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Evolution of hunter-gatherer socioeconomic systems during the middle to late Holocene in the Upper Columbia and the Interior Northwest

Nathan B. Goodale
The University of Montana

The Evolution of Hunter-Gatherer Socioeconomic Systems During the Middle to Late Holocene in the Upper Columbia and the Interior Northwest

By

Nathan B. Goodale
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Abstract

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Conclusive of several regional data sets that include information on paleoenvironmental and settlement system(s) change during the past 6,000 years BP, the forager to collector transition and the emergence of complex social organization were wide-spread phenomena in the Interior Northwest. This thesis utilizes an approach based on calibrated radiocarbon data to examine and evaluate theoretical hypotheses concerning transitions in socioeconomic systems, each giving credence to a different mechanism of change. These models are tested with the calibrated radiocarbon data and paleoenvironmental evidence to indicate a model(s) that best explains the advent of the collector system and the emergence of social complexity in the Interior Northwest.

This thesis has an overlying purpose: to explore the timing and nature of the advent of collector-type systems and the emergence of social complexity in the Interior Northwest. This is accomplished by establishing an adaptive sequence for the Upper Columbia region based on calibrated radiocarbon dates for the past 6,000 cal years BP. This sequence is then compared to similar models constructed for the Columbia Plateau (Chatters 1992; 1995) and the Canadian Plateau (Lenert and Goodale 2001). Conclusions based upon the adaptive model include an established collector system in play by 3,800 cal BP in the Upper Columbia, and 3,500 cal BP in the Canadian and Columbia Plateaus. Moreover, large-scale aggregated villages utilizing complex social organization are apparent at 1,600 cal BP in the Canadian Plateau and 1,200 cal BP in the Columbia Plateau and Upper Columbia. Based on these data I argue that the shifts from high-mobility to semi-sedentism, forager to collector, and dispersed collector to aggregated collector can be correlated to climatic change events. However, these data indicate that the transition from generalized to complex social organization may be related to multifaceted events related to subsistence intensification, population packing, and the control of labor organization.

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I would like to dedicate this thesis to my Grandmother, Joan Landy, who always supported the goals I wished to attain. G'ma, I know you are there watching this exciting time in my life.

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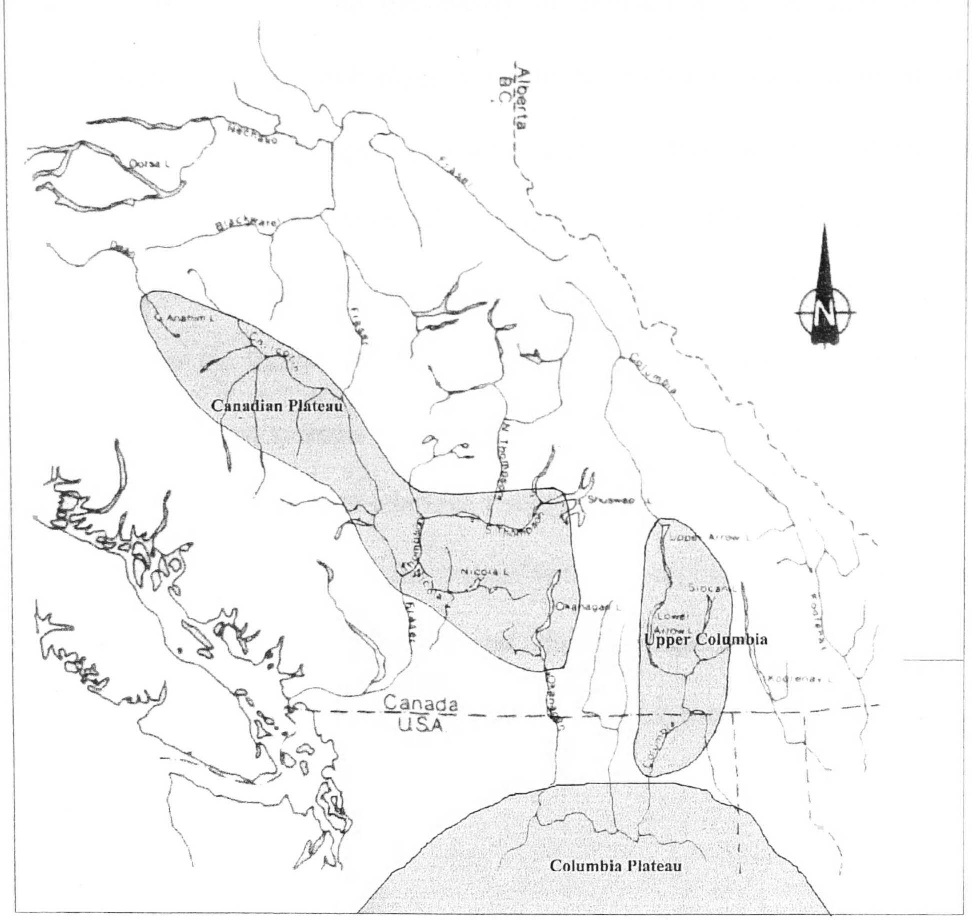
CHAPTER ONE: Introduction

