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ARCHAEOLOGICAL OVERVIEW ASSESSMENT

FOR THE INVERMERE FOREST DISTRICT

Contract Report

Prepared for the Ministry of Forests, Inverrnere District

by

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1. Introduction

1.1 Objectives

This document comprises an Archaeological Overview Assessment (AOA) for the Invermere Forest District (IFD) in the northeastern portion of the Nelson Forest Region. It forms part of the work carried out under Major Service Contract 130053O/In97DIN-007.

Phase I of the project consisted of an analysis of the Five Year Development Plans to identify where Archaeological Impact Assessments (AIAs) would be required. This was carried out in July-August of 1996 and has been reported upon separately (Choquette and Yip 1996).

The primary objectives of the present study comprise Phases II and III: to define criteria that relate to the potential for parts of the landscape to contain archaeological sites and to stratify the IFD Landscape Units based on these criteria with an accompanying textual report and database. The project scheduling was disrupted by the very late start of impact assessments in the eastern part of the Nelson Forest District, with the result that a single report has been produced for these two phases. The criteria derive from the distillation of synthesized environmental, archaeological and ethnographic background information. The intent is that they can be applied within the existing planning framework by being used to predict the archaeological potential of IFD Landscape Units. Sections 2 and 3 of this report summarize the background information from which the predictive criteria are derived while the study methodology is described in Section 4. The criteria themselves are defined in Section 5 and are applied to the Landscape Units in matrix format The results of the stratification and recommendations for future work are discussed in Section 6.

1.2 First Nations Involvement

The Columbia Lake and Shuswap bands are headquartered within the IFD and maintain a strong interest in their traditional grounds now encompassed by the District. Both bands are affiliated with the Ktunaxa/Kinbasket Tribal Council, to whom the agency that carried out this project (the Kootenay Cultural Heritage Centre) is directly accountable. The Shuswap Band also has ties with the Secwepemc First Nation, represented by the Shuswap Nation Tribal Council. Discussions with representatives of SNTC have been ongoing throughout the duration of the project. Close communications were maintained with the Aboriginal Forestry Advisor, Lillian Rose, and issues of relevance to archaeology in the IFD have been discussed with Tribal and Band Council representatives and band members. Draft copies of this report were also submitted to these groups for their review and comment.

1.3 Personnel and Acknowledgements

Lillian Rose, Liaison Officer Aboriginal Affairs with the Invermere District, was instrumental in initiating and administering the overview contract and in facilitating access to background information. Russ Haas, Harvesting Manager, Timber and Kelly Loch, Operations Manager, Integrated Resource Management assisted with the commencement and continuation of the project, respectively. Wayne Choquette and Arlene Yip analysed the 1996 Five Year Development Plans and provided recommendations for impact assessments. The background research, development of the archaeological potential matrix and preparation of this report were carried out by Wayne Choquette.

Thanks also to Alfred Joseph and David Burgoyne of the Columbia Lake Band and Joe Thomas, Coordinator of the Native Resource Management Program, SNTC, for sharing their knowledge of the natural and cultural heritage of the lands encompassed by the IFD. I am most appreciative of the courtesy, interest and assistance of the staff of the Ministry of Forests Invermere District office. In particular Debbie Waterer, Richard Domini and Al Neil assisted in accessing data in the IFD office. Other individuals who provided information and resources to this study are Regina Shedd and Marvel Nash of the University of Calgary Gallagher Library of Geology and Geophysics and Dale Cormier, Head, Publications, Sales and Promotion of the Geological Survey of Canada. Finally, I would also like to acknowledge the encouragement and advice of Bill Horswill, Director of Forest Lands Management, SNTC and Doug Brown, Tribal Director of SNTC.

2. Environmental Background

2.1 Geology and Landscape Evolution

More than 1500 million years of complex geological history are represented by the rocks of the Invermere Forest District, beginning with sediments originating from erosion of a continent that was one of the earliest in Earth's history. Deposition in a shallow-water environment in which subsidence maintained equilibrium over a long period produced a thickness of at least 11,000 metres of fine-grained sediments (Reesor 1973). The Precambrian sequence is referred to as the Purcell System (ibid.). It includes the Aldridge, Creston, Kitchener-Siyeh, Dutch Creek and Mount Nelson formations and is dominated by argillite, impure quartzite and siltstone, succeeded by impure quartzite, argillite, slate and thin-bedded dolomites. As some of the sediments of the Aldridge Formation, the oldest known in the region, were being laid down, mineralizing fluids were extruded from vents in the sea floor in a fashion probably analogous to present-day fumaroles. This resulted in the deposition of mineral ores such as sulphides of iron, lead, and zinc and the alteration of adjacent rocks. A conspicuous and rather unusual product of this process was tourmalinite, apart from diamond the hardest stone in Canada.

Hundreds of millions of years later, the sediments were altered again, this time by the intrusion of granitic magma and associated contact metamorphism. Granitic intrusions in the Purcell Mountains have been dated by the potassium-argon method to ca. 700-800 million years ago. According to Leech (1962: 7), the intrusions and the accompanying metamorphism were associated with an episode of mountain building that was intermediate between the one whose erosion produced the Aldridge Formation sediments and a better known Mesozoic orogenic episode. This intermediate episode is referred to as the East Kootenay orogeny; it produced the Purcell platform or anticlinorium, a periodically emergent arch that persisted to Tertiary times (Wheeler 1966, Reesor 1973).

The positive land mass created during this period of uplift and regional metamorphism can be considered to be the ancestral Purcell Mountains. This was an area of apparently considerable relief, erosion of which produced coarse clasticsediments that were deposited as the Windermere System (Reesor 1973). The Toby and Horsethief Creek formations that comprise this system contain conglomerates, quartzite, slate, argillite and minor limestones. The basin of deposition of these formations deepened rapidly to the northward; the southern strata in the upper part of the section are a “red bed” facies due to high oxidation in a shallow deltaic zone.

During the Cambrian, the Purcell Anticlinorium began to subside. By late Early Cambrian time (ca. 550 million years ago), the only emergent landmass in this part of BC was the “Windermere High”, adjacent to which sediments of the Cranbrook and Eager formations and the Chancellor Group were deposited; they are only sparsely represented in the IFD. Following this, the entire, area was submerged and deposits beginning with coarse clastic sediments followed by the extensive sequence of carbonate and shale-carbonate sequences of the Jubilee (Ottertail) Formation, the McKay Group, the Glenogle Shales, and the Beaverfoot and Tegart formations lead Reesor to conclude that there was no nearby eroding landmass or emergent shoreline from the Early Cambrian to the Devonian (ibid.: 64). However, a coarsening of sediments indicated by the quartzites and quartz sandstones of the Mount Wilson and especially the Cedared, Harrogate, Mount Forster and Starbird formations and several unconformities in the Palaeozoic sequence (ibid.: 42-43) may relate to fluctuations of the marine transgression. Norford (1969: 3) identifies a period of warping, uplift and erosion correlative with a major Middle Silurian to early Devonian unconformity and documents a middle Ordovician facies change within this sequence.

The Purcell Mountains of today are primarily the product of the Early Cretaceous Columbian Orogeny (North and Henderson 1954); widespread associated metamorphism occurred during this period of mountain building, K-Ar dates on which range from 220 to 70 million years ago. The quartz monzonite and granodiorite intrusions of the Bugaboo, Horsethief and White Creek batholiths were emplaced at this time. The Rocky Mountains were uplifted during the later Laramide Orogeny about 50 million years ago. The Rocky Mountain Trench had formed by the Tertiary as a combined result of uplift of the adjacent mountains, downfaulting, and erosion by local watercourses (Schofield 1913, Holland 1964).

This mountainous region was extensively glaciated during the Pleistocene Epoch of the last few million years. While most of the stratigraphic record from earlier advances was destroyed by later glacial activity, deposits predating the last major advance have been identified in several localities in the southern Rocky Mountain Trench including the high terraces at the mouths of Dutch Creek and Horsethief Creek and probably also where the Kootenay River enters the Rocky Mountain Trench (Sawicki 1990). Radiocarbon dates from these deposits define an interglacial period, tentatively correlated with the Olympia Interglacial (Clague 1975), that spans the period from at least 40,460 + 440 to 21,500 + 300 before present in the Rocky Mountain Trench (Dyck et al 1965: Sawicki 1990).

During the latest major glacial episode, small glaciers originating in Purcell and Rocky Mountain cirques expanded and merged into a system of valley glaciers. Glacial till was deposited in the Rocky Mountain Trench at Wood River after 21,500 years ago (Fulton and Achard 1985: 5). By 17,000 years ago, a large southerly flowing ice stream occupied the Rocky Mountain Trench (Clague et al 1980). Clague (1973) identified three separate advances of this glacier. Interstadial glacial recession between the middle and late advances was of short duration and extent; lacustrine sediments were deposited only along the margins of the Rocky Mountain Trench and residual ice apparently remained in the centre of the trench (ibid.: 112).

Final deglaciation commenced about 15,000 years ago (Ryder 198 1) and parts of the upper Columbia River drainage became ice-free sooner than areas further west (Choquette 1996). A mechanism for this that has significant palaeoclimatic implications (see below) has been suggested by Clague (1989: 43): “The early retreat of mountain glaciers in some areas may have resulted from a reduction in precipitation in the eastern Cordillera due to growth of the Cordilleran Ice Sheet to the west. Ice covering the British Columbia interior may have depleted or diverted moist air masses that previously had flowed across the Rocky Mountains, making the air reaching that area rather dry. This, in turn, may have caused some local glaciers in the Rocky Mountains to retreat at a time when both the Cordilleran and Laurentide ice sheets were growing.”

Large lakes were ponded against the glacier’s sides during at least part of this advance (Clague 1973,198l) and a considerable thickness of stratified silt, sand, and gravel was deposited within them. At the highest elevations, these deposits were in separate lakes in tributary valleys but, at the south end of the IFD at least, such deposits could reflect a lake co-extensive with the huge branching Glacial Lake Missoula which dominated the late Pleistocene landscape of northwestern Montana and northern Idaho c.f. Bretz 1969, Choquette and Holstine 1982: 6-8).

After the latest advance, the Rocky Mountain Trench itself was occupied by large proglacial lakes dammed by moraines and melting ice blocks. Deposits in Glacial Lake Invermere have been identified in the Trench *from* 7 km south of Canal Flats as far north as Bluewater Creek north of Donald (Sawicki 1990). Based on the measured elevations of remnant delta surfaces, Sawicki identified two distinct phases of this lake: an initial phase at 900 m a.m.s.1. and a lower phase at 840 m a.m.s.1. (ibid.: 48-55). Fulton’s (1971) date

of 10,000 + 140 B.P. (GSC-1457) on peats near Oldman Creek about 4 km west of Donald provides an upper limiting age assessment for Glacial Lake Invermere and for the ice dam formed by the Trench glacier (ibid.: 55-56). This date also provides a lower limiting age assessment for the dissection by the Columbia River and its tributaries of the glaciolacustrine valley fill of stratified gravel, sand and silt,

Final drainage of the lakes was followed by post-glacial adjustments of surface topography in the most recent period, the Holocene. Several of the rivers underwent drastic changes in their flow regimes, contributing to the complex sequence of landforms that characterizes their courses through the Rocky Mountain Trench. Aerial photos of the vicinity of the Columbia River's headwaters record geomorphological features that can only be explained by the augmentation of the Columbia's northward flow by that of the Kootenay River. The Kootenay later changed its course and began its present southward flow in the Trench. The Kicking Horse River at one time conjoined with a southward flowing Beaverfoot River to form the headwaters of the Kootenay River, possibly at the same time as when the Kootenay formed the headwaters of the Columbia. The Kicking Horse subsequently cut a westward course, capturing the Beaverfoot and leaving the Kootenay underfit in its own trough. The combined loss at the Columbia River's headwaters of the Kicking Horse-Beaverfoot-and or-Kootenay would have had a significant impact upon the Columbia's hydrology. The drastically reduced Columbia River became underfit in its valley, no longer able to carry away the load of silt dumped into it by its tributaries as they cut through the valley fill adjacent to the river. Debris washed down by Dutch and Toby creeks partially dammed the Columbia River at its uppermost reaches to form Columbia and Windermere lakes. Further north, deposition of the Kicking Horse River fan caused the Columbia River to meander slowly through increasingly marshy terrain (Kelley and Holland 1961) creating the Columbia River wetlands.

Other terraces and fans were formed as the ancestral rivers carved channels and deposited sediments at various places and elevations in response to climatic variation. The flow of the Columbia River is strongly influenced by the amount of regional precipitation locked up as snow and ice, while its sediment load is dependant uponabsolute discharge, timing of floods, and the products of glaciation. The early millennia of the post-glacial period were characterized by increasing drought, a climatic interval known variously as the "Altithermal" "Thermal Maximum" or "Climatic Optimum". By 10,000 years ago, there was probably less glacial ice in the region than exists today and by 7000 years ago, it is doubtful if there were any glaciers at all in the surrounding mountains. Fluvial discharge would have coincidentally declined to a minimum in the upper Columbia system. The climate became cooler around 5000 years ago and cirque glaciers began to form again; this interval is known as the "Neoglacial". This trend towards cooler and moister conditions would have resulted in increased fluvial discharge, but it would not have been a constant, unidirectional trend.

Increased glacial activity is documented in the Rocky Mountains at the Columbia headwaters around 5000 and 2800 years ago, and during the Little Ice Age, from ca. A.D.

1650 - 1870, glacial ice in the upper Columbia drainage area reached its greatest extent in more than 10,000 years. There may also have been a second, albeit less severe, dry interval around 1000 years ago. Along other stretches of the Columbia and its tributaries, variations in flow and sediment load related to these climatic fluctuations created distinctive sets of erosional and alluvial terraces (c.f. Choquette 1985a Chatters and Hoover 1992), but data relating to the Columbia River's alluvial chronology in the Rocky Mountain Trench is too limited at this time to determine the degree of correlation with these better studied areas. A spruce log buried 1.5 m below the surface of the Columbia's alluvial floodplain at the head of Mud Lake yielded a radiocarbon date of 640 years before present (GSC 2410, Entech 1978: 3-12), providing at least an indication of the rapid rate of aggradation that has characterized that river's course in recent times, as well as the potentially young geological age of some of its associated features.

2.2 **Palaeoecology**

The evolution of the regional ecology is not yet well documented but like the geological history summarized above, it apparently has been very dynamic. Sediments in a borrow pit at the mouth of the Wood River in the Trench north of the IFD have been interpreted as overbank or floodbasin silts of a large river. These deposits contained abundant plant debris including pieces of wood identified as Populus balsamifera and Picea sp.; the latter dated 25,200 + 260 BP (GSC-1802) (Fulton and Achard 1985: 5). These data suggest that nonglacial conditions prevailed in the area 25,200 years ago and that the Rocky Mountain Trench in this locality was occupied by a river with a floodplain level 75 m above modern river level (ibid.). Along with the localities containing deposits of the Olympia Interglacial mentioned in the previous section, this information indicates that the survival of evidence of human occupation prior to the last glacial advance (if such did occurj is at least physically possible in the IFD.

