
research design	-	A structure which is applied to data collection which orients the research towards answering questions of interest.
retouch	-	The intentional removal of flakes from the sides or edges of a stone in order to alter its shape.
rock pavement	-	Large cobbles placed tightly together to line the pit in an earth oven.

sample	-	A portion taken of a whole or a group to represent the group.
sampling frame	-	The enumerated list of individuals or items to be sampled.
settlement pattern	-	The spatial distribution of archaeological sites with respect to each other and the environment.
social group	-	A collection of individuals which can be defined on the basis of social relationships.
social organization	-	The system of interactions between individuals or societies (groups of individuals).
society	-	A group of individuals whose social relationships occur more within the group than outside the group.
stratigraphy	-	The sequence of natural and/or cultural deposits.
stratum	-	In random sampling, this refers to the subgroups resulting from the division of the original population to be sampled in such a way so as to increase the homogeneity within the subgroups for one or more variables.
subsistence	-	All human behaviour related to the provision of life's material needs.
surface survey or inventory	-	The systematic inspection of the land surface to locate archaeological sites.

territory, band or hunting	-	The geographic area whose resources a band consistently exploits and/or occupies.
transect	-	In this study, a 2 m wide rectangle of variable length superimposed upon an archaeological site for surface collection.
typology	-	A sorting of items into groups according to specified criteria such as size, shape and colour.
uniface	-	A stone tool produced by removing flakes from only one of its sides.
vitreous basalt	-	An igneous rock varying in colour from dark grey to black and in texture from granular to glassy.