Introduction

The Upper Columbia is a region that is situated along the northern portion of the Columbia River and it's tributaries in southeastern British Columbia and northeastern Washington. This area has previously been defined by Richard and Rousseau (1987) as the Arrow Lakes Region and by Bouchard and Kennedy (2000) as the Lower Kootenay/Columbia Region. Ethnographically the Sngaytskstx (Lakes Salish) occupied pithouse villages in the north while the Sngaytskstx and other groups extensively used the Kettle Falls area and Calispell Valley on a seasonal basis (Figure 1-1). The Upper Columbia refers to the traditional lands in which the Sngaytskstx seasonally migrated. In Plateau archaeology, the Upper Columbia is often ignored or is characterized as a culturally identical sub-area to those of the Canadian and Columbia Plateaus. This situation exists because: 1) no extensive synthesis of the archaeological record has been published for the area, 2) the syntheses that do exist leave many gaps in our understanding of the settlement systems and artifact assemblages, and 3) the region lacks thorough archaeological investigations. Archaeological studies in this region of the northwest have been restricted to constructing culture-historical sequences based on site-specific data. These basic frameworks are necessary before specific anthropological research problems can be properly and adequately addressed within their respective temporal and cultural contexts. However, now it is time that archaeologists step out of the culture historical mode and analyzed the Upper Columbia in a regional context examining behavioral changes during the prehistory of the region. The archaeological record in the Upper Columbia Region is disappearing rapidly due to hydroelectric damming projects, logging, land development, and illegal artifact collecting. Only a few First Nations' villages remain and they are also in severe threat because of the aforementioned. The summer of 2000 marked the first excavation in this area in nearly two decades at the Slocan Narrows Housepit Village located in southeastern British Columbia (Prentiss et al 2001).

Based on the previously defined intra-site cultural chronologies and calibrated radiocarbon dates, this thesis constructs an adaptive settlement model to examine changes in socioeconomic systems for the past 6,000 years in the Upper Columbia. Although intra-site chronologies exist and were constructed for this area via studying stylistic changes in artifacts, this method may be regarded as inaccurate because artifacts are often not associated with organic materials that can be directly dated. Artifacts are typically dated in "relative" terms in association with radiocarbon dates and stratigraphic positioning. Artifacts are also subject to natural processes (N transforms per Schiffer 1986) that may translocate them from their original stratigraphic positions. In this study, I build an adaptive model based on cultural features that can be "absolutely" dated by calibrated radiocarbon means. This study synthesizes four decades of archaeological investigation in the Upper Columbia by compiling 116 ^{14}C dates, calibrating them with CALIB 4.3, and then plotting them through time with respect to the cultural features they date. The adaptive sequence is then tested under statistical methods to determine the accuracy in placement of the interval boundaries and the validity of the model as a population proxy. This methodology has revealed significant information regarding the transition from forager to collector hunter-gatherer economic systems, the advent of aggregated collector villages, and the emergence of complex hunter-gatherers. These issues dealing with the evolution of hunter-gatherer socioeconomic systems in the Upper Columbia are then compared with (N=120) calibrated radiocarbon dates from the Canadian Plateau (Lenert and Goodale 2001) and (N=850) *corrected* radiocarbon dates from the Columbia Plateau (Chatters 1995). These data facilitate the examination of region-wide changes in socioeconomic systems in the Interior Northwest. I believe that the regional synthesis of the Upper Columbia as well as the synthesis for the Interior Northwest based on inter-site calibrated radiocarbon data will clarify the past 6,000 years of prehistory in this region. This research represents a foundation for future studies that will build on these tests and can facilitate further detailed examinations into the advent of the collector system and the emergence of social inequality in the Upper Columbia as well as the Interior Northwest.

Figure 1-1. *Upper Columbia Region, Canadian Plateau, and Columbia Plateau*



Thesis Outline

Chapter One is dedicated to the introduction of the problem. Chapter Two defines common terms concerned with anthropological research in the Plateau, summarizing the background of Middle Range Theory research on hunter-gatherer groups, and presenting hypotheses explaining the transition from forager to collector-type systems and the emergence of complex hunter-gatherers. Chapter Three presents the previously defined cultural chronologies developed for the Interior Northwest under a cultural material and paleoenvironmental framework. This chapter also presents the ethnographic Syngaytskstx (Lakes Salish), and the history of archaeological research in the area. Chapter Four defines my research objectives and methods for synthesizing an adaptive evolutionary sequence for the Upper Columbia Region. I offer the results and present the Upper Columbia regional adaptive model in Chapter Five and then compare the sequence to models developed for the Canadian and Columbia Plateaus. Chapter Six tests the adaptive models for the Interior Northwest under theoretical discussions that attempt to explain shifts in economic systems and the advent of social complexity; these are applied to the study area and the ultimate adaptive rise of aggregated complex collectors in the Interior. Chapter Seven concludes this project with the implications of this research on the understanding of the Interior Northwest, future research questions, and further theoretical discussions on the evolution of socioeconomic systems.