The earliest postglacial vegetation in the region was the open community known as "steppe tundra" in the palaeoenvironmental literature. Prior to 10,500 years ago, a pioneer community of grass, sage, cattails and scattered conifers occupied slopes and ridges amongst the expanses of bedrock, lingering glaciers, and proglacial lakes ponded against them. This community was probably adapted to the cold dry conditions resulting, from the influence of the large glaciers still present on the British Columbia interior plateau and on the plains east of the mountain front (Choquette 1982, Clague 1989). Charred plant remains on an early floodplain of the Kootenai River in Montana (Mierendorf 1984) indicate that fne was already part of the regional ecology by 11,730 + 410 years ago. As the climate warmed after 10,500 years ago, coniferous forest invaded the valley bottoms and cloaked the mountainsides, forcing the steppe tundra community to higher elevations where remnants of it are hypothesized to survive today as refirgia. The trend to aridity and high solar insolation apparently peaked between 9000 and 7000 years ago. At this time, forest communities in the upper Columbia basin were simpler in composition and were characterized by pronounced altitudinal and latitudinal zonation (Choquette 1987a). Evidence of wildfire is more common in sediments dating to this time than in any other

part of postglacial time. At low to middle elevations, it would have favourtd sagebrush-grass savannah and fire climax Ponderosa pine. Douglas-fir and western larch parkland. Upper treeline rose considerably in the vicinity of the Columbia Icefield (Kearney and Luckman 1983). Further south, however. high elevation grasslands must have been prevalent, for many of species surviving today above timberline are part of the natural grassland communities on the floor of the Columbia Plateau to the south.

Before 7000 years ago, the climate was markedly continental, but around this date, a major change occurred when the maritime westerlies began to exert a significant influence (Choquette 1987a). The predominant trend in vegetal configuration became longitudinal and the crest of the Purcell Mountains became a major climatic divide. The western, windward slopes became cloaked with denser forests but on the lee side, grasslands and open forest persisted and even expanded in rainshadows located both in valley bottom and ridgetop settings. The latter circumstance facilitated the persistence of high elevation grasslands to the present day in some areas. In others, however, the persistent snow cover eliminated the vegetal cover that had previously held a rich blanket of loess in place. The resultant denudation of soil by wind and running water caused a great loss in the carrying capacity of high elevation habitats and the grasslands there now exist as 'islands' in a sea of bare rock and coniferous forest.

On the other hand, new plant communities began to develop in the storm tracks that now crossed the Trench downwind of major gaps in the Columbia Mountains. The maritime influence was apparently quite mild at first but by 5,000 years ago, however, a global cooling trend marking the beginning of the Neoglacial period had begun to affect the region. This cool, moist trend was accompanied by significant changes in the vegetation. Forest fire frequency declined, forests expanded at the expense of grasslands throughout the region and regional timberlines receded (Keamey and Luckman 1983). Cedar and hemlock pollen appears in core samples 4000-5000 years ago and becomes common after 3000 b.p. (Hebda 1995) as a whole community of maritime plants such as yew and devil's club became established at lower elevations. The climate may have become somewhat drier again within the last two millenia, reaching a second, albeit shorter and less intense drought interval between about 1500 and 500 years ago, when forest fire frequency again increased and grasslands expanded once more. The final episode in the region's palaeoclimate is the "Little Ice Age", the most severe glacial episode since the Pleistocene.

At the present time. the paucity of palaeofaunal data from the studv area limits our knowledge of the evolution of its wildlife populations. However, it is clear that such populations have not been static over time, and major changes in distributions have undoubtedly occurred. The following information is derived primarily from adjacent areas and should be viewed as a set of hypotheses to be tested by directed research within the study area. The strong emphasis on hunting that characterizes pre-7000 years before present (B.P.) tool assemblages, plus the focus of early Holocene human settlement patterns on ungulate ranges, certainly indicates an abundance of these large animals.

Data from Banff National Park c.f. Fedje 1986) demonstrate the importance of mountain sheep in the early precontact economy while certain features of the regional archaeological record, for example inferred game drives at Top of the World (Choquette 1985b) and shared meat portions in the Crowsnest Pass area (Driver 1982), point to communal hunting as the means whereby mountain sheep were procured during early postglacial times. The size and disjunct distribution of mountain sheep populations at the time of European contact strongly suggest that mountain sheep have declined drastically in numbers since the early Holocene. The primary cause of this population reduction was probably the Neoglacial decline in range due to erosion of the soil base of the high elevation grasslands and lower wildfire frequency with concomitant forest encroachment at lower elevations (Choquette 1987a).

Bison expanded into the Elk Valley and the southern Rocky Mountain Trench within the last 2000 years (Choquette 1987b), probably in response to enlarged grasslands associated with the dry interval around 1000 years ago. Bison remains from the southern Rocky Mountain Trench have been dated at ; a bison skull was reputedly found at Canal Flats. Heavy snowfalls and harsh winters of the Little Ice Age resulted in the extirpation of bison, antelope, and prairie chicken from the intermontane valleys west of the Continental Divide (c.f. Johnson 1969, Choquette and Holstine 1982).

Fluctuations in deer and elk populations in response to climatic variation have been documented in the archaeological and ethnohistoric records further south (c.f. Choquette and Holstine 1982). Elk populations in the vicinity of the Columbia River headwaters must have been considerable in the more recent pre-contact past, for in 1859 Hector observed that "elk or wapiti must at one time have been very numerous in this district, as we saw a great many antlers lying on the ground, and sometimes the Indians had piled them in heaps of 50 or 60 together" (Spry 1968: 459). A northward expansion of the range of whitetail deer is apparent from reports of Schaeffer's Ktunaxa informants (Schaeffer 1940: 16); this is probably related.to European land use practices.

Caribou were apparently more widespread at the time of contact than in more recent times in the mountains drained by the Kootenay,River (e.g. Schaeffer 1940: 26). While the impact of Europeans undoubedtly contributed to their decline, it is also likely related to climatic change at the end of the Little Ice Age. The mountains on either side of the Rocky Mountain Trench in the IFD thus probably supported significantly larger caribou populations during cool climatic cycles when wildfires were less frequent and their habitat more extensive.

Aquatic resources probably fluctuated considerably as well. Data from pollen profiles, soil and sediment sequences, forest fire chronologies, and glacial moraine positions have been synthesized into models of Holocene palaeoclimatology and palaeohydrology for the upper Columbia River drainage (Choquette 1985a, 19872) that are probably applicable to the upper Fraqer basin as well. These models cover the past 10,000 years and provide more detail than the larger scale climatic trends described previously; initially they have been used as a basis for predicting the Columbia's past salmon carrying

capacity. In composite, the models define a series of climatic cycles, each of about 2000 years duration. Within each cycle, climatically induced variations in fluvial discharge and sediment load would have affected salmon carrying capacity either positively or negatively. The peak of the t\ltithermal drought interval around 8000 years ago and the Neoglacial episodes ca. 2800 years ago and within the past three centuries probably affected salmon carrying capacity adversely. On the other hand, periods of high fluvial discharge and relative stability around 3.500 and 1500 years ago probably fostered large salmon runs..Archaeological evidence from elsewhere in the upper Columbia River basin suggests that during the latter two time periods, the region may have supported generally more extensive aquatic communities including large numbers of resident fish and waterfowl.

2.3 Modern Environment

The Invermere Forest District encompasses 1,018,351 hectares of predominantly mountainous terrain that includes part of the Rocky Mountain Trench and portions of the flanking west and east slopes of the Rocky and Columbia mountains. Elevations range from about 790 and 774 m a.m.s.1. in the Columbia and Kootenay Valley bottoms at the north and south ends of the district, respectively, to peaks over 3400 m a.m.s.1. in the Rocky and Purcell mountains. The climate can be characterized in general terms as modified maritime, with relatively hot and dry summers and cool winters with relatively abundant precipitation. However, the physiography and topography are such that there is significant climatic variation over relatively small distances. Along the Rocky Mountain Trench, local precipitation and maritime influence both vary due to rainshadow and storm track effects. In the adjacent mountains on both sides of the Trench, available moisture is greater and temperatures are cooler at higher elevations and along a south to north cline.

Typical of the upper Columbia River drainage, the IFD contains significant biodiversity, the classification of which reflects the distributions of temperature and precipitation described above. A hierarchical scheme of classification is employed to summarize the biogeography of the region [Dimarchi / Pojar?]. At the highest level are three "ecoregions" that correspond with the Rocky and Columbia Mountains and the intervening Rocky Mountain Trench. These are subdivided into ecosections that reflect general latitudinal environmental differences. In the IFD, the three ecoregions are represented by three correlative ecosections: the Southern Park Ranges, the Eastern Purcell Mountains, and the East Kootenay Trench (Quesnel and Thiessen 1993). Ecosections are made up of biogeoclimatic (BEC) zones which are in turn subdivided into subzones and variants based on (c.f. Braumandl and Curran 1992).

2.3.1 **Southern Canadian Rocky Mountains Ecoregion, Southern Park Ranges**

This ecosection is characterized by rugged mountains and long rivers with narrow valleys. The larger river systems are eroding deep deposits of glaciofluvi.al and glaciolacustrine drift. Bedrock consists of limestone, dolomite, calcareous shale, sandstone, schist, phyllite, and quartzite.

The cool, moderately dry climate reflects a strong continental influence that is manifest by the low elevation Dry Cool Montane Spruce subzone (MSdk) (Braumandl et al 1992: 80) characterized by hybrid white spruce and subalpine fir with minor amounts of Douglas-fir. Some Kootenay Moist Cool Interior Cedar-Hemlock variant (ICHmkl) forest occurs in the Beaverfoot and Kickinghorse valleys (ibid.: 122). Seral stands of lodgepole pine are common because of widespread wildfires; these also contain Douglas-fir and western larch at low elevations. Mid to high elevation are in the Dry Cool Engelmann Spruce - Subalpine Fir subzone (ESSFdk) (ibid.: 104). Alpine larch and whitebark pine occur at the upper timberline. At the north end of the IFD, the Alpine Tundra zone supports willows, mountain heather, broad-leaved willow herb, subalpine fleabane, Sitka valerian, kmmmholz trees and tree islands. To the south, however, high elevation grasslands are maintained on peaks and ridges in the rainshadows of higher peaks to the west.

Floodplains, riparian zones and grasslands at low elevations support populations of elk, whitetailed and mule deer, and bighorn sheep; moister parts of these areas are important habitat for moose, elk, whitetailed deer, black bear, and ruffed grouse. The MSdk subzone is important autumn and early winter range for deer, elk, moose, and bighorn sheep. Both climax and seral stages are very productive deer, elk, and moose summer range. Higher elevation forests dissected by avalanche tracks provide habitat for grizzly bear, elk, mule deer, and mountain goat. Southerly aspects in the alpine tundra are important for mountain goat, bighorn sheep, mule deer, and blue grouse; talus slopes in the high elevations have hoary marmot and rock ptarmigan.

2.3.2 Southern Rocky Mountain Trench Ecoregion, East Kootenay Trench

This is a broad flat glacial plain, underlain by deep Quatemay sediments, with small scattered lakes. The Columbia River bottom is characterized by extensive fluvial deposits. Low to middle elevations support a climax Douglas fir parkland; the semi-arid conditions at the Columbia River headwaters are reflected in the classification of an Undifferentiated Interior Douglas-fir (Windermere Lake) Unit (IDFun) (ibid.: 63) while in the Trench floor to the south and north the forest is classified as Kootenay Dry Mild Interior Douglas-fir variant (IDFdm2) (ibid.: 72). Mixed seral stands of Douglas-fir, western larch and lodgepole pine are common in the latter areas and some ICHrnkl is also present at the north end of the District.

Floodplains, riparian areas,and the Columbia River marshes are important habitat for waterfowl, elk, whit&led deer, mink~muskrat, black bear, and beaver. Young seral shrublands are utilized by elk, whitetailed deer, mule deer, bighorn sheep, and blue grouse. Fire climax IDFdm2 is very important winter range for mule and whitetailed deer, elk, bighorn sheep while the seral stands support a wide variety of animal species dependent on a mix of forest and grassland.

2.3.3 Columbia Mountains and Highlands Ecoregion, Eastern Purcell Mountains

The geological structure of the Purcell Mountains in the study area is characterized by northerly trending minor folds with steep east limbs and westward-dipping axial planes (Leech 1962: 4). This dominant northerly structural trend apparently was established well before the Montania interval and was reemphasized in the late Mesozoic mountain-building episode

This is mountainous terrain with high valleys and rounded shoulders with serrate peaks rising above extensive interconnecting ridges. Exposed bedrock and associated shallow to deep colluvium are the most common surface expressions. Glaciers are present on higher mountains, where there are deposits of moraine; glaciofluvial material is common on lower slopes.

In the low elevation rainshadows, the most common biogeoclimatic sequence is IDFdrn2 or MSdk, mid elevation ESSFdk with subalpine meadows, and high elevation Alpine Tundra. Moister areas have cedar-hemlock zones at lower elevations instead of Douglas fir or montane spruce. Seral stands include western larch and lodgepole pine at low elevations, extensive lodgepole pine at middle elevations and lodgepole and whitebark pine and alpine larch at high elevations. Avalanche tracks are common in upper elevation forests, extending from alpine areas into upper to mid elevation forest.

Low to mid elevation forested habitats support herds of whitetailed deer, elk, *moose,* grizzly and brown bear. High elevation forests support caribou, mule deer, marten, wolverine plus summer deer and elk range in subalpine meadows. Caribou utilize rolling parkland ridges while alpine tundra is habitat for mountain goats, golden eagles, and rock ptarmigan.

3. Cultural Context

3.1 Aboriginal Population

3.1.1 The Ktunaxa

Known as the Kutenai or Kootenay Indians in the ethnographic literature, the Kttmaxa are a culturally and linguistically unique group who have inhabited the region that now bears their anglicized name since early postglacial times. The cultural evolution of the Ktunaxa paralleled the evolution of the diverse regional ecology, so that by late precontact times, they comprised four geographically and linguistically distinct subdivisions. The Upper Ktunaxa, with whom we are concerned here, inhabited the Rocky Mountain Trench from Tobacco Plains north to beyond Golden, as well as the Rocky and Purcell mountains. The major ethnographic works on the Ktunaxa are Schaeffer (1940) and Turney-High (1941); Smith (1984) has compiled a recent synthesis.

The Upper Ktunaxa followed a nomadic seasonal subsistence round, the structure of which was determined by the location and scheduling of abundance and ripening of a

broad range of animal and plant resources. Although the upper Columbia River drainage area lacked the concentrated abundance of the areas downstream with regard to salmon and roots or the Plains with regard to bison, the great diversity of species that characterize this region was well utilized. The archaeological record suggests that this diversity served as a buffer against the effects of climatic change, contributing to the notable duration of the Ktunaxa's occupation (Choquette 1987b and c).

Turney-High (1941:122) observed that:

> Game was so abundant that the hunters could never make an impression on the animal population until they received firearms. No one ever was greatly concerned about getting enough for his family . . . One only needed to expend a reasonable amount of energy at work.

Because of the disappearance of resident bison during the Little Ice Age, the ethnographic literature contains no references to the local hunting of these animals, instead emphasizing the trans-mountain treks to hunt them on the plains. Other large ungulates, particularly deer and elk, were hunted singly with bows and traps and in communal hunts, mostly in the spring and fall. The latter provided the bulk of the meat that was dried and stored for winter consumption.

Caribou hunting was especially important in the spring as these animals were the first to' provide fat after the iean winter diet; the southern Purcells were significant caribou hunting grounds. Deer drives were conducted in riparian zones, for example floodplain islands, and, along with elk drives, continued through late spring. In summer, deer were taken via fire surround, deer and elk were driven to ambush, and moose, caribou, and mountain sheep were hunted. Licks were important ambush localities. In late summer, Ktunaxa bands travelled into and through the Rocky Mountains for major elk hunts. The elk were driven from higher elevations along the edge of the timber towards their runways at lower altitudes where they were shot as they ran past hunters stationed along their trails. The Palliser, White, and, as its name implies, Elk drainages were important elk hunting areas Hunting for bighorn sheep and mountain goat took place en route to these elk hunts. Mountain sheep were hunted along the Continental Divide and in the Columbia - Windermere lakes locality; they were driven over cliffs or into dense forest. Mountain goats were hunted at this time for hides as well as meat. Fall again saw deer drives and hunting of these animals with the aid of dogs. Elk and caribou hunting continued, especially for hides during the rut. Small groups of Upper Ktunaxa traversed the mountains on snowshoes in a winter bison hunt; elk were also hunted at this time. Upper Ktunaxa winter camps were located adjacent to major winter ungulate ranges where deer and elk hunting took place on snowshoes with the aid of dogs. Deer were driven out of yarding areas onto thin ice and up the narrow valleys leading from them. The Upper Ktunaxa also hunted moose: caribou, and mountain sheep during the winter, when they were lured into ambush or driven into snowdrifts.