CHAPTER TWO: Hunter-Gatherer Socioeconomic Systems

Introduction

This chapter is intended to explore variability in the socioeconomic systems of hunter-gatherer groups. This is facilitated by defining key terms associated with settlement patterns of hunter-gatherers in the Interior Northwest, exploring the differences between forager and collector economic systems, and providing a prospectus of complex social organization among hunter-gatherers.

Hunter-Gatherer Socioeconomic Systems

Settlement Pattern: A settlement pattern refers to the landscape positioning of human groups in their traditional environment and how that positioning, and as a consequence, the use of local resources changes through time (Kelly 1983). A settlement pattern, as defined here involves many aspects of the archaeological record including: living structures, types of resources procured and processing techniques used to obtain them or convert them into an edible food source, features that are directly associated with storing procured resources, structures that may be defined as "defense" mechanisms, and non-residential sites that are associated with procuring other resources such as lithic raw materials. A settlement pattern is based on year-round occupation and seasonal migration throughout a given territory.

Living Structures: Semi-subterranean dwellings (pithouses) initially appeared between 4500 and 4000 BP in the Columbia Plateau and around 3000 cal. BP in the Canadian Plateau (excluding the Baker Site at nearly 4500 BP). These dwellings indicate that the hunter-gatherers in these regions adopted a semi-sedentary lifestyle.

The terms pithouse and housepit are not used interchangeably. "Pithouse" refers to the semi-subterranean dwelling that was occupied in prehistoric times; it includes the floor, rim deposits, superstructure, and roof of the lodge. It refers to a standing, occupied lodge. "Housepit" refers to the collapsed remains of a pithouse. These remains typically include the floor, rim, collapsed roof deposits, and superstructural elements. These latter two components of housepits are discovered often lying directly upon floor deposits. Pithouses were occupied by "households" that can be defined as "people who co-reside under one roof" (Coupland 1985: 41). A "housepit site" is defined as one or more housepits situated in a specific locale on the landscape.

Pithouse sites are believed to represent the winter habitations of Plateau groups (Richards and Rousseau 1987). During the cold season, people spent most of their time in semi-subterranean lodges living off of stored resources and then emerged from them at the onset of the warm season to begin a period of resource collecting. These groups later returned to over-winter in the lodges at the end of the warm season.

Sizes of dwellings varied greatly through time in the Plateau regions. Some scholars link the transition in the sizes of residential structures to aspects of social organization (i.e. Hayden 1992, 1997; Richards and Rousseau 1987; Lenert and Goodale 2001). Differences in pithouse size also may reflect (1) ranking in a village (the large houses may have been occupied by "noble" / wealthy families), and (2) permanency of a family within a winter social group (the more "stable" households reside in the large dwellings) (Stryd 1973: 83).

Foragers and Collectors: The concepts of foragers and collectors derive most prominently from the work of Binford (1980, 1982). Forager adaptations characteristically "map-on" to new resource patches and generally utilize an immediate-return subsistence tactic (Kelly 1983). Foragers are defined as residentially mobile and rarely stay in a given place for more than a few weeks. Group populations are usually low, food sharing is mandatory, and social systems are egalitarian (Hayden 1981, 1995). Collectors are defined as residentially less mobile while employing logistical mobility. Resources are usually mass harvested and stored for delayed consumption, and this economic system typically requires forms of technology, labor organization and task specialization that is unknown to forager systems (Binford 1980, 1982).

During the past two decades Plateau researchers (Ames 1995; Chatters 1995; Hayden 1992, 1997; Matson and Coupland 1995) have dedicated considerable studies on the shift from forager to collector-type systems on the Northwest Coast as well as the Interior. The shift in these economic systems has been argued to lay in a continuum of hunting and gathering subsistence and mobility adaptations which link patterns of hunter-gather behaviors to the archaeological record (Binford 1980, 1982: Bamforth 1991, 1997, Chatters 1987; Kelly 1983, 1992). Three major theoretical models seek to explain the shift from forager to collector-type systems. First, Cohen (1981), Schalk (1981), Croes and Hackenberger (1988) and Lohse and Sammons-Lohse (1986) suggest, based on arguments by Binford (1968), Boserup (1966), and Cohen (1977), that climatic change leads to resource stress. The collector system with traits characteristic of resource intensification and storage emerged out of necessity. Second, environmental opportunity models link the rise of collector systems to optimal environmental conditions (Fladmark 1975; Carlson 1998; Carlson and Hobler 1993; Cannon 1998). These researchers argue that the environment was sufficient for development of the ethnographic collector-type system in the Interior Northwest prior to 4,000 BP. Finally, Hayden (1981) argues that technological advancements coupled with environmental opportunity cause transition to collector systems. This model examines hunter-gatherer behavioral characteristics with a semi-sedentary lifestyle in play that relies on resource intensification and storage will inherently develop social inequality and hierarchical social relations which assume control of resource processing and then lead to the eventual advent of a(n) aspiring elite individual or group (Hayden 1990, 1995; Maschner 1991, Burley 1980).