While fishing was less important than hunting in the overall Upper Ktunaxa economy, it still made a major seasonal contribution. Turney-HIgh (1940: 52) indicates that in the spring, thousands of trout were taken by the Upper Ktunaxa in weirs fitted with basket traps and according to Schaeffer (1940), the Upper Ktunaxa used weirs and traps in the tributaries and larger lakes of the Columbia and Kootenay river systems to catch trout and charr as they moved upstream in spring and downstream in the fall, and during the rise and fall of flood waters. In the southern Rocky Mountain Trench, schools of suckers were trapped in small spring-fed lakes from late spring into summer. From late summer into fall, salmon fishing was undertaken further north by some Upper Ktunaxa families; the Brisco, Athalmere, and Fairmont Hot Springs localities were especially important. Later in summer, while some Upper Ktunaxa were en route through the Rocky Mountains, they harpooned charr moving downstream. Ice fishing was a very important late winter subsistence pursuit.

Although their territory lacked the huge root fields that were present on the fringe of the Columbia Plateau, what it lacked in concentrated plant resources, it more than made up for in diversity. The years first important plant foods were edible green shoots, especially balsamroot. Late spring began the really active gathering season, for roots such~as balsamroot, biscuitroot, mariposa lily corms, water parsnip, nodding onions plus green cow-parsnip stalks and leaf stems, and stems of water parsnip. Bitterroot digging was undertaken in root grounds located in arid localities. Other important late spring-early summer resources included avalanche lily corms followed by spring beauty corms and tiger lily bulbs, plus yampah, bugleweed, three-spot tulip, elk thistle, and Oregon grape. Pine cambium was removed from trees and eaten during this time of year as well. Mid to late summer saw a shift to berry crops: servicebenies, strawberries, soapberries, wild raspberries, blueberries, black hawthorn berries, thimbleberries, red-osier dogwood berries, wild gooseberries and currants were collected using baskets and special picking devices, starting at lower elevations and moving to successively higher elevations where other plant foods such as huckleberries and whitebark pine nuts were gathered as well. Also gathered in summer were black tree lichens, balsamroot seeds, and blue elderberries. Chokecherries were a very important late summer crop. In fall, a new set of berries ripened, including bog and high bush cranberries, rose hips, and kinnickinnick berries. While most winter subsistence was on stored food, some fall berries such as bog and high bush cranberries, kinnickinnick berries, plus rose hips and black tree moss were gathered to supplement the larder.

From late spring through early fall, game, fish, waterfowl, and plant foods such as roots and berries were acquired by task groups (for example, a group of women and children picking berries, accompanied by a few men who undertook casual hunting at the same time). Schaeffer (1940: 28-29) reports that in the cold season families from Tobacco Plains regularly journeyed up the Kootenay River and then down the Columbia as far as Golden to hunt elk and moose; they also hunted bighorn sheep around Columbia and Windermere lakes.

Periodic religious gatherings, attended by all Ktunaxa, were held at various locations throughout the region. The guardian spirit quest was also an important component of Ktunaxa religion and localities of spiritual energy were sought out as sites for vigils. Such sites included caves, rockshelters, and unusual geological formations, and occur throughout their territory. Burial was by simple interment, under a rock cairn; the dead were also exposed in trees or on scaffolds.

3.1.2 The Shuswap

Speakers of the Shuswap language, a division of the Salishan linguistic stock, occupied a large area of southern British Columbia centred on the Thompson and middle Fraser River drainages. Teit's 1909 and 1930 accounts of the Shuswap comprise the bulk of written data for that group.

While their economy included exploitation of a diverse range of plant and animal resources, the Shuswap settlement pattern was semi-nomadic with a strong riverine focus. Permanent settlements of semi-subterranean "pithouses" were occupied by groups of closely related families during the winter and early spring. These were situated close to the shores of the major rivers, usually on sandy, well-drained soil (Dawson 1892: 18; Teit 1900: 192). Associated with these winter villages were non-habitation features such as storage pits and sweat lodges. With the coming of spring, individual family units dispersed into the surrounding terrain in quest of ungulates, fish and plants. The time of maximum economic focus occurred during the summer and early fall when all groups would gather at fishing stations on the rivers for the annual salmon runs. Dawson (1892: 15) summarized the importance of the salmon resource as follows:

> Dried salmon . . constituted the sole winter staple. The right to occupy certain salmon-fishing places, with the annual visit tot these of the more remote families. and the congregation of large numbers of Indians at specially favourable places, largely influenced the life and customs of the Shuswaps.

Teit (1909: 523) describes a group of "almost completely nomadic Indians who live nearly in the heart of the Rocky Mountains, around the head waters of North Thompson River, the Yellow Head Pass, and Jasper House" whom he named the Upper North Thompson band: east and north [their hunting grounds] . . . include... part of the Big Bend of the Columbia, part of the Rocky Mountain region. Some of these people apparently became part of a group known as the Kinbaskets, who according to Teit (1909: 460,467), were named for Kenpesket, a North Thompson chief. Kenpesket's English name was Paul Ignatius Kinbasket and he was the son of Chief Yelhillna, who had begun the practice of seasonal migrations to the Columbia River from the winter village on Adams Lake (Dehart 1988: 6). Social problems at Adams Lake resulted in Kinbasket's group resettling themselves near pre-dam Kinbasket Lake around 1840. They gradually moved southward, camping near Golden and then Spillimacheen, where they encountered the Ktunaxa,

whose numbers had been significantly reduced by disease. The two groups subsequnetly intermarried and their descendents are members of the present-day Shuswap Band of Invermere. Other descendents of this group reside in the Neskonlith community near Adams Lake (Bob Manuel 1996: personal communication).

3.2 Archaeology

3.2.1 Previous Archaeological Investigations in the IFD

The first systematic archaeological survey in the Rocky Mountain Trench was a two-week examination of two localities by Charles Borden of the University of British Columbia in 1954 (Borden 1956). One locality was the Kootenay River valley from Bull River to the International Boundary while the second comprised the shores of Columbia and Windermere Lakes. Fourteen archaeological sites were recorded adjacent to Columbia Lake and the Columbia River immediately to the north. Borden noted that the occurrence of remains of pithouses (semi-subterranean earth lodges) indicated the presence of some group other than the Ktunaxa, since the Ktunaxa did not utilize such dwellings. He speculated that these remains were the result of inhabitation by Shuswaps. Borden also noted the predominance of small side-notched projectile points in the artifact sample from the Columbia-Windermere lakes locality when compared to the Kootenay Valley to the south. Borden assigned these artifacts to the Kinbasket Shuswaps, although he indicates that this group arrived around 1840 (Borden 1956: 74). The relative difference in projectile point distribution was subsequently proven to be the result of sampling bias: excavations in the Libby Reservoir to the south yielded numerous small side-notched points in open camps undoubtedly inhabited by the prehistoric Ktunaxa (Choquette 1987~). Borden also inferred a relationship between the pithouses and Kinbasket inhabitation, but given the recency of their arrival and the large number of these remains, it is unlikely that this small group could have been singly responsible for them. No evidence of early Holocene inhabitation was found, although Duff and Borden (1953) had previously published a description of a Scot&bluff-Eden spearpoint, a distinctive early type on the Plains, that had reportedly been found in the Windermere vicinity.

John Comer (1961) conducted an inventory of pictographs in British Columbia and included a description and illustration of several East Kootenay rock art sites including EaPw-1 on the southeast side of Columbia Lake.

In 197 1, a three day archaeological reconnaissance for the Archaeological Sites Advisory Board of BC (ASAB) was conducted of a small area south of Fairmont Hot Springs threatened with destruction by topsoil removal (Choquette 1971). One site previously recorded by Borden (EbPx-3) was surface collected, mapped, and test excavated and three additional sites (EbPx-14, 18, and 19) were recorded. The test excavation sampled a circular cultural depression 5 m in diameter with a shallow saucer-shaped cross section. Two stratigraphic archaeological components were identified, one associated with the pithouse and one associated with the pre-house sediments. The former component

included well-preserved elk skull fragments, non-diagnostic lithic artifacts, and a birch bark roll and was tentatively related to occupation by the Kinbaskets. The earlier component included an expanding stemmed projectile point fragment and, following Borden, was assigned to Ktunaxa inhabitation. One of the three new sites (EbPx-14) also contained pithouse depressions, but these differed from those of EbPx-3 in having deeper, bowl-shaped cross sections and in being situated on slopes rather than on the level terrace surfaces. It was speculated that these depressions might relate to occupation by a cultural group distinct from the Kinbaskets and Ktunaxa. A third site (EbPx-19) was situated on an alluvial fan adjacent to a bend in the Columbia River. Artifacts were found on the surface and on the eroding shore. Among those from the latter area were six notched pebble sinkers and a stemmed projectile point. The fourth site (EbPx-18) was situated on a high terrace overlooking the previous sites; it had been extensively disturbed by construction of a golf course. The archaeological remains at the Fairmont Hot Springs locality were assigned a Late Prehistoric age (i.e. within the last two thousand years) but in hindsight, this age assessment is unduly conservative, since stemmed projectile points like those found in the locality are now known to date' thousands of years older (Choquene 1987b). Unfortunately, two of the sites have since been almost completely destroyed without further investigation.

BC Hydro's 230 kv Canal Flats to Golden transmission line was surveyed for archaeological sites in 1974 by ASAB's Brian Spurling and James Pike (Pike 1974). Two pre-contact archaeological sites and the Historic 'Whiskey Trail" between Field and Fort Steele were potentially in conflict with the line but the exact location of the right-of-way had not been determined at the time. Pike mentions the potential for historic cairn burials to be found along the Whiskey Trail. The Canal Flats to Invermere section was re-examined by Aresco Ltd. in 1979, resulting in the discovery of five sites, four pre-contact and one post-contact (Wilson 1979).

As part of an archaeological inventory of provincial park reserves in the Kootenay Region, four park reserves on the east side of Columbia Lake were surveyed for ASAB in 1974 (Choquette 1974). A wide diversity of pre-contact sites were recorded (33 in total) including isolated finds, open camps and activity areas, cultural depressions, and rock art.

Two seasons of excavation were carried out in 1975-76 on the east side of Windermere Lake in locations that were being developed for recreational housing (McKenzie 1976a and b). This project was sponsored by the Windermere District Historical Society and supportedby funding from the Canadian Secretary of State through the Student Community Services Fund. EcQa-1, on the northeast side of Windetmere Lake, contained cultural depressions of various sizes; burials had been found there in the past. Excavations in a 5 m diameter depression revealed a packed floor and a cobble "lingin", but no artifacts. Six smaller depressions (ranging from 2.3 to 2.7 m in diameter) were situated adjacent to a small stream immediately below, and to the north of, the high terrace on which the larger depression was situated. One of the smaller depressions was excavated, its contents consisting only of charcoal. The second site, EcPx-5, was located at the margin of a high terrace south of Windermere Creek. A buried soil, developed in

ness and containing several hearths. was visible in the stratigraphy exposed at the eroded face edge. Two stratigraphic components were identified upon excavation, one associated with the Ahb horizon and the other with the Bmb. Both contained large quantities of fire broken rock, plus artifacts and bone. Two shallow hearths were apparently associated with the upper component. The recovered bone was poorly preserved and highly fragmented in both assemblages. Species represented include mountain sheep, deer: beaver, small mammal, and bird; freshwater mollusc shell was also found. Unfortunately, with the exception of a mule deer mandible from the upper component and a sheep mandible from the lower, the distribution of identified fragments is not specified. The lithic assemblage of the upper component was dominated by cryptocrystalline stone, most of it Top of the World Chert (c.f. Choquerte 1981). Microcrystalline stone, primarily siliceous siltstone but also including stone identified as basalt, was the most common lithic material represented in the lower component. The projectile points from the upper component were primarily side-notched with corner-notched forms secondary in frequency, while comer-notched points, and secondarily expanding stemmed points, characterized the lower component. McKenzie identified microblades at the site, but considering their infrequency, the lack of microblade cores, and the description oftheir platforms as facetted, the presence of a microblade industry at the site must be considered questionable. Charcoal samples were collected from both sites but funding was not sufftcient to have them analysed. No items of historic manufacture were found, so a terminal date of A.D. 1800 was suggested for occupation of the site (McKenzie 1976a: 10). On the basis of artifact cross-dating, McKenzie postulated a maximum date of two millennia (McKenzie 1976a: 1 1), but for the same reasons as cited above with regard to the Fairmont Hot Springs sites, a greater time depth is likely.

Lucile Campbell, one of McKenzie's students and a long-time amateur collector, prepared a report describing the artifacts in her collection, (Campbell 1980). Most of them were apparently found in the Fairrnont Hot Springs locality, particularly by searching in the piles of topsoil stripped during golf course construction. A wide variety of artifacts are described, including large pecked mauls and pestles, and flaked tools of a range of sizes and material types. The range of projectile point forms encompasses those dating within the last 8000 years on the adjacent Northwestern Plains (c.f. Vickers 1986) and Canadian Plateau (c.f. Richards and Rousseau 1987). Campbell also illustrated several distinctive earlier projectile points from her own collection plus two others found by Joy Bond of Invermere; the provenience of the latter specimens is not specified.

As part of studies associated with BC Hydro's proposed Kootenay Diversion Project, three archaeological surveys were conducted in the Rocky Mountain Trench from the head of the Libby Reservoir to Kinbasket Lake in the north. Entech Environmental Consultants and ASAB personnel briefly examined parts of the project area in 1977, in what was essentially an overview study (Entech 1978). During the following two phases of the survey, a total of 266 prehistoric sites were revisited or discovered. Reported descriptive information is sparse. The sites were classified as follows: general activity (176), circular cultural depressions (83), pictographs (4), isolated finds (6), and others (3). The Northwest Heritage Consultants study (Sneed 1979) presents a tabulation of site

type, size, condition. proximity to high water, and project sector. Interpretation consists of a brief discussion of the possible functions of various sizes of cultural depressions, in which it is speculated that depressions less than 2 m in diameter were probably storage pita, those between 2 and 4 m diameter were most likely food processing facilities, and those with diameters exceeding 4 m were probably housepits. The Aresco study (Wilson 1981) produced a tabulation of site characteristics and locational attributes. For example, sites containing pits of all sizes were most frequently located on feeder streams of the large lakes and there appeared to be some tendancy for cultural depressions to be situated near marshes. Unfortunately, neither of these studies took into account the Columbia River's complex palaeohydrology - for example, it was not considered that these marshes could have been created by the Columbia's rising hydrologic baseline after the depression sites had been abandoned, so this could be a spurious relationship. In addition, low-lying areas immediately adjacent to the Columbia River were not targetted for examination, producing a potentially large negative skew in the site inventory.