Population Aggregations/Packing: An increase in the number, diversity, ~~frequency, and~~ size of archaeological sites associated with logistical collectors, particularly after 2,500 BP, is presumed to reflect increases in prehistoric population aggregation in the Interior Northwest; this period is typically viewed as one of population growth (Peacock 1998: 296). By illuminating trends in the frequency of radiocarbon dates and the percentage of occupied sites during specific intervals of economic adaptations, this study provides a window for observing changes in human population densities. It should be noted that this analysis is structured to obtain relative differences in populations not to seek absolute estimates. Small, nuclear families probably inhabited small pithouses, and multiple families probably resided in medium and large dwellings (Hayden 1997). Inferences concerning population "packing" rely on identifying changes, if any, in the occupation of pithouse sites through time. Hypothetically, the appearance of medium and/or large dwellings may denote higher local population densities. Also, a high frequency of pithouses being occupied within a given interval at a specific locale may represent aggregated communities in the Interior.

Social Organization: Recently there have been significant developments in the way that archaeologists view hunter-gatherers that utilize a hierarchical social system. These hunter groups have been termed *complex* hunter-gatherers because they utilize social systems that posit some members in the group in social positions over the others. Most researchers suggest that social complexity is linked to some form of labor organization (Bard 1992, Earl 1987, Hastorf 1990, Hodder 1982; Kristiansen 1987). Some researchers rely on a wide definition to distinguish a complex group from an egalitarian group (Hayden 1994, 1995, 1997) while others define the concept very narrowly (Arnold 1993, 1996). The definition that most explicitly and easily defines a complex hunter-gatherer is given by Arnold (1993, 1996) and refers to the institutionalized control by some individual(s) over non-kin labor with that individual(s) position being hereditarily ascribed. I endorse this definition however, for the purpose of this thesis I define complexity as incorporating both wealth achieved status as well as ascribed status individual(s). I expand on Arnold's definition because I believe that archaeologically it would take an extremely detailed analysis to recognize a system with elite(s) based on wealth achieved status between a system with elite(s) based on hereditarily ascribed status. In short I use a combination of Arnold's (1993, 1996) definition that incorporates institutionalized labor control over kin and non-kin individuals that are either ranked because of wealth or ranked because they are ascribed to that position (these are characteristically numbers 6 and 7 in Binford's (2001:334) systems states rankings). Egalitarian hunter-gatherer groups have been referred to by many different terms (i.e. simple, generalized, or generic). This system, as defined in this thesis, includes groups from Binford (2001: 334) (rankings 1-5 in the system state) as mounted hunters, mutualists, egalitarian without leaders, and egalitarian with leaders. Leaders refer to knowledgeable people that can aid in subsistence acquisition but don't have any formal political control or elite status based on wealth.

Summary

With 6,000 years of archaeological record available for the Upper Columbia, the region provides researchers with a unique opportunity to examine the forager to collector transition and the emergence of complex social organization. The region consists of a variety ecological zones which provide a range of subsistence staples and the prehistoric settlement patters have produced an extensive variety of sites including residential and logistical locales. As will be discussed later, there is also evidence of a system utilizing hierarchical social organization that comes about after 1,200 cal BP. The concepts introduced in this chapter referring to hunter-gatherer settlement patterns and social and economic systems will be utilized throughout this thesis to examine the evolution of the socioeconomic adaptations for the past 6,000 cal years BP in the Upper Columbia and the Interior Northwest.

CHAPTER THREE:
Environmental and Cultural Background of the Upper Columbia and Interior Northwest

Introduction

This chapter provides an environmental and cultural context for prehistoric occupations of the Upper Columbia Region. This is accomplished through an introduction to the local environment and a review of the Plateau paleoenvironment. Second, this section covers the proposed sub-region chronology for the Upper Columbia system, the Kettle Falls, and the larger regional Canadian Plateau and Columbia Plateau sequences. Third, this chapter presents ethnographic research on the Sngaytskstx Salish people whose traditional territory encompasses the Upper Columbia drainage.

Environmental Context

Topography, climate, and water drainage have always affected the demography and economy of human populations in the Interior Northwest (Nelson 1973). The Upper Columbia system is situated in the southeastern boundary of the Canadian Plateau. The northern portion of this region is located in the Interior Western Hemlock biogeoclimatic zone in the Interior Wet Belt of British Columbia (B.C. Department of Lands, Forests, and Water Resources n.d.). Mild temperatures with high precipitation characterize this climatic zone. The southern part of the study area is relatively dryer, however, precipitation levels still support vast forests.

Physiography and Geological Context

The Upper Columbia Region is within the Selkirk Mountains, the larger Columbia Mountains and Southern Rockies Physiographic Region (Mohs 1982). Great vertical relief and intermittent narrow valleys characterize the northern environmental setting. The southern portion of the study area contains wider valleys with significant flood plains and glacial outwash terraces. Rivers drain the northern Slocan, Arrow, and Kootenay Lakes and numerous creeks originating in the Valhalla and Slocan Mountains. These rivers drain into the Upper Columbia River and flow south with the Columbia and Pend Oreille Rivers splitting on the British Columbia and Washington border.

Prehistoric settlements in the northern part of the Upper Columbia cluster in three different areas: 1) on the Lower Arrow Lake, 2) the Slocan River Valley, 3) and at the confluence of the Slocan and Kootenay Rivers (Eldridge 1981). The local topography in the area undoubly had a major factor in restricting human settlement to these areas. In the southern part of the study area, human settlements occur in the Kettle Falls area and Calispell Valley in northeastern Washington.

The mountain ranges in the Upper Columbia Region are comprised primarily of folded sedimentary and metamorphic rocks with granite stocks and batholiths (Ryder 1981). Bedrock outcrops are common on the steeper slopes above 1800 meters, while the lower slopes and the valley floor are covered by till deposits and fluvioglacial gravels.

Climate and Vegetation

The northern portion of the Upper Columbia is in the most productive forest zone in the Interior of British Columbia (Jones and Annas 1981). Western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*) are the dominant tree species. In sites susceptible to constant water seepage, western red cedar and western hemlock stands are very common. Where water saturation is close to the surface, cedar-hemlock-devil's club shrubs are present. The southern portion of the study area, with relatively less precipitation, *Pinus ponderosa* is the dominant tree species. Tables 3-1--3 give the common and scientific names of plants found in the Upper Columbia Region.

Ecology of Edible Roots

The ethnographic record attests to the wide ecological availability of camas which grows in wet meadow microenvironments within most environmental zones in the Interior Northwest. Camas was important to groups living in the sagebrush and grassland environments of the northeastern Great Basin and to those living in the dense hemlock and cedar forests along the Northwest Coast (Thoms 1989). The regular used of camas as a supplement and intensified resource by groups inhabiting diverse ecological zones provides an indication that climatic changes may not have affected camas exploitation as adversely as previously thought (Thoms 1989). It does not seem likely that paleoclimatic changes in a given region would effectively eliminate the potential for camas to be an important supplement or staple. Therefore, productivity of camas in a given region is related to the nature and distribution of wet meadows than it is to climatic conditions. Because wet meadows are found in all regions of the Interior Northwest it does not seem likely the climatic changes on the order of those during the last 10,000 years would have done much more that cause wet meadows to be less productive in some areas, while more productive in others (Thoms 1989).

Claytonia lanceolata Pursh (mountain potato) is ecologically found in dry sagebrush foothills to damp alpine meadows and is often abundant near snowdrifts in the Canadian Plateau (Turner 1997). *Calochortus macrocarpus* Dougl (sweet onion) grows west of the Cascade Mountains in the Canadian Plateau and prefers rocky crevices with sandy soil in exposed areas (Turner 1997). The mountain potato and sweet onion are also documented ethnographically as playing a role in dietary calories for the hunter-gatherers in the Canadian Plateau. Thoms (1989) argues that camas was not significantly effected by climatic changes during the past 10,000 years BP, and it appears the availability of other edible roots have been severely affected since the end of the Pleistocene.

Fauna

The Upper Columbia Region lies within a rich environment to support a diversity of habitat for a wide range of fauna. Hydrologic Dam construction has greatly restricted the anadromous sockeye and chinook salmon migrations up the Columbia River. The villages in the Upper Columbia are located in optimal locales for mass harvesting of fish and this indicates a possible rich prehistoric salmon migration in this area. Today the

Upper Columbia River supports a wide variety of fish that include: dolly varden char, rainbow trout, whitefish, kokanee, suckers, squawfish, chub, sculpins, and crayfish (Mohs 1982).

The lower elevations in the valley support wintering grounds for white-tailed deer, mule deer, elk and black bears. Small populations of caribou, mountain goat, and grizzly bear can be found in the higher elevations in the Selkirk Mountain Range. Smaller mammals are common in the river valleys and include: beaver, mink, otter, marten, wolverine, coyote, squirrel, raccoon, fisher, lynx, bobcat, and weasel.