In response to subdivision and housing development at the southeast end of Columbia Lake, two seasons of excavation were carried out at EaPw-1 (Mobs 1981, Yip 1982). The project was funded by the BC Heritage Conservation Branch (ASAB's successor) and involved surface collection, shovel testing, and test excavation. The latter effort concentrated on sampling cultural depressions in addition to testing the contents of deposits at the base of a pictograph panel. A considerable amount of cultural material was encountered, in spatially discrete occurrances suggesting temporally anndlor functionally ~segregated occupations. The continuity of cultural deposition in the upper 30 cm led Mohs (1981: 10) to suggest that there were no major breaks in the occupation of the site. Excavation of a rimmed 3.5 m diameter cultural depression, inferred to be a "roasting pit", encountered a possible post-mould that yielded a radiocarbon date of 480 + 80 (SFU 80) while the 1981 project obtained a date of 830 + 160 (SFU 202) on a similar feature. A date of 800 + 80 (SFU 79) was obtained on charcoal collected from a hearth within a cultural depression 8 m in diameter. Excavation of this depression revealed two archaeological components, the date relating to the more recent. On the basis of the spatial distribution of artifacts at the site, Mohs inferred two components. The later deposits occur over much of the site area and are characterized by predominance of side-notched projectile points and cryptocrystalline stone; they are assigned to the Late Prehistoric period, which Mohs dates at A.D. 500 - 1800 (Mohs 1981: 99). The earlier , component is associated with occupation of the cultural depressions and accounts for 80% of the "basalt" recovered at the site as well as all but one of the comer-notched points. Comer-notched points occurred in the deeper cultural deposits sampled by Yip the following year (Yip 1982: 135) and a radiocarbon date of 1700 + 600 (SFU 201) was obtained from them. The "basalt" noted by Mohs was later identified as a siliceous siltstone (Kullar 1982); this material was the predominant Iithic material in the deeper deposits sampled by Yip (1982: 92). A third component at the site, although not specifically identified as such by Mohs or Yip, was that represented by a date of 3 160 + 100 (SFU 78) and two atypical projectile points. This component was encountered during excavations at the base of a pictograph panel at the eastern boundary of the site. Although Mohs (198 1: 93) states that this establishes a date for the painting of the pictograph panel,

it must be noted that one the more striking panels depicts people with bows. The bow and arrow are generally recognized to have diffused into southern Canada some time after the beginning of the first millenium of the Christian era (e.g. Vickers 1986: 74), so at least some of the pictographs at the site are not coeval with the radiocarbon date.

In response to Fairmont Hot Springs Resort's proposal to create a new golf course and recreational housing complex adjacent to the Columbia River, Shawn Haley conducted a heritage resource impact assessment for Mercon Engineering in 1983 (Haley 1983). Three previously recorded archaeological sites were cursorily examined: two of them (EbPx-29 and 59) contained cultural depressions while the third (EbPx-60) was a large open camp. Unfortunately, Haley was not aware of the Salish presence in the Columbia Valley despite its widespread discussion in the literature, and~wrote off all three sites as being insignificant.

Upgrading the highway access to Athalmere-Invennere was preceded in 1986 by salvage excavation of EdQa-8, a precontact site situated near the margin of the high terrace overlooking the outlet of Windermere Lake (Bussey 1986). Excavations under contract with the Archaeology Branch focussed on two tire broken rock concentrations; the resultant yield included lithic artifacts and bone as well as post moulds. The features, which were radiocarbon dated at 2130 + 70 (Beta 16902) and 2360 + 80 (Beta 16903), are interpreted to be hearths as opposed to food processing pits. A wide range of artifacts were recovered; comer-notched forms greatly predominate the projectile point sample. The large majority of bone recovered was highly fragmented, unidentifiable pieces. Identified bone included that of elk, deer, wolverine, lynx, bird, and fish (suckers).

A number of archaeological sites have been recorded in parts of the IFD during sporadic archaeological surveys. Site concentrations have been documented in the Premier Ridge, Whiteswan Lake, Top of the World and Middle White River areas. Numerous campsites, workshops and a quarry were recorded in 1975 on and around Premier Ridge during a systematic survey of two localities in the Rocky Mountain Trench (Choquette 1976). Subsequent excavations in Premier Lake Provincial Park documented three separate components baaed on exploitation of crystalline quartz, tourmalinite, and Top of the World Chert. The second surveyed locality was the Cartwright Lakes area on the west side of the Trench further north, in contrast to the Premier Ridge locality, only one small lakeside temporary camp was found in this more heavily forested area.

A large campsite complex is situated at the east end of Whiteswan Lake and a continuous precontact cultural deposit characterizes the trail along the north side of Alces and Whiteswan lakes that includes pictographs and a quarry in addition to camps and activity areas. The presence cf stone from Top of the World as well as the Purcell Mountains and the Kananaskis valley indicates the importance of this travel corridor in precontact times (Choquette 1996a).

A very high site density associated with precontact quarrying and hunting has been documented in the Top of the World locality (Choquette 1973b, 1974a, 1975a, 198 1,

1985b; Brown and Lundborg 1976, Robertson et al 1992). More than 80 sites have been recorded, including camps, cairn complexes, quarries, and numerous workshops in the alpine zone plus camps and workshops in forested lower elevation settings. In anticipation of logging, a brief survey was undertaken along the middle fork of the White River (Choquette 1977). Six precontact sites were recorded, including camps on alluvial fans and river terraces, a quarry on a glaciated bedrock ledge, and a trail through the Pass in the Clouds which connects the White and Elk drainages at 2623 m a.m.s.1.

Archaeological sites have been recorded at forest recreation sites at Monroe Lake on the Bull River - White River divide, at the Kootenay - White River confluence and at Findlay Falls (Choquette 1996b). The latter area contains a significant site concentration with evidence of,multiple activities as well as travel through the Purcell Mountains.

Archaeological work prior to forest industry activities prior to 1996 has been restricted to the brief reconnaissance of Brown and Lundborg (1976). Systematic pre-harvesting impact assessments began in the IFD in 1996, resulting in the recording of 3 precontact sites in the Kootenay Valley northeast of Canal Flats and a large site with evidence of considerable antiquity in the Whitetail Brook corridor (Choquette 1996b).

3.2.2 Archaeologicai Investigations in Adjacent Regions

There have been few archaeological investigations conducted in the mountainous areas of the upper Columbia drainage adjacent to the IFD. Archaeological surveys and excavations in Canada's *mountain* national parks have been ongoing since the 1960s and a large information base has been established for the Rocky Mountain Parks. Support for analysis and management of the archaeological resources, both tangible (the sites and artifacts themselves) and intangible (the information base derived from them), of these parks, especially Banff, far exceeds that which characterizes the present Provincial management framework. Tbe results of archaeological work in the Columbia drainage national parks are summarized below while the culture history sequence for Banff National Park is included in the following section.

A crew from Simon Fraser University surveyed Bald Ridge and parts of the Rogers Pass corridor in Glacier National Park in 1971, with negative results (Crowe-Swords 1971). The Tram-Canada Highway section of Glacier National Park have been rather intensively examined by Canadian Parks Service archaeologists in recent years (e.g. Sumpter and Perry 1987); numerous historic sites have been recorded, but no precontact sites have been found.

A comprehensive archaeological survey of Kootenay National Park was conducted in 1987 by the Kootenay Cultural Heritage Centre under contract with the Canadian Parks Service (Choquette 1988). Sixty-three prehistoric sites were recorded in a wide range of settings, from alluvial terraces of the Kootenay River through high glaciolacustrine terraces to arretes at timberline on both the Continental Divide and the divide between the Kootenay Valley and the Rocky Mountain Trench. Most sites occurred within the

montane ecozone. but there were also significant site clusters associated with the ponderosa pine-bunchgrass habitat on the east side of the Rocky Mountain Trench, the high elevation grasslands at the head of Kindersley and Sinclair creeks, and the upper timberline-alpine zone in upper Tokumm Creek at the extreme north end of the park. The results of this project demonstrated that human presence in the park was more extensive and of greater time depth than had been thought previously. In addition to being an area traversed on horseback en route from the Rocky Mountain Trench to the plains during the contact period, it was found that the upper reaches of the Kootenay drainage had been the scene of several discrete periods of systematic resource exploitation. Game and mineral resources had supported human activity in different localities at different times over the past 10,000 + years. The presence of human groups tied culturally to the east slope of the Rockies, the southern Rocky Mountain Trench, and the Fraser Plateau was identified.

The Kootenay Park survey was followed in 1988-89 by the Kootenay Cultural Heritage Centre's inventory of Yoho National Park, also under contract with the Canadian Parks Service (Choquette and Fedje 1990). This study dealt primarily with historic sites, a large number of which had been previously recorded by Parks personnel, but it also included some pre-contact archaeological survey and test excavation. The numerous historic sites were related to construction and operation of the Canadian Pacific Railway, mining, logging, and recreation, in that order of frequency. Transmountain travel accounted,for most of the eleven precontact sites. An upper component containing butchered bison bone and a stratigraphically discrete lower component yielding black quart&e flakage were the respective hallmarks of two occupations at the Emerald - Kicking Horse confluence. In addition, a significant resource exploitation focus was discovered in the Lake O'Hara basin where the presence of crystalline quartz debitage links these sites with the high elevation site focus at the extreme north end of Kootenay National Park mentioned previously.

3.2.3 Culture History

The archaeological record is subdivided by archaeologists into time periods and cult&al units based on observed differences in the material obtained via archaeological investigations. The most common approach is a sequence of periods, variously subdivided into complexes, traditions, or phases based primarily on the presence or frequency of certain "diagnostic" artifacts, usually projectile points. The following sections summarize the culture history sequences for the adjacent Plains and Plateau regions, followed by a more detailed discussion of the upper Columbia sequence.

3.2.3.1 Northwestern Plains East Slope of the Rocky Mountains

The Northwestern Plains sequence is subdivided into the Early, Middle, and Late Prehistoric periods (Vickers 1986). Within this scheme, Fedje (1988) has defined a sequence of phases group into four larger constructs based on extensive work in Banff National Park. Because of the proximity of BNP to the IFD, its sequence is examined in some detail.

The Early Prehistoric Period (ca. 10,000 - 7500 B.P.) is defined by the presence ofpoints assumed to have been hafted on thrusting or stabbing spears. The earliest recognized evidence of human occupation is associated with Clovis fluted and basally thinned spearpoints designed for hafting onto split shafts. Fedje's Banff I incorporates surface finds of these types of points from a site at Lake Minnewanka and an excavated component from the Vermilion Lakes site that yielded radiocarbon dates ranging from ca. 10,750 to 10,740 B.P. The litbic technology is based on removal of lamelhir flakes from relatively small high angle tabular cores. A strong preference is displayed for local black chert from the lower Livingstone and upper Banff formations. Non-local stone consists of a single specimen closely resembling Top of the World Chert. The limited fauna1 remains from the Vermilion Lakes site indicate hunting of sheep and secondarily, bison. Fedje infers a strongly local, mountain valley hunter-gatherer adaptation characterized by little movement or contact beyond the area of the local seasonal round.

On the Plains, Agate Basin points are considered to represent a group who followed Clovis in the period ca. 10,000 - 9500 B.P. A specialized group of Plains bison hunting people is represented by stemmed Alberta and Cody Complex points. This occupation gave way to a more generalized group referred to as Plains/Mountains (Reeves 1978). The subsequent time period encompasses occupations for which the Hell Gap, Cody, Frederick and Lusk types have been defined.

Banff II is suggested to date between ca. 10,200 - 9600 B.P. and encompases excavated components from two sites, Vermilion Lakes and Eclipse. It is characterized by use of leaf-shaped and stemmed spearpoints mounted on socketed shafts. Large stone tools are diagnostic and include massive domed endscrapers, slab and cobble choppres and large flake-based tools. The iithic technology employed low angle reduction of bifacial (discoidal) cores to produce large flake blanks for immediate use or subsequent modification into tools; the biface cores also became tools. A strong preference for microcrystalline stone is evident, especially local siltstones and quartzites; siliceous sandstone from the Rocky Mountain east'slope and foothills to the south was also used. Use of local Banff and Livingstone formation black chert continued. An object of soapstone was recovered from one occupation, the closest source for which is the Cathedral Formation just west of the Continental Divide. Sheep were by far the most commonly hunted species although deer, bison and small mammals including beaver and hare were also utilized.

The next 1600 years are poorly represented in Banff National Park, primarily by surface finds of projectile points similar to dated types on the Plains. In the excavated assemblages, cryptocrystalline stone greatly predominates, including cherts from Montana. Discoidal cores and large flake tools are absent.

The Middle Prehistoric Period on the Plains (ca. 7500 - 1750/1250 B.P.) is defined by medium-sized notched or stemmed projectile points that were propelled by a spearthrower or atlatl. Bitterroot and Salmon River side-notched points typify the

Mummy Cave Complex of the early portion of the period (Early Middle Prehistoric I, ca. 7500 - 5000 B.P.) which is interpreted as representing the arrival of intrusive bison hunters with eastern and/or southern affiliation (cf. Reeves 1969). The Early Middle Prehistoric II (ca. 5000 - 3000 B.P.) is defined by the presence of Oxbow and McKean compiexes. The former is well represented on the Plains and is considered to have developed out of the Mummy Cave Complex while the latter is considered to have expanded into the Plains, displacing the Oxbow people northward. The Late Middle Prehistoric Period (ca. 3500 - 175011250 B.P.) is characterized by the Pelican Lake Phase which was partially displaced by people of the Besant Phase.

BanffIII dates from ca. 8000 BP to 4000 BP. It is not well represented but side- to comer-notched atlatl dart points and a typical Plains tool kit including bifaces, enscrapers and small flake tools. Large flakes and flake tools are absent. Chert, especially from the Banff and Livingstone formations dominates the lithic assemblages; rare non-local materials are from Crowsnest Pass and Montana sources. It has been speculated on the basis of palaeoclimatic reconstruction that the bison carrying capacity of the East Slope of the Rockies would be at its peak during this time due to the influence of warm westerly winds (Choquette 1987a). The archaeological evidence from the Crowsnest Pass area (Driver 1978), the Kananaskis (e.g. Lifeways 1974) and Jasper National Park (Pickard 1984) supports this hypothesis, so it would seem that the Bow Valley, where most of the detailed investigations in BanffNational Park have taken place, did not lend itself as well to the effects of Chinooks on ungulate range as the Crowsnest, Kananaskis and Athabasca valleys. The configuration of the major valleys west of the Continental Divide offers a clue to this in their possible functions in funnelling the strong westerlies.

Banff IV extends from around 4000 years ago to the time of contact. It is characterized by a variety of side and comer-notched points and includes a significant diversity in archaeological manifestations, The period includes the adoption of the bow and arrow and a trend towards microlithic technology as well as semi-subterranean houses in some phases. Cryptocrystalline stone from the local Banff and Livingstone formations is still predominant but there is greater variability and representation of non-local materials. Top of the World Chert is the most common sourced non-local stone~while southern east slope materials are still occasionally present. Fairly abundant faunal remains indicate a highly diversified hunter-gatherer economy in which sheep, bison; elk, deer, bear, wolf, beaver, muskrat, porcupine and several species of birds and fish were utilized.

On the Plains, the beginning of the Late Prehistoric Period (ca. 175011250 - 250 B.P.) is marked by the introduction of the bow and arrow and a concomitant reduction in the size of the projectile points. The Avonlea Complex, which may have been in part coeval with Besant, is succeeded by the Old Women's Phase.

3.2.3.2 Fraser Plateau

The Early Period in the Fraser-Thompson drainage (Stryd and Rousseau 1996) encompasses a variety of surface finds of projectile points resembling those dating to the

ca. 10,500 to 7500 B.P. period in other parts of northwestern North America. A human skeleton from an accidental death was dated to 8250 B.P.; carbon isotope analysis suggests that about 8 + 10 % of the individual's dietary protein came from marine fish (salmon/steelhead) (Chisholm 1986). The Early Period also includes microblades from components dated at 7700 and 7500 years ago.

The Middle Period includes the Nesikep Tradition (ca. 7000 - 4500 B.P.) that is inferred to have been derived from the melding of earlier cultural traditions (Stryd and Rousseau 1996: 187). Subsistence was primarily based on hunting of deer and elk supplemented with rabbits, freshwater molluscs, salmon, freshwater fish, small birds and plants; there is 'no evidence for an intensive salmon fishery. Artifacts characteristic of the early Nesikep Tradition include lanceolate, comer-notched, and barbed projectile points and a microblade technology. Large side/comer notched points characterize the Lehman Phase of the later Nesikep Tradition; microblade technology is apparently lacking.