Marshlands in the river valleys provide habitat for various migrating waterfowl that include: grebes, mallards, Canada geese, and whistling swans. Game birds in the area include: ruffed grouse, spruce grouse, blue grouse, and ptarmigan. Figure 3-4 gives the common and scientific names of terrestrial mammals and fowl and aquatic fish found in the Upper Columbia Region.

Ecology of Anadromous Fish

The Interior Northwest prehistoric inhabitants are often linked with intensification of anadromous fish, especially salmon. The cold clear waters of the Columbia and Fraser Rivers do not produce high populations of resident fish, but do provide optimal conditions for anadromous fish species. Salmon require cold, clear, gravel-bottomed streams for hatching and rearing, and an annual pulse of snowmelt runoff to wash young to the sea (Chatters 1995). Fish runs are highly productive near the coast in the Fraser and Columbia Rivers and decrease as they go to the eastern Plateau. Warm conditions will negatively affect salmon with prolonged residence in increased temperatures which can increase the probability of infection in adults and fungal attacks on eggs. Increased temperatures may also reduce snow pack which will produce an earlier freshet, and in turn diminish the out-migration success of the young.

Table 3-1. Common and scientific names of trees found in the Upper Columbia Region.

Tree Common Name	*Scientific Name*
Ponderosa Pine	*Pinus ponderosa*
Western White Pine	*Pinus monticola*
Lodgepole Pine	*Pinus contorta*
Douglas Fir	*Pseudotsuga menziosii*
Black Cottonwood	*Populus balsamifera*
White Birch	*Betula papynifera*
Chokecherry	*Prunus virginiana*
Douglas Maple	*Acer glabrum*
Western Red Cedar	*Thuja plicata*

Table 3-2. Common and scientific names of shrubs found in the Upper Columbia Region.

Shrubs	
Devil's club	*Oplopanax horridus*
Bebb willow	*Salix bebbiana*
Hazelnut	*Corylus cornuta*
Thinleaf alder	*Alnus tenuifolia*
Common Juniper	*Juniperus communis*
Oregon grape	*Berberis nervosa*
False-box	*Pachystima myrsinites*
Poison ivy	*Rhus radicans*
Snowbush	*Ceanothus velutinus*
soopolallie	*Shepherdia canadensis*
Saskatoon berry	*Amelanchier alnifolia*
Ocean spray	*Molodiscus discolor*
Columbian hawthorne	*Crataegus columbianum*
Wild rose	*Rose woodsii*
Thimbleberry	*Rubus parviflourus*
Flat-top spirea	*Spirea lucida*
Syringa	*Philadelphus lewisii*
Bilberry	*Vaccinium myrtillus*
Black mountain huckleberry	*Vaccinium membranaccum*
Kinnickinnick	*Arctostaphylos Uva-ursi*
Twinberry	*Lonicera utahensis*
twinflower	*Linnea borealis*
Waxberry	*Symphoricarpos albus*

Table 3-3. Common and scientific names of herbaceous plants found in the Upper Columbia.

Herbaceous Plants	
Bracken fern	*Pteridium aquilinum*
Wild ginger	*Asarum caudatum*
Meadow buttercup	*Ranunculus acris*
Meadow rue	*Thalictrum occidentale*
Stonecrop	*Sedum spp.*
Alumroot	*Heuchera cylindrica*
Sweet-scented bedstraw	*Galium triflorum*
Dawson's angelica	*Angelica dawsonii*
Rockcress	*Arbis spp.*
Sulfpher paintbrush	*Castilleja sulphurea*
Fireweed	*Epilobium angustifolium*
Yellos penstemon	*Penstemon cofertus*
Wild strawberry	*Fagaria virginiana*
Wild sarsaparilla	*Aralia nudicaulis*
Princes pine	*Chimaphila umbrellata*
Pinedrops	*Pterospora andromeda*
Dutch clover	*Trifolium repens*
Spreading dogbane	*Apocynum cannabinum*
Bluebell	*Campanula rotundifolia*
Yarrow	*Achillea millefolium*
Silver-green	*Adenocaulon bicolor*
pussytoes	*Antennaria spp.*
Golden aster	*Chrysopsis villosa*
Wolly thistle	*Cirsium undulatum*
Western hawksbeard	*Crepis occidentalis*
Large purpule feabane	*Erigeron speciosus*
False sunflower	*Heliopsis helianthoides*
Hairy hawkweed	*Hieracium scouleri*
Common groundsel	*Senecio vulgaris*
Dandelion	*Taraxacum officinale*
Threeleaf foamflower	*Tiarella trifoliata*
Bluejoint	*Calamagrostis canadensis*
Prarie sandgrass	*Calamovlfa longifolia*
Orchard grass	*Dactylis glomerata*
California oatgrass	*Danthonia californica*
Foxtail fescue	*Fastuca megalura*
Timothy	*Phleum pratense*
Tiger lily	*Lilium columbianum*
Queen cup	*Clintonia uniflora*
False spikenard	*Smilacina racemosa*
Rough-fruited fairy bells	*Disporum trachycarpum*
Spotted coral root	*Corralorrhiza maculata*
Rattlesnake plantain	*Goodyera oblongifolia*

Table 3-4. Common and scientific names of terrestrial mammals and fowl and aquatic fish found in the Upper Columbia Region.