A second tradition, the Plateau Pithouse Tradition, is inferred to relate to the arrival of Salish-speaking peoples from the coast. It begins with the Lochnore Phase, typified by leaf-shaped to Ianceloate points (some With wide side notches), microblades, the first appearance of pithouses, and the beginnings of intensive salmon utilization (ibid.: 193-196).

Three archaeological horizons comprise the Late Period (4500 - 200 B.P.). A culmination of the Plateau Pithouse Tradition, they are inferred to encompass the remains of semi-sedentary, pithouse dwelling band level societies of logistically organized, hunter-gatherers who relied heavily on anadromous fish for subsistence (Richards and Rousseau 1987: 21). The Shuswap Horizon, from ca. 3500 to 2400 B.P., is characterized by large (ca. 10 m diameter) rimless, circular to oval housepit depressions commonly with hearths and internal storage and cooking pits, bmad side-notched and stemmed projectile points, and a well developed bone and antler technology. Pithouse size decreased during the succeeding Plateau Horizon (ca. 2400 - 1200 B.P.); points are bilaterally barbed. The Kamloops Horizon (1200 - 200 B.P.) is defined by variable housepit size, small circular to oval external depressions, small side-notched arrow points and an increase in ground slate artifacts.

3.2.3.3 Upper Columbia River drainage

The scheme utilized in this area has been developed over the past 15 years to encompass certain characteristics of the archaeological data not reflected by the phase scheme, in particular, the sparseness of many assemblages and the unique inter-relationships between precontact mineral exploitation, regional bedrock geology, and the distribution of subsistence resources (Choquette 1981, 1984, 1987b). The organizational units are complexes based on criteria that reflect the relationships between past human behaviour and the palaeoenvironmental context. The complexes are systemic constellations of the

fc?llowing attributes: landform, soil, sediment; palaeohydrology, lithic preference, technology, artifact form and function, features, subsistence base, and settlement pattern. The source of tool stock is explicitly recognized as being a potential indicator of other characteristics of the seasonal round such as the habitats exploited, seasonality, range, etc.

This scheme treats culture history as a series of land and resource use patterns that are related to past arrangements of the landscape and natural resources based on the palaeoenviromnental record. The relationships are presented as a series of models from which hypotheses can be derived regarding prevailing palaeoecological conditions as well as other aspects of past lifeways such as size and composition of social units and subsistence territory. This allows for testing of the hypotheses via controlled archaeological research.

The present data base for the IFD is too limited to allow for the construction of a formal precontact culture history sequence. Instead, in keeping with the scheme outlined above, the folIoRing discussion comprises a summary of the general culture history of the region in which the complexes that comprise this scheme are related to the IFD as a series of hypothetical land and resource use models. In combination with the palaeoenvironmental background information described in Section 2, thqse models are the source for the predict&s of past human activity that are used to assess the archaeological potential of the IFD landscape units (see Section 4 for a more thorough discussion of this methodology).

3.2.3.3.1 Early Postglacial Inhabitation

Cultural deposits yielding radiocarbon dates between 10,000 and 11,000 years ago have been found in some of the earliest postglacial contexts in the Columbia and Rocky mountains (Ames et al 198 1, Fedje 1988). On the Clearwater River in Idaho, they have been excavated from the upper portion of the basal fluvial gravels (Ames et al 1981) while in the Bow Valley and in the Purcell Mountains to the south, they occur within sediments associated with the drained basins of the earliest proglacial lakes, above the levels of later lakes (Fedje 1996, Choquette 1984, 1996).

The archaeological complex encompassing these deposits in the Kootenay Region was named the "Goatfell Complex" after a quarry near Yahk where black tourmalinite and tourmaline chert were mined and distributed south- and westward via a network of workshops across an open landscape probably vegetated with steppe tundra. Traits characteristic of the Goatfell Complex include: sites with well-drained, often oxidized sediments on elevated landfonns associated with proglacial lakes (beaches, drainageway terraces, and dunes) and higher stands of existing lakes; preference for tourmalinite and fine-grained quartzite; technology oriented to bifacial core reduction with platform abrasion producing large knives, projectile points, and large side-struck flake tools; and very low frequency of fire-broken rock..Projectile points are large (7 - 12 *cm* long) stemmed and lanceolate forms; some of the latter dare fluted or basally thinned (Choquette 1982). Acid soil conditions have prevented bone preservation, so nothing definite can be

said yet about the subsistence base other beyond noting that hunting-related implements dominate the artifact assemblages and the locations of some of the stone sources and isolated spearpoint finds indicate anupland orientation for part of the seasonal round.

The economy and settlement pattern were apparently oriented to the multiple, environmental edges of the mountain valley - lakeside steppe-tundra environment that characterized the upper Columbia River drainage at the end of the last ice age. The arrival of Goatfell Complex people coincides with the northward shift of this ecosystem as glacial influence declined. Many if not all of the stone quarries were probably discovered during this initial occupation when the outcrops would have been most visible and accessible to early hunters roaming the open terrain in search of game.

The Goatfell Complex has not yet been identified as a systematic pattern in the Rocky Mountain Trench, but this probably reflects the limited amount of intensive archaeological investigations conducted in early contexts. Large stemmed and lanceolate spearpoints have been found in the Trench, including in the IFD, on high terraces above the levels of proglacial lakes. These same settings have also. yielded large biface core reduction flakes with ground platforms; the stone is typically microcrystalline siliceous dolomite, quartzite and siliceous siltstone. The limited analysis to date has not yet delineated cultural alliances between this area and the earliest postglacial inhabitants of the Bow and Kootenay river drainages. Likewise, the nature of the subsistence base is unknown. The residents of adjacent areas at this time had strongly hunting-oriented economies but the presence of viable fisheries lower down on the Fraser and Columbia rivers by at least 9000 years ago (Borden 1975; Chance, Chance, and Fagan 1977; Choquette 1996) suggests that aquatic resource utilization cannot be ruled out entirely.

Determining the chronology of the various stages of drainage rearrangement is a major priority because of its relevance to settlement patterns at this time. It is not impossible that the lack of recorded early sites in this part of the upper Columbia drainage could be due to sampling bias. Sites may not have been discovered because of their burial or destruction associated with the Columbia River's aggradation following abandonment by the Kootenay. Additionally, the focus of most research has been on reservoirs by archaeologists with limited knowledge of regional landscape evolution - glaciolacustrine terraces and fossil beaches typically have been accorded a low priority for examination as human occupational foci. An exception to the above is Kootenay National Park, where early sites were encountered on such landforms as well as in association with extinct drainage channels..

The droughty fire-prone interval between ca. 10,000 and 7000 years ago would have maintained open canopy forests and high elevation grasslands, with their attendant high **ungulate** capability. As mentioned in Section 2, the fauna1 associations of stemmed and lanceolate points in the Rocky Mountains demonstrates the importance of mountain sheep in the early precontact economy. As much of the southern part of the IFD is still mountain sheep range. it is likely that sites containing the archaeological record relating to this time period and economic facet are present.

3.2.3.3.2 Mid-Holocene Occupation

As discussed in section 2, the influence of the Maritime westerlies on the palaeoenvironment of the upperColumbia Basin increased after 7000 b.p. There were significant changes in the environment that would have had direct consequences for those whose lives depended upon the wild plant and animal resources of the region. For example, forest cover increased west of the Purcell Mountain crest but grasslands persisted in rain shadows, especially east of this divide. Given the transitional nature of the palaeoenvironment, especially the fluctuating boundaries of vegetation zones, and the general lack of archaeological investigation of upland areas, it should not be surprising that the period between about 7000 and 5000 years ago is at present not well documented in the region.

Intensive cu!tural deposits dating between about 8000 and 5000 years ago have been found on high terraces at the mouths of Gold and Bristow Creeks which drain the southeast slope of the Purcell Mountains. The archaeological'complex encompassing these deposits was named "Bristow", emphasizing the location of the main sites at the mouths of valleys leading directly into the southern Purcells. Significant continuities between the Bristow Complex and the Goatfell Complex include the high terrace orientation of the settlement pattern, selective preference for microcrystalline stone such as tounnalinite and quartzite, and an identical stone technology, the latter especially indicating cultural continuity. Stemmed and shouldered projectile points are still present in Bristow Complex artifact assemblages but notching was also adopted as a hafting technology and side- and comer-notched points are common. A significant difference between the two complexes is the greater emphasis placed on gravel sources for tool making material, which may reflect the availability of these sources in the glaciolacustrine terrace fills at the southern terminus of the Rocky Mountain Trench trunk glacier. The development of the Bristow Complex may have been a response to climatically induced changes in distribution of ungulates at this time.

The common occurrance in the upper 'Columbia Valley of medium to large side-notched and stemmed projectile points, which typically date between ca. 8000 and 3000 years ago in adjacent areas, indicates that this part of the IFD area was occupied by a hunting-gathering society during this time span. Cobbles of siliceous dolomite are an evident source of workable stone, the extent of weathering on the fragments indicating a considerable span of time elapsed since their production. Less abundamarchaeological evidence indicates human presence in the Rocky and Purcell mountains but the present data is not sufficient to support the definition of additional complexes. The representation in Kootenay National Park of khaki tourmalinite and Kootenay Argillite shows that humans' movements took them north to the vicinity of the Kootenay River's headwaters as well as east and west across the Purcell Mountains during this time. It is probable that the mountainous parts of the IFD contain a considerable number of hunting camps and associated activity areas relating to this time period. Rainshadow areas, in the east slope of the Purcells in particular, are candidate areas for a higher amount of precontact human

use during early Mid-Holocene time, a speculation supported by private artifact collections from the Findlay Creek drainage.

3.2.3.3.3 Economic Diversification

As the climate became cooler during the Neoglacial interval of the last 5000 years, rivers, ponds, sloughs and their associated riparian zones increased in size due to increased precipitation. New plant communities evolved under increased Maritime influence while forest fire frequency declined with a concomitant increase in forest cover. By 5000 years ago, the upland orientation of the resident humans further south had given way to a more intensive focus on valley bottom resources. Evidence from archaeological sites along the Kootenay River dating between 5,000 and 2,500 years ago indicates that fishing, plant gathering, and the taking of waterfowl had become more important. Fire-broken rock is much more common than previously and often occurs as concentrations, indicating that a new method of cooking, by stone boiling, had been adopted in response to these changes in diet.

A number of discrete archaeological units have been defined in the Kootenay Region for the time period 5000 - 2500 years ago. The shores of the numerous kettle lakes that dot the floor of the Rocky Mountain Trench between Bull River and Canal Flats were typical locations for temporary campsites during this time period, hence the name "Kettle Lake Complex" for the archaeological assemblages from these settings. The sites themselves tend to be small and are usually situated on terraces above the present shorelines of these small lakes. The cultural deposits are typically rather sparse, suggesting ephemeral use by small groups. Stone use continues to show a preference for microcrystalline material. Khaki and black tourrnalinite and siliceous dolomite from nearby quarries are the most common types of stone in Kettle Lake Complex sites, with stone from gravel sources somewhat less common. The tool-making technology remains essentially the same as that of the Goatfell and Bristow complexes indicating cultural continuity with the previous residents. This continuity is also reflected in the stemmed points characteristic of Kettle Lake Complex cultural deposits, which strongly resemble those of the Goatfell Complex, but are smaller in **size.** Some larger campsites are also known for this complex, situated on higher terraces adjacent to tributaries of the.Kootenay River. The Kettle Lake Complex is well represented in the south end of the IFD in the Rocky Mountain Trench. A second: contemporary archaeological ,complex is present in sites within what is now the Libby Reservoir. Kikomun Complex sites are most commonly situated on alluvial fans and stream terraces; kettle lakes in the vicinity do not seem to have been heavily utilized. Otherwise. Kikomun Complex sites have several characteristics in common with those of the Kettle Lake Complex: they are small but numerous, contain a relatively simple array of flake-based tools, and deer bone predominates in the fauna1 assemblages. The projectile points are the same stemmed and notched forms as occur in Kettle Lake Complex assemblages. Also in common with the Kettle Lake Complex, microcrystalline stone is the preferred tool stock, but siliceous mudstone from the Elk and middle Kootenay river gravels predominates. Besides site location, this difference in lithic material representation is the most important characteristic differentiating the two

complexes: tourmalinite and siliceous dolomite are not common in Kikomun Complex sites while siliceous mudstone is virtually non-existent in Kettle Lake Complex assemblages. This strong focus on locally available stone, with very little overlap between the two localities, suggests that there were separate and discrete band territories in the southern Rocky Mountain Trench during this time period.

The Inissimi Complex has been defined to encompass a distinctive set of assemblages dating to the 5000 - 2500 b.p. time period on the Kootenay River and its major tributaries from the big bend in northwestern Montana at least as far downstream as the north arm of Kootenay Lake. These artifact assemblages are found on terraces and fans directly associated with specific hydrological features, notably confluences, outlets, large eddies, and rapids. A characteristic feature of this complex is the predominance of Kootenay Argillite, a distinctive type of stone for which quarries are known only beside the north atm of Kootenay Lake. The "Inissimi Point", an expanding.stemmed form with a ground convex base a&acute to right-angled shoulders, is a distinctive style not found in surrounding regions. Projectile points similar in form to those of contemporary complexes also occur in lower frequency. The chipped stone technology @face reduction oriented to production of flake tool blanks) is the same as that which characterizes the Goatfell, Bristow, Kettle Lake, and Kikomun complexes, except that the tool stock is tabular Kootenay Argillite blanks. Notched pebble sinkers are noteworthy artifacts commonly found in Inissimi Complex deposits. Like the Kettle Lake and Kikomun complexes, Inissimi components contain circular hearths as well as more amorphous concentrations of fire broken rock. The distribution of Kootenay Argillite in Inissimi Complex sites along the Kootenay River as far upstream as Libby, Montana has been interpreted to reflect the use of canoes in a seasonal round hypothesized to have comprised wintering near the important deer winter ranges of the Middle Kootenai Valley in Montana, a summer focus on the salmon fishery along the lower Kootenay River, and following this, a northward swing to obtain stone from the Blue Ridge quarries and to hunt deer on the east side of Kootenay Lake's North Arm.

Pithouse depressions, as the structural evidence of a semi-sedentary lifestyle, are functionally associated with a strong focus on the salmon fishery. Their distribution in the upper Columbia drainage corellates directly with salmon spawning habitat. Pithouses are not known to have been used by the nomadic Ktunaxa and are absent from almost all of the Kootenay River, up which salmon were prevented from ascending by falls on its lowermost course.

In the West Kootenay area, the best represented archaeological complex to date is the Deer Park Phase (Tumbull 1977) that encompasses cultural deposits found primarily associated with pithouses dating between 3500 and 2500 years ago. It is best represented in the Arrow Lakes locality, although assemblages assignable to this phase are represented to an unknown degree in the Slocan Valley and along the lower Kootenay River. In addition to semi-subterranean houses, this phase is characterized by parallel and expanding stem, comer-notched, and lanceolate projectile points; triangular and ovoid bifaces; straight or round end scrapers and concave scrapers; phyllite knives; conical

pestles; and nephrite adzes. In the context of the reconstructed palaeohydro!ogy of the Columbia River, the Deer Park Phase coincides with a period of high fluvial discharge and high predicted salmon carrying capacity. Indeed, some of the artifacts found by local collectors indicate that the Arrow Lakes - Lower Kootenay River area was a cultural centre of sorts during this time period. It ended during an interval of instability and reduced fluvial discharge that correlates with the Neoglacial advance of ca. 2800 b.p.