Land Mammals	
White-tailed deer	*Odocoileus virginianus ochrourus*
Mule deer	*Odocoileus hemionus*
Elk (wapiti)	*Cervus canadensis*
mountain caribou	*Rangifer tarandus*
American black bear	*Ursus americanus*
Mountain goat	*Oreamnos americanus*
Grizzly bear	*Castor canadensis*
coyote	*Canis latrans*
Bobcat	*Lynx rufus*
Mink	*Mustela vison*
Wolverine	*Gulo luscus*
Otter	*Lutra canadensis*
Short tailed weasel	*Mustela erminae*
Marten	*Mertes americana*
Fisher	*Martes pennanti*
Raccoon	*Procyon lotor*
Birds	
Mallard	*Anas platyrhynchos*
Canada goose	*Brata canadensis*
Whistling swan	*Olor columianus*
Grebes	*Podiceps spp.*
Blue grouse	*Bdendragapus obscurus*
Spruce grouse	*Canachites canadensis*
Ruffed grouse	*bonasa umbellus*
Ptarmigan	*Lagopus spp.*
Fish	
Dolly varden	*Salvelinus malma*
Rainbow trout	*Salmo gairdneri*
Whitefish	*Prosopium williamsoni*
Kokanee	*Oncorhynchus nerka*
Suckers	*Catostomus spp.*
Squawfish	*ptychocheilus oregonensis*
Northern chub	*Couesius plumbeus*
Sculpin	*Cottus spp.*
Sockeye Salmon	*Oncorhynchus nerka*
Chinook salmon	*Oncorhynchus tschawytscha*
Shellfish	
river pearl mussel	*Maragaritifera margaritifera falcata*

Paleoenvironment

Significant climatic and geomorphologic variations have occurred in the Upper Columbia Region since the end of the Wisconsin glaciation at ca. 13,000 BP (Handly et.al. 1996). These variations caused fluctuations in the floral and faunal resources available to prehistoric inhabitants of the area. Moreover, these resource restrictions had a major impact on archaeological site distribution. The placement and abundance of such resources and the effects this had on human settlement patterns is discussed in this section.

13,000-10,000 BP (Postglacial Environment and Geomorphology)

The Rocky Mountain system, Cascade glacier system, and the Cordilleran Ice-Sheet of the Wisconsin glaciation covered most of British Columbia and reached its last maximum ca 15,000 BP. This glacial system extended into the northern portions of Washington, Idaho, and Montana (Clague et. al. 1980). During the terminal Pleistocene (ca 13,000 BP) the ice sheets began to retreat and vegetation with associated fauna entered the area. The geomorphologic effects that occur during the deglaciation however, were considerable and involved complex inter-relationships between the retreat and occasional advance of individual glaciers. These retreats and advances caused individualistic processes in specific river valleys due to aeolian, glaciofluvial, and glaciolacustrine conditions. These conditions constructed the localized climatic fluctuations, underlying geology, and resulted in the contemporary water shed systems and land forms present today (Ryder 1971, 1982: Clague 1975, 1989; Holland 1976).

The depth of the Cordilleran ice-sheet was approximately 2,400 m in the northern section of the Selkirk Mountains (Holland 1976, Clague 1989). Generally the northern Selkirk Mountains are typically higher in elevation, have sharp peaks, and deep, steep-sided, connecting valleys. These higher peaks escaped the erosional and scouring effects of glaciation. Clague (1989), Fulton (1971, 1984), Fulton and Smith (1987) suggest that deglaciation began at ca. 15,000 BP and was complete at ca. 10,000 BP.

Glacial meltwaters resulted in the formation of numerous glacial and proglacial lakes above current water levels and developed raised terraces and deltas at the mouths of tributary valleys. Non-glacial lakes replaced these glacial and proglacial lakes with near-modern water levels by 10,000 BP (Anderton n.d.). This suggests that major geomorphological processes underwent during the time period between 10,000 and 11,000 BP. These proglacial and glacial lakes in the Columbia River system would have cut through approximately 100m of glacial till.

During the initial postglacial time period at ca. 10,000 BP the climate was significantly colder and moister than present. This caused significant erosional effects to take place until significant land-stabilizing vegetation could aggregate (Handly et al. 1996).