Cultural depressions are common in the Rocky Mountain Trench from Canal Flats to Golden. While most of these features probably relate to Salish occupation, the precise cultural identity of their occupants, as well as their ages, have yet to be determined. The cultural depressions on the upper Columbia cannot be associated with the Kinbasket Shuswap band, which was too small, and arrived too late to account for the relatively large number of cultural depression sites known in the upper Columbia Valley. A significant problem domain thus involves elucidating the settlement dynamics and identities of resident salmon fishers in the study area in view of the evidence for the dynamic palaeohydrology of the Columbia River and its potential impact upon salmon carrying capacity.

3.2.3.3.4 Later Cultural Developments

In the southern Rocky Mountain Trench, significant changes in settlement pattern, technology, stone use, and subsistence base are also apparent in the record of the last two millenia. The Akanohonek Complex is typified by large, intensively inhabited sites on alluvial terraces, containing dense middens of fue-broken rock and burnt bone. Smaller encampments have been documented in upland settings such as high terraces and along tributaries; these commonly contain hearths with associated tools and burnt bone fragments. Technological developments during this time included adoption of the bow and arrow and a significant reduction in tool size. There was a shift in stone exploitation during this time period and for the first time, cryptocrystalline stone became the preferred tool stock; Top of the World Chert from the Rocky Mountains reaches its highest proportions. Deer bone continues to be abundant but hunting of herd ungulates (elk, sheep, and **bison)** increased significantly. The presence of bison bone is especially noteworthy since it demonstrates that these animals were present in the Kootenay drainage in precontact time. The Akanohonek Complex begins at least as early as ca. 1500 years ago and extends up to the time of European contact. In contrast to the previous social structure of small, relatively isolated bands, Akanohonek social organization was apparently more complex, with a large wintering population that fragmented as summer arrived into smaller task-oriented groups who dispersed on a wide range of subsistence pursuits. The main focus of the Akanohonek Complex was the Tobacco Plains in the southern Rocky Mountain Trench.

Evidence is accumulating of two contemporary but as yet unnamed occupational foci associated with the winter ungulate range further north in the Trench, one in the vicinity of the mouth of the St. Mary River and the other at the Columbia River headwaters. Hunting of local bison is documented for the former area (Choquette 1985), the north end

of which would include Skookumchuck Prairie. Further north, evidence of hunting is abundant in excavated sites adjacent to Columbia and Windermere lakes (McKenzie 1976a and b, Mohs 1981, Yip 1982, Bussey 1986). At least 3000 years of occupation is represented at these sites which contain hearths, roasting pits, and occasional cultural depressions. Stemmed and comer notched dart points and small side-notched arrow points are included in the artifact assemblages, a parallel to the sequence in the more intensively examined sires in the Libby Reservoir. The same shift in lithic material from microcrystalline to cryptocrystalline stone is also reflected. The former class of stone is identified as "siliceous siltstone" by most of the investigators who have not had much if any previous experience with the local geology; it could also include both tourmalinite and siliceous dolomite. Identification of the cryptocrystalline stone is clearer: it represents the same virtual replacement of the previous stone types by Top of the World Chert.

3.2.3.3.5 Contact

The pre-contact period ends with a series of developments which had profound effects on the lifeways of the Native population. Most of these developments were the result of the arrival of Europeans. One of the most drastic is also the least well documented: the effect of epidemic diseases such as smallpox, measles, and influenza which likely reduced the native population by 80% or more before Europeans even arrived in the region.

Complex new patterns of native population movement and influx developed in the Rocky Mountains as a result of European influence, especially the greatly increased tribal mobility following acquisition of horses in the early 1700s. Hostilities between the Ktunaxa and the Blackfoot Nation, and the latter's desire to prevent the Ktunaxa from obtaining firearms, ultimately resulted in the virtual abandonme'nt of Continental Divide passes in the southern Canadian Rockies. The more northerly routes of tram-mountain travel subsequently saw increased use, for example, the Athabasca Pass. The Kootenay Trail was an important travel corridor for the Ktunaxa when the new economy, based on exchange of goods and services accompanied by the disappearance of bison from west of the Rockies, encouraged mounted parties of Ktunaxa to travel to bison range in the Saskatchewan River drainage (today known as the "Kootenay Plains"). Use of the Kananaskis Passes is indicated by Palliser's observation of Ktunaxa using canoes to hunt elk on Upper Kananaskis Lake (Spry 1968).

4. Methodology

4.1 Theoretical Context

With the exception of the Cranbrook Forest District, this AOA differs from those conducted elsewhere in the province in not mapping zones of archaeological potential. An explanation for this is in order at this point.

Numerous archaeological overview assessments have been produced under terms of reference consistent with the provincial Protocol Agreement between the Ministry of forests and the Archaeology Branch. However, their utility is questionable at the operational level (cf. Apland 1995). The following observations provide the rationale for the approach taken herein. They are grounded in the writer's past experience in utilizing archaeological overviews in the context of combining cultural resource management with scientific research (c.f. Choquette 1973, 1976, 1979, Choquette and Holstine 1980, 1982, Choquette and Fedje 1992) but derive more specifically from the preparation of overviews at the regional level with mapping of archaeological potential at 1:250,000 (Choquette 1993), at the district level with the mapping of the Golden District at 1:50,000 (Choquette 1996), and at the LRUP level utilizing 1:20,000 TRIM maps in the Cranbrook District (Choquette 1994).

One of the Protocol Agreement's most significant limitations has been the concept of the archaeological overview assessment (AOA) as a product or unilineal stage that is passed through on the way to an "impact assessment" stage. In Provincial Forests, there is seldom sufficient data to support the preparation of a initially comprehensive overview assessment. Because there has been practically no previous archaeological work on lands under Ministry of Forests jurisdiction, the present stage of integration of cultural heritage into forest management is characterized by a~very incomplete inventory of archaeological sites on these lands. Typically, there is little or no firm information from Provincial Forests themselves upon which to even base predictions of archaeological potential. In addition, in the Kootenay Region at least: the preponderance of hydroelectric project-related archaeological surveys has heavily skewed the existing site inventory to valley bottoms immediately adjacent to existing rivers. In the absence of a representative site inventory for areas outside the major valley bottoms, it is necessary to rely upon predictive modelling to provide an assessment of archaeological potential. The predictive models have had to be based on data derived largely from other better studied areas and therefore must be considered as hypothetical for most forest districts, in need of testing or "ground truthing".

Archaeological impact assessments (AlAs) of proposed forest industry activities commonly represent the first systematic archaeological field investigations in most provincial forests. It would seem prudent to link them to the AOAs in such a way that they can serve as tests of the hypothetical predictive models of archaeological potential that have been utilized in the AOAs. This would establish an iterative process to improve the precision of the predictive models and the archaeological potential assessments that flow from them. In addition to realizing future increases in efficiency and consequent cost savings, this would facilitate the progress of archaeology as a scientific discipline in that assumptions and the models deriving from them can be evaluated and corrected or discarded if found to be faulty, resulting in a cumulative increase in our collective knowledge. Especially if the archaeological investigations are conducted within a palaeoecological context, the incorporation of archaeology into the forest resource management process in this way can be productive of useful multi-disciplinary information in addition to representing an exercise in conservation of cultural deposits by

avoidance. The structure of forest development planning as an ongoing process is well suited for the articulation of archaeological management and research into integrated resource management in this fashion, However, treating the AOA as a discrete stage or phase is inconsistent with this approach.

Increasing the efficiency and productivity of the archaeoiogical impact assessment process requires improving the precision of the predictive models both in terms of the accuracy of the data upon which they are based and in terms of the level of detail of the predictions themselves. The AOA concept arose from dealing with spatially ,and temporally confined developments such as mines, reservoirs, highways and the like. In the process of implementing the Protocol Agreement, this was apparently overlooked and it was decided that, except for LRMPs, the forest district would be the target area for preparation of archaeological overviews. Besides the temporal inconsistency between the concept of AOA as a discrete stage as opposed to being part of the ongoing forest management planning process discussed above, mapping of archaeological potential at the administrative level (i.e. the Forest District) as opposed to the planning level introduces problems of scale that severely limit the precision of the predictive models. Mapping archaeological potential at the 1:250,000 and 1:50,000 scales that are typical at the regional, district and even LRMP level produces large polygons that usually encompass a great diversity of terrain and vegetation features. Little detail is possible at these scales in defining criteria upon which polygon identification is based. This represents a significant blunting of the power of detailed predictive modelling that is possible utilizing a geomorphological and palaeoecological approach to defining landscape polygons via stereoscopic aerial photography analysis. Spatial detail is also lost at these small scales in defining the size and shape of the polygons themselves: these scales do not usually allow for the delinection of discrete land areas specifically enough that they can be used to guide the location of many of the most destructive types of forest industry activities (e.g. roads and landings). Indeed, at these scales. the lines delineating polygon boundaries are often larger than the archaeological sites themselves!

There is a ready solution to the problem presented by the 1:250,000 and 1:50,000 scales being too small to support the degree of precision possible and necessary to make the results really useful as a planning tool. Base maps other than the NTS series are now available that are considerably better in many ways for maximizing the eftiency of archaeological “resource” management in provincial forests. BC TRIM (Terrain Resource Information Management) digital mapping is accurate and up-to-date comprehensive mapping at the regional level, with a relatively large scale (1:20.000) and a smaller contour interval (20 m) than NTS maps; utilizing computer mapping and the digital elevation model, even larger scales and a slightly improved vertical resolution are also possible. Through the use of translators, a huge array of digital remote sensing information is now available to further improve the power and accuracy of predictive modelling.

However, the typical forest district is too large to be analyzed as a single unit for archaeological potential via landform polygon mapping at a degree of precision to make

the results really useful as a planning tool. To employ mapping at the 1:20,000 scale making use of the excellent aerial photo coverage and exploiting the power of TRIM and GIS as management tools would require several years. It is unrealistic to expect activity in the forests to halt while overviews at this scale are done and we have already been waiting for decades for archaeological resource management to commence in provincial forests.

The challenge in maximizing the effectiveness of the overview assessment process thus lies in matching the precision of the mapping to that of the supporting data and to the nature of its intended use in current planning processes. The typical forest district encompasses too large an area, and in the Kootenay Region at least, encompasses too much environmental and topographic diversity to be mapped effectively at the overview level as conceived within the context of the Protocol Agreement if the results are to serve as a planning tool. Moreover, not all of the land in most forest districts is subject to forestry-related impacts. Much is private, park or wilderness, inoperable, contains immature forest or has already been logged. For these reasons, archaeological potential mapping of smaller management units is recommended. This would allow for a level of precision useful in landscape-level planning that would more effectively incorporate archaeological resource management into Ministry of Forests planning processes.

These principles were applied in a 1993 pilot project of archaeological potential mapping in the southern Purcell Mountains (Choquette 1994). This project was primarily oriented to attempting to deal with mineral exploration referrals but recognized the existence of other resource development conflicts in the same area including highway construction, aggregate borrowing, and logging. Part of the latter activity was the subject of the Moyie LRUP process and it was possible to incorporate the LRUP into the pilot mapping project. The Moyie LRUP archaeological potential mapping was entered into the Crestbrook Forest Industries GIS and is being used in determining the need for archaeological impact assessments and in advance planning for roads and cutblocks.

The value of this process was recognized and two additional planning units (Gold-Joseph and Perry Creek) were mapped for archaeological potential in 1995 at the request of Cranbrook District personnel. It was found upon completion of these two areas that there was relatively little conflict between the archaeological potential polygons and the major areas of harvesting activity, especially in Perry Creek. As a result, the writer suggested that a more efficient approach might be to evaluate the Cranbrook District's planning units at an "overview" level and prioritize them for their archaeological potential. It would then be possible for the District planners, on the basis of their own priorities related to harvesting schedules, other resource conflicts, etc., to select for archaeological potential mapping those management units with the highest probability for containing archaeological resources and thus the greatest potential for conflicts with logging.

At the very least, this system allows for a much more precise identification of industry activities requiring AIAs and in the Moyie LRUP area has already resulted in both cost savings and conservation of archaeological sites. In the Invermere District, landscape

level planning is well advanced; the District's TRP process is well suited for incorporation of this type of archaeological potential mapping into forest planning. The experience in the Cranbrook District cited above has shown the value of coordinating District planning priorities with the potential for conflicts with archaeological sites. The step undertaken at the district level, whereby the archaeological potential of the sub-district planning units is evaluated produces a stratification of planning units by archaeological potential that can then be incorporated into the district's planning agendas. The present "archaeological overview" represents this type of evaluation: its primary objective is to rank the IFD Landscape Units for their archaeological potential. The methods by which this is accomplished are described below.

4.2 Definition of Predictive Criteria

The IFD has been divided into 38 Landscape Units. Because these landscape planning units are either watershed-based or are sub-divisions of watersheds, they can be conceived of as polygons defined by predominantly natural criteria primarily drainage basins. As such, they represent objectively defined land units that are suitable for analysis and extrapolation of patterns past human land and resource use that can be subsequently evaluated by the results of future field investigations.

The archaeological potential of the Landscape Units is based on predictions of past human land and resource use. These predictions derive from synthesizing benchmark values in the available geological and palaeoenvironmental background information snmmarized in Section 2 above with patterns of human behaviour related to these values that comprise the units of the regional culture historic sequence discussed previously (especially settlement pattern, lithic preference, subsistence base and palaeo-environmental context as extrapolated from the soil and sediment associations of the cultural deposits). The result is a set of criteria that are significant predictors of the presence of archaeological sites. Each criterion has been given a score that reflects its relative contribution to the archaeological potential of each Landscape Unit. "0" indicates that the criterion in question does not contribute to the archaeological potential of the Landscape Unit, "1" indicates a minor contribution, "2" a more significant contribution, and "3" indicates that the criterion is a major contributor to the definition of the archaeological potential of the Landscape Unit. The ranking of the Landscape Units by archaeological potential is. the sum of the scores of the contributing criteria. The criteria are described below.

4.2.1 Mineral Resources

As discussed in Choquette (1981) stone suitable for tool manufacture is neither ubiquitous in the region nor restricted to a single source. At least 22 discrete bedrock outcrop sources of 12 distinct types of flakable stone are known for Ktunaxa traditional territory, along with the approximate locations of an additional 7 discrete bedrock sources. Besides its effect on the locations of outcrops of the various formations, the regional geologic history has also produced a generally reticulate pattern in the

macrotopograpy that influenced the distribution of the rocks derived from these outcrops by ice and water. It is thus possible to differentiate a further 8 float source areas in various moraine and fluvial deposits. In addition to flakable stone, three bedrock sources are known for carvable argillite and three other bedrock sources are known for red pigment. Two sources of clay for making pots are also known.

Because of the non-biodegradable nature of the minerals utilized in the technology and the ability to track movements of people across the landscape relative to the location of the geological sources by following the trails of by-product and used fragments, this criterion is of great importance to the archaeology of Ktunaxa territory. Since workable stone was such an essential underpinning of the precontact economy, stone sources are hypothesized to have been sufficiently strong attractions that they were significant determinants of some of the foci of subsistence resource exploitation as well as of routes of transmountain travel. Locations of stone sources are thus extremely valuable for predicting archaeological potential.

Landscape Units were ranked according to the known size and extent of exploitation of the sources within them and according to the potential for as yet undiscovered bedrock outcrop and float sources. For example, the Beaverfoot and Aldridge formations predictably contain workable stone (chert, siliceous limestone, tourmalinite) as do the formations containing quartzites. The late Precambrian shallow deltaic zone where high oxidation produced a “red bed” facies informs as to potential locations for pigment sources. A score of 3 was assessed to Landscape Units containing major stone sources such as Top of the World and parts of the Aldridge Formation while LUs containing minor bedrock sources and/or known float sources were scored as 2. Potential float or bedrock sources scored 1; lack of mineral resources ranked 0.

4.2.2 Solar Aspect

Southerly exposures tend to support a more open vegetal cover than other aspects, making them preferable locations of trails for both animals and humans. Human habitation sites, especially late fall, winter, and early spring settlements tend to be situated to take advantage of solar heating. South-facing slopes tend to be snow-free in winter and lose snow earlier in the spring, so they comprise extremely important winter and spring ungulate ranges. Certain economically important plants, especially Balsamorhiza sagitatta, occur on south-facing slopes.

An additional predictive component of solar exposure is the possibility that south-facing “solar bowls” may be loci of high biological productivity that would have tended to attract greater human subsistence-oriented activity than localities having other exposures or those with level terrain,

Scoring for this criterion is based on valley orientation and internal topography, i.e. amount, angle and arrangement of south- to southwest-facing slopes. LUs containing large south facing solar bowls or extensive south-facing slopes at low elevations scored 2.

West-facing, relatively even valley walls and south-facing valley sides broken up by tributary valleys yielded a score of 1 while smaller solar bowls and LUs with limited solar aspect scored 0. The lower overall score accorded to this criterion is a reflection of its additional manifestation in ungulate range (that is, it is underrepresented in scoring to reduce redundancy) as well as the presently hypothetical nature of the significance of solar bowls on biological productivity.

4.2 3 Corridor

The physiography of the region exerted a major influence on the movements of both animals and humans. A series of valleys extends eastward and westward from the Rocky Mountain Trench, most of which were utilized as travel corridors on a seasonal basis. In addition to serving as routes to other major population areas, these valleys provided access to fishing and gathering areas and stone sources as well as to hunting grounds in the Rocky and Purcell Mountains. Differential intensity of uses eg salmon in Arrow Lakes area, sheep in high elevation habitats, ungulates in East Slope upper valleys esp. Kananaskis

A number of pre-contact era travel corridors into/out of the IFD are indicated by the presence of archaeological sites on passes (e.g. Simpson, Sinclair, Luxor, Kananaskis). Some continued to be used in post-contact times for the fur trade, or later as rail and highway corridors.

The score assigned to this criteria reflects the relative importance of valleys or travel corridors in the context of what is known about the past patterns of movement. Contributing factors to the assessment include the presence of passes, steepness of terrain, and broader patterns of connectivity. A score of 3 was assigned to LUs associated with the east sides of major valleys such as the Rocky Mountain Trench and the Kootenay Valley along with the north and east sides of the most direct corridors connecting the Tiench with the East Slope of the Rocky Mountains or the West Kootenay area (the Palliser and Toby valleys) or providing access to major resource nodes such as quariies (e.g. Whitetail Brook corridor, upper Lussier). Lower order corridors providing access to more localized resources or leading to the adjacent regions by less direct routes are indicated by topography and passes; LUS are scored as 2 if they contain these types of corridors. LUs characterized only by possible “circle” routes and valleys connected by high but traversable passes were ranked as 1. LUS characterized by blind or dead-end valleys scored 0 for this criterion.

4.2.4 Microtopography

This criterion relates to the range of slope and landforms available for human activities. Much of the IFD consists of moderate to steep slopes (i.e. greater than 300) having simple concave to convex topography. Howevre, there are considerable areas where more level terrain is present that contains a sufficient multiplicity of minor landforms so as to promote multiple ecological niches. The resultant biodiversity, characteristic of the upper

Columbia drainage region as a whole, was a key element in sustaining human populations, particularly those of the Ktunaxa.

After drainage of the proglacial lakes, downcutting watercourses left series of erosional terraces before reaching bedrock. Once there, their geomorphological products changed from erosional to depositional. The present alluvial floodplain of the Kootenay River began to develop as early as 9000 + years ago in the narrow Kootenai Valley of Montana, but in the southern Trench, the Kootenay River was still above its present course at the time of the Mazama ashfall 6800 years ago (Choquette 1990). The extensive terraces of Skookumchuck Prairie represent a different geomotphological pattern that undoubtedly relates in an as yet undefined way to the effect of the Kootenay River's changing course at Canal Flats. The combined effect of these geomorphological processes and the developing rainshadows created an important habitat in this part of the Trench that included large quantities of economically important bitterroot.

The floodplain development pattern described in the previous paragraph is the typical one in mountain valleys containing thick tills of glacial drift. Columbia River section of the Rocky Mountain Trench is an exception to this pattern. At the Columbia River's headwaters, radical rearrangements in the early postglacial drainage patterns complicated matters significantly. The geomorphological characteristics of the Trench floor north of Canal Flats indicate that at one time the Kootenay River flowed northward upon entering the Rocky Mountain Trench, in effect forming the headwaters of the Columbia River. As discussed in Section 2.1 above, the rearrangement of the Kootenay, Kicking Horse and Beaver-foot rivers, plus the addition of debris washed into the Trench by flanking tributaries created a huge linear expanse of shallow lake and marshland ecology.

The landscape flanking the Columbia and Kootenay rivers contains alluvial fans and loess-capped erosional terraces. At slightly higher elevations, initial postglacial dissection of the thick glacial drift on the Trench floor produced a series of terraces now situated high above the modem valley bottoms. Some of these terraces have experienced relatively little subsequent deposition although the margins of those on the north and east sides of watercourses often bear loess deposits known as 'cliff-top dunes'. Periodic episodes of flooding have provided the source for long-term but discontinuous accumulation of loess as longitudinal ridges and on adjacent drumlins and low bedrock ridges on the Trench till plain. Such enriched habitats can support rich vegetal communities.

A whole series of fluvial and alluvial landforms were formed on the Trench floor away from the major river valleys, graded to the changing hydrological baselines that accompanied drainage of proglacial lakes and dissection of the valley fill. These alluvial fans, terraces, and other relict watercourse features occur at a range of elevations. This took place in the larger valleys in the Rocky and Purcell mountains as well, for example, the valleys of the Findlay, Kootenay and White rivers.

The presence of proglacial lakes and braided streams in much of the study area in late glacial and immediate postglacial time was also responsible for the creation of a specialized set of landforms upon which very early sites may be situated. These include beaches, deltas, and fluvial bars which now occupy elevated situations on the lower valley walls well away from modem watercourses, often in areas now presently forested.

Knolls and prominences resulting from dissection of the valley fill as well as drumlins, eskers, and bedrock outcrops provide numerous microhabitats as well as movement corridors and vantage points for animals and humans alike. The glacial till plains of the Trench floor is also dotted with numerous kettle lakes that provide a dispersed riparian ecology as well as watering places for more mobile species. As discussed in Section 3. , the shores of kettle lakes were so typically utilized as campsites during the time period from ca. 6000 to 2500 years ago that an archaeological complex (the "Kettle Lake" complex) was named for this association (Choquette 1987b).

In addition to the aforementioned valley floor settings, parts of the IFD contain significant level areas at high elevations. The gently synclinal structure and the constituent quantity of hard chert in the Beaver-foot Formation in combination produced the resistent platform known as Top of the World at an elevation of ca. 2270 m a.m.s.1. at the headwaters of Lussier River and Coyote Creek. The rather gentle upland surfaces in the Purcell Mountains west of Invermere and north of Bugaboo Creek apparently resulted from the effect of an extensive ice sheet on the thinly bedded slates, argillites and pebble conglomerates of the Horsethief Creek Group (Reesor 1973: 7). When the ice sheet retreated, the rolling upland between ca. 2290 and 2590 m a.m.s.1. was too low for intense alpine glaciation to carve more than incipient cirques on north and east slopes. The high bedrock shelf west of Sylvan Pass at the Middle White River - Joffre Creek headwaters and large cirque basins such as are present at the head of Palliser and Albert rivers are other examples of significant relatively level expanses occurring in the vicinity of the modem timberline that represent major high elevation habitats supportive of animal and human populations. Given the fluctuations in timberline documented in the past (c.f. Keamey and Luckman 1983) and the previously extensive loess blanket postulated for high elevations (Choquette 1987a), such relatively level areas may have been highly significant localities in the aboriginal seasonal round.

Extent of level ground in the Landscape Units was a primary indicator,for this criterion. LUS having wide valleys with extensive valley floor fills of glacial drift received scores of 3 while those with large expanses of level topography at elevations near, at, or above timberline scored 2. Other LUs received scores of 1 or 0 depending upon whether or not they contained valleys flanked by terraces and the extent of level ridges and cirque basins near timberline.

4.2.5 Ungulate Range

The East Kootenay area is globally significant with regard to the abundance and diversity of large ungulates, even today. Ethnohistoric and archaeological evidence cited in Section

2.3 democstrates considerable fluctuations in ungulate populations as well as the previous existence of both bison and antelope in the sourhem Rocky Mountain Trench. Not surprisingly, these ungulate resources comprised a major underpinning of the aboriginal economy throughout the Holocene. Ungulate ranges are therefore extremely valuable predictors of past locations of human activity that are represented as archaeological sites. In fully utilizing this criterion in predictions of archaeological potential it is necessary to exercise major powers of retrodiction based on changes in vegetation due to such things as wildfire frequency, soil erosion, floodplain stability and so on.

Present ungulate ranges are the starting point for retrodiction. These include extensive &inter range on the floors of the Rocky Mountain Trench and the major tributary valleys; spring ranges on the south-facing slopes of the lower walls of the major valleys; the forb-rich elk, deer and mountain goat pasture in the avalanche chutes and meadows of the Rocky and Purcell Mountains; and the higher elevation sheep, goat and caribou habitat. Fire climax larch, ponderosa pine and Douglas-fir forests and fire succession montane forests are present in many parts of the IFD which can provide ungulate habitat at all times of year. In addition, as discussed in Section 2, potential mountain sheep range is extrapolated into high elevation grasslands that may have been more extensive between 10,000 and 7000 years ago.

Scoring for this criterion reflects the predicted relative value of ungulate range extrapolated from present values and palaeoenvironmental reconstructions. A score of 3 was given to LUs containing significant amounts of winter range while spring and fall range, major movement corridors, and major summer ranges ranked 2. Less significant seasonal ranges such as those provided by small tieas of south-facing slopes and avalanche chutes scored 1 while little or no ungulate capability ranked 0.

4.2.6 Fisheries

This criterion reflects the potential importance of fish resources in the aboriginal economy. LUs with frontage on the Columbia River and its tributaries that contained spawning channels for anadromous salmon (e.g. lower Spillimacheen River, lower Toby and Horsethief Creeks) were scored 3. Major natural (i.e. non-stocked) lake fisheries such as Premier, Whiteswan, Columbia and Windermere lakes and major resident stream fisheries such as the Kootenay and White along with lesser tributaries that supported significant freshwater species' spawning runs scored 2. LUs containing less significant albeit natural resident stream and lake fish populations scored 1 for this criterion. LUs whose streams and lakes are characterized by effective natural barriers, which were of too high a gradient, or, for some other reason such as glacial effects would not support significant fish populations scored 0.

4.2.7 Known Sites

Where the level of previous investigation has been sufficient to support it, the distributions of known sites can provide a relatively reliable measure of the intensity of

precontact human utilization within the given study area in which they occiu and also some indication of the types.of past human activities that might have taken place.

Focussed occupation, particularly that of a winter settlement or base camp characterized by a significant duration and continuity of human presence, would have had a range of other activities associated with it. Besides those related to procurement and processing of subsistence resources, such ancillary activities would have included a range of social and ceremonial practices that could be represented as archaeological sites. Thus the vicinity of a habitation focus would be characterized by a higher site density than would other parts of the landscape even if they were characterized by similar topography.

Even without an adequate inventory, in some areas, the non-perishable nature of stone as tool-making material (see Section 4.2.1) makes its distribution a valuable indicator of past human movements. Because such movements were not conducted in a vacuum and were, instead, part of highly integrated patterns, the presence of a site in one part of a valley indicates that other sites would also be present, predictable at least at the level of a day's travel away. In a similar vein, presence of sites that could be definitely associated with a specific archaeological complex might allow for the prediction of the locations of other sites based on an understanding of the particular land and resource use pattern. Unfortunately, despite the relatively large number of investigators who have worked in parts of the IFD, especially the Rocky Mountain Trench section, the archaeological record of this area is not yet well enough documented so that such patterns can be confidently utilized to any great degree beyond the level of extrapolating from the models developed by synthesizing the various natural resources of the IFD identified in the modem and palaeoenvironmental data with the archaeological complexes defined in adjacent areas.

The score assigned to this criterion reflects the occurrance of only certain types of sites known to be present in the vicinity. Because of the skewed nature of the site inventory, this criterion did not receive as heavy a weighting as the other criteria in order to avoid a potential circularity in ranking. LUs that contain major habitation sites such as pithouse complexes or large base camps, along with LUs containing numerous activity sites such as hunting camps or those related to the industrial processes of mineral exploitation scored 2. All other LUs were equally not scored, whether or not they contained recorded sites, reflecting the inadequate level of inventory sampling that presently characterizes the IFD with regard to archaeological sites.

4.2.8 Traditional Use

The archaeological record, although limited at present, makes clear that the IFD has been occupied by natives for most if not all of postglacial time. However, the Contact Period was extremely disruptive of traditional land and resource practices. The effects of disease, horses, the fur trade, gold rushes, missionaries, the creation of the international boundary, and the establishment of reservations all transpired before any serious documentation of traditional lifeways took place. It should not be surprising, therefore, that the

ethnographic record is rather incomplete today with regard to specific references to the area now within the Invermere Forest District.

Nevertheless, the importance of traditional use information in expanding archaeology's often limited perspective on human behavior is recognized. Given that the distinction between archaeological and traditional use sites is often an arbitrary one based on factors of preservation, it can be concluded that in many if not most cases, archaeological and traditional use sites are co-extensive. **At** the scale of the present undertaking and within the caveat regarding the effect of European contact just discussed, the general use patterns indicated by the upper echelon of the hierarchy of activities identified in the Traditional Use typology (e.g. food, medicine or material gathering, transportation, ceremonial, and recreation) were considered as representative of the importance of the various landscape units with regard to their place in the more recent aboriginal culture. Again, the limitations in the existing data produce a skew with regard to certain activities as reported in the ethnographic literature (for example, stone technology and pedestrian travel are grossly underreported) and with regard to certain geographic areas as reported in the TUS. An additional factor is that the Ktunaxa Traditional Use study is not yet complete, while that for the Secwepemc (as represented by the Neskonlith Band TUS project) has only just commenced (Bob Manuel 1997: personal communication). Therefore, although useful, this criterion was also not weighted as heavily as the more objective archaeologically predictive categories. LUs characterized by high levels of Traditional Use, especially for plants and habitation, scored 1; all others were equally not scored.

This is not to say that this criterion is not capable of yielding extremely valuable mformation relevant to the archaeological record. Such is indeed the case, especially with regard to types of sites that might not occur with very great frequency and especially with regard to sites whose locations cannot be predicted on the basis of natural criteria or the archaeological recored by reasons of preservation - in these cases, it must be emphasized that while not abundant or "rich" in material remains, such sites are highly significant and worthy of the highest level of management. These considerations are beyond the present level of resolution, however.

4.3 Limitations in the Definition of Archaeological Potential

Definition of archaeological potential depends upon an adequate data base to support accurate predictions of the presence of sites. What is meant by adequacy involves a number of considerations. The ideal would consist of an inventory of all sites within the study area and information regarding the nature of past human use in terms of activities, seasonality, duration of occupation and nature of social unit(s), and the time span(s) of such use. The concept of potential arises when this ideal is not met, leading to the compromise of attempting to identify areas where sites might be located. Erring on the side of caution is a necessary element in this "compromise" since we are dealing with a precious, unique non-renewable resource that in fact represents a significant component of the cultural identity of living groups, their ancestors and their future generations.

Besides information regarding the locations of archaeological sites. another factor influencing the accuracy of prediction of archaeological potential is the level and nature of spatial sampling that has taken place. First of all, a large enough proportion of the target land base must have been examined so that the known inventory can be accepted as being representative of the actual distribution of sites over the landscape. Both negative and positive data (i.e. absence vs. presence of sites) must be taken into account and places where sites have not been found at a sufficiently intensive level of sampling (especially where sites may have been expected) must be kept track of as well as locations where sites actually have been found. Except for immediately adjacent to the Columbia and Kootenay rivers, this level of information is not presently available in any systematic form, although the writer has some subjective knowledge of the nature of the present sample in this regard.

A second factor is the type of descriptive data available from sitesespecially regarding context. Both modem and palaeoenvironmental information is necessary to support accuracy in predicting the potential locations of archaeological sites. This represents a great challenge in that modem environmental information is not always available in a form that is readily incorporated into models of past human land use. For example, there is at present no consistency with regard to geomorphological attributes, which in some cases are mapped as surficial geology, in others as landforms, and in still others as soil types reflective of genesis from parent materials. Palaeoenvironmental information is generally not readily available from external sources and must be developed in the course of mapping by the archaeologist based on experience. Still other types of potentially very useful contextual information (for example, “solar bowls”) have not been evaluated sufficiently to allow for any specific definitions of the level of confidence that can be placed on them.

Given the above,,the definition of archaeological potential is at present a very inexact science. However, in the present context of GIS mapping and large-scale and spatially ‘extensive field investigations in the form of impact assessments, there is reason to be optimistic that science can indeed be practiced and the present inexactitude of it is merely reflective of the early stage of practice that we find ourselves in. It is our ultimate objective to eliminate this subjectivity by allowing computer assisted spatial analyses to define archaeological potential on the basis of attributes whose predictive capability is objectively defined. The present study should be seen as part of the ongoing progress towards this objective in the Nelson Forest Region that was begun in 1993 with the Moyie LRUP (Choquette 1994) and continued with mapping of Landscape Units in the Cranbrook District (Choquene 1996d) and the Golden Forest District (Choquette 1996e).

While the general methodology of the mapping and the criteria upon which the mapped polygons have been defined: the manner in which the criteria for polygon definition and assessment of archaeological potential have been recorded have changed considerably. This is reflected in the restructuring of the present database as compared to previous studies. This restructuring is a response to making the product more consistent with other

archaeological potential mapping in the province (c.f. Muir and Franck 1996) while at the same time maintaining the potential for ultimately feeding the results of fieldwork back into the system and evaluating the assumptions, hypotheses, and models upon which the mapping was based. It is in this latter, long term objective that the science can be improved, with attendant benefits of increased precision and planning certainty.

While it is of course desirable to reduce subjectivity, it must be pointed out that the scores placed on the various defining criteria are still subjective to some degree and thus the ranks as sums of these scores are also still subjective. The subjectivity is merely reflected by numerical values as opposed to the words high, medium and low.

5. Results

The analysis of Landscape Units within the Invermere Forest District via the criteria and methods outlined above yields a matrix of scores (Table 1).

It must be emphasized that low archaeological potential does not imply the absence of sites and certainly does not imply a lack of heritage significance for those sites which may be present. Indeed, the very scarcity and isolation of sites in such settings can convey upon them a relatively greater significance than for sites in denser zones because they may contain unique information.

LU	M-RES	S-ASP	CORR	M-TOP	UNG-RG	FISH	K-SITE	TUS	SCORE
1	1	1	1	1	2	1	0	0	8
2	I	2	1	2	1	1	0	0	10
3	1	1	2	3	3	2	0	1	13
4	3	1	3	3	3	2	2	1	18
5	3	1	3	2	2	1	2	0	14
6	1	1	0	0	0	0	0	0	2
7	2	1	2	2	2	1	0	0	10
8	2	1	1	2	2	1	0	0	9
9	1	1	2	2	2	1	0	0	9
10	2	1	3	1	2	2	0	1	12

11	2	1	1	2	2	2	2	0	12
12	1	2	2	3	3	3	2	1	17
13	2	2	3	3	3	3	2	1	19
14	1.	2	1	2	2	3	0	1	12
,15	1	1	3	0	1	1	0	0	7
16	0	1	3	0	1	0	0	0	5
17	1	0	0	0	0	0	0	0	1
18	0	1	2	3	3	3	2	1	15
19	0	1	2	2 .	2	1	0	0	10
20	1	2	3	2	2	0	0	0	10
21	0	1	3	2	2	1	0	0	9
22	0	1	2	2	2	0	0	0	7
23	0	2	2	1	2	0	0	0	7
24	1	2	2	2	2	1	0	1	11
25	1	2	3	3	3	3	2	0	17
26	0	2	0	0	1	0	0	0	3
27	0	1	0	0	1	0	0	0	2
28	1	1	0	0	1	0	0	0	3
29	1	1	1	0	3	3	0	1	10
30	1	2	3	3	3	3	2	1	18
31’	1	0	1	2	1	0	0	0	5
32	1	0	1	2	3	3	0	1	11
33	1	1	2	0	1	1	0	0	6
34	0	1	0	0	1	0	0	0	2
35	0	2	2	3	3	3	0	1	14
36	1	2	3	3	2	3	0	0	14
37	0	2	1	2	1	1	0	0	7
38	0	0	0	2	1	3	0	0	6

Table 1. Matrix of Landscape Units by Archaeological Potential Criteria.

It .can be seen that there is a broad range in the scoring, from a low of 1 to a high of 19. This distribution breaks itself into five groupings, which are mapped as polygons of low, low-medium, medium, medium-high, and high archaeological potential. Table 2 summarizes the classification of IFD LU archaeological potential and Figure 2 provides a graphical image of the distribution of these classes of archaeological potential in the IFD.

LOW	LOW-MEDIUM	MEDIUM
Blackfoot/Thunder	Findlay	Buhl/Bradford
Goldie	Toby	East-Middle White
Horsethief	Jumbo	North White
Forster	Albert	Grave

Frances	Cross	Fenwick
Bobbie Burns	Bugaboo	Palliser
	Luxor	cochran
	Upper Spiilimacheen	Pedley
	Twelve Mile	Steamboat/Cartwright
		Dunbar/Templeton

MEDIUM-HIGH	HIGH
SkookumchucMTorrent	Premier/Diorite
LussierlCoyote	Doctor/Fir
Nine Mile/Moscow	East Columbia
Kootenay	Shuswap/Windermere
Brewer/Dutch	Kindersley/Macaulay
Invermere	
Lower Spillimacheen	
McMurdo/Fraling	

Table 2. IFD Landscape Units ranked by archaeological potential.

6. Recommendations

The above ranking can now be used to determine on a priority basis how more detailed evaluation of archaeological potential and inventory can be carried out. It is recommended that; following this listing, that the LUs ranking highest have archaeological potential mapping at 1:20,000 carried out as a component of the TRP process. This would provide landform level identification of specific locations having archaeological potential that can be utilized in planning of roads, landings and cutblocks.

It is also recommended that satellite imagery be evaluated to determine whether it can be employed in this detailed archaeological potential mapping to pre-select polygons for such attributes as slope, aspect and vegetation. If successful, and present indications are that it should be, this will provide a very powerful objective tool that will also provide significant time and cost savings to the detailed mapping process.

As field work is undertaken in the IFD, for example, in impact assessment work, it is recommended that the results be applied as tests of the criteria and assumptions behind this prioritization of Landscape Units and also of future more detailed mapping. Through the use of computer-assisted mapping techniques such as GIS, this data can be constantly updated, resulting in an ever more refined planning tool.

7. Summary and Conclusion

The archaeological potential of the Invermere Forest District has been evaluated in the course of this project via two approaches, In the first, proposed roads and cutblocks requiring impact assessments were identified in the Five Year Development Plan analysis. This was assessed via what can be called “conceptual polygons”, in that they were viewed at the same scale as the typical 1 :50,000 archaeological potential maps of most other District AOAs onto which proposed logging activities are projected. In fact, the process carried out as reported upon in Choquette and Yip 1996 actually represents a more precise evaluation in that the proposed cutblocks and roads were viewed as polygons and vectors at “real scale” and the recommendations are accompanied by the criteria that formed the basis of the assessment. This was a rather subjective process however. The evaluation of the Landscape Units is at a somewhat smaller scale but employs a more objective approach that sets the stage for managing archaeological sites within the Invermere Forest District’s own planning framework.

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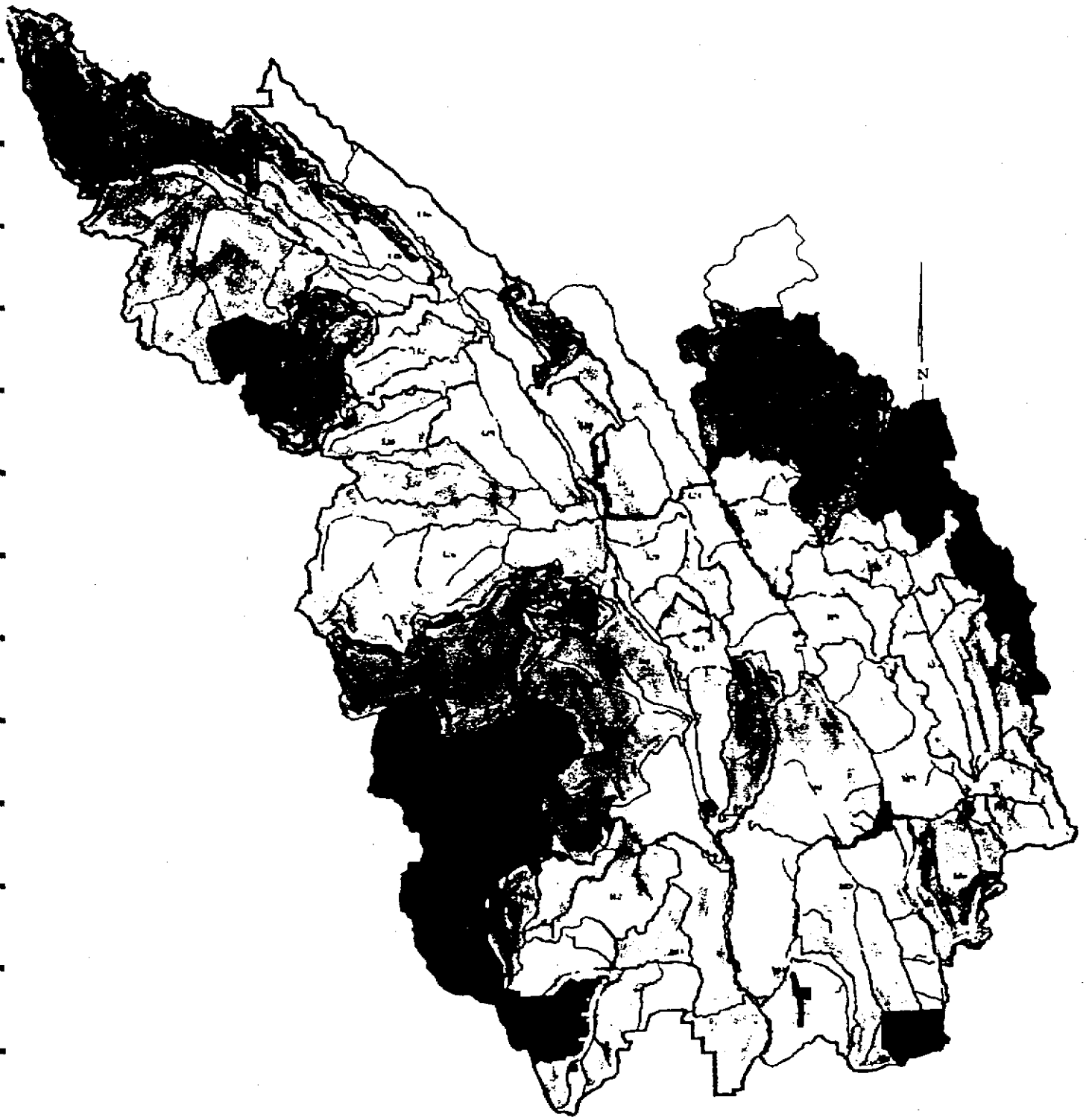

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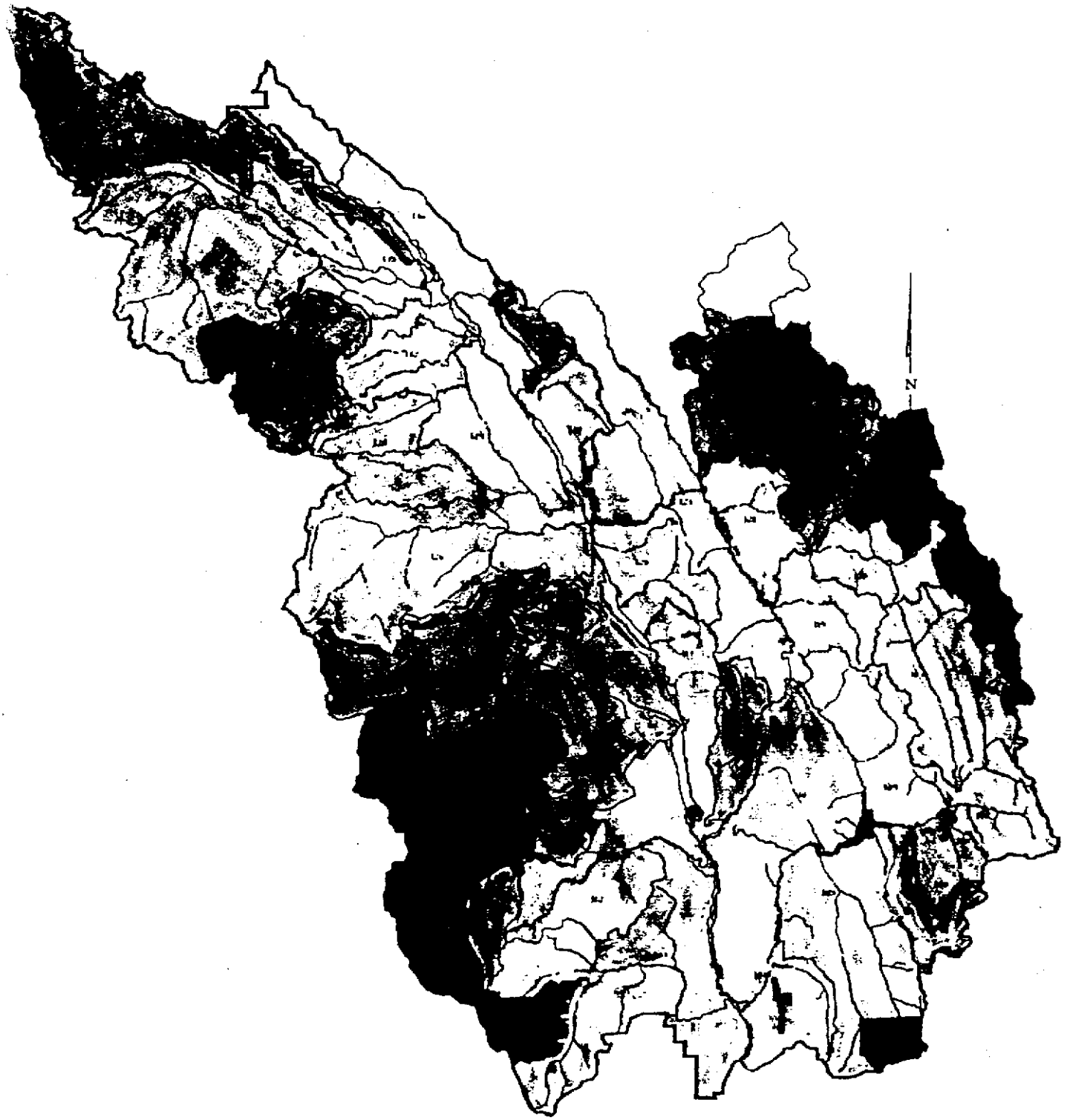

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