10,000-7,000 BP (Xerothermic Environment)

During the xerothermic environmental stage (defined by Hebda 1995), starting around 10,500 BP, the environment began to warm rapidly and the final stages of deglaciation took place. The xerothermic is considered to be warmer and dryer than the present climate, especially during the peak at ca. 7,500 BP (Hebda 1995). The tree line advanced in latitude and grass species reached their greatest extensions. Lake levels most likely declined from the previous period due to the increased aridity. Erosional downcutting continued through the glacial till in the Columbia River system until 6,700 BP when modern levels were reached.

Shrubs such as juniper, soopolallie, willow, birch and alder dominated the floral landscape. Lodgepole pine was common in sheltered and well-developed soil areas, while relatively high percentage of sage pollens show that significant open grasslands existed (Handly et al. 1996).

Chance and Chance (1982), Schalk (1976) and Choquette (1985) propose that the effects of the xerothermic climate upon aquatic resources could have been significant. These authors predict that in times of higher temperatures and lower discharge rates, anadromous fish would have had a more limited range and population density. Because of poor preservation, fish remains are rare if not totally absent in most archaeological contexts in this region and this causes speculation for salmon being a significant portion of the diet in prehistoric populations in the Upper Columbia. The warm and dry climate during this time would have caused water temperatures to increase as well. Salmon eggs have a hard time surviving if water temperatures exceeded 20°C for an extended time. This hostile environment for salmon spawning could have made it difficult for mass harvesting salmon like in other areas of the Canadian Plateau such as the well documented trends in the Mid-Fraser area.

7,000-4,500 BP (Mesothermic Environment)

During the mesothermic there is extensive evidence for cooling temperatures beginning between 6,500 and 6,300 BP. Timbers began to descend and there was development of a small glacier on Mount Garibaldi in the Coast Range (Ryder and Church 1986). The cooling temperatures brought an increase in moisture and vegetation density in the Plateau region. Precipitation continued and rose between 5,400 and 5,000 BP under continued cooler ~~conditions and~~ glaciers started to advance ~~in the~~ North Cascade Range. Pine forests reached elevations of 400-600 meters around the rim of the Columbia Basin and forests of the Thompson Plateau closed, eliminating the last of the northern grasslands (Chatters 1998). Although this time period is associated with cooler temperatures than the xerothermic, temperatures remained relatively warm. Evidence for this can be found in the existence of trees typical of the upper montane forest and the more xeric subalpine forests on the southwest flank of Mount Rainer and in the Arrow Lakes area where a mountain hemlock forest now grows. These relatively warm temperatures kept mussel growth rates relatively high, similar to the xerothermic, and temperatures still had severe effects on the anadromous fish populations.

4,500 - 2,800 BP (Pre-Modern Environment)

The climate cooled dramatically between 4,500 and 4,100 BP and remained unusually wet (Chatters 1998). Alpine glaciers advanced in all higher mountain ranges, mussel growth rates decline dramatically, subalpine forests moved downslope to 1,100 meters in what is now hemlock-cedar forests like the Upper Columbia. *Gonidea* mussel is rare in assemblages and the decline in growth rates indicate clear, cold, gravel bottomed streams that produced optimal conditions for salmonid populations and would have meant punctuated intense, fish runs in the Columbia system (Chatters 1998).

The climate of this period can be interpreted as the coldest and wettest of the Holocene. The continued existence of shrub steppe, further expansion of evergreen forests, and high rates of ground-water indicate that precipitation remained winter dominant and low timber lines, and reduced evaporation rates show that both summer and winter temperatures were low (Chatters 1998).

2,800-Present (Modern Environment)

Glaciers receded as relatively stable temperatures continued between 2,800 and 1,900 BP and modern vegetation distributions appeared. Subalpine forests again moved upslope and grass invaded the ponderosa pine woodland on the valley floors (Chatters 1998). Geologic evidence in the form of erosion in alluvial fans and small basins throughout the Columbia Basin and surrounding highlands and an absence of ground water dates for the period between 2,800 and 1,600 BP are indicative of severe drought and summer dominated precipitation (Chatters 1998; Chatters and Hoover 1992). Rivers began aggrading a final Holocene floodplain and mussels increased in the Columbia River (Chatters 1998).

The Little Ice Age which caused alpine glaciers to advance world wide between 600 and 150 BP brought cooler temperatures and glacial advances in the mountain ranges although, it is thought to have had little effect on the flora of the Northwest. There is also evidence of more flooding episodes during 1000 and 600 BP, a drought in the central Columbia Basin round 600 BP and subsequent less flooding after 600 BP (Chatters 1986).

Cultural Chronology

This section reviews the culture history of the regions discussed in this thesis by summarizing time period from 6,000 BP through the duration of the ethnographic pattern. The cultural historical sequences presented herein have been established for the Canadian Plateau and Columbia Plateau regions as well as the Arrow Lakes and Kettle Falls sub-areas. This section is intended to present the data that is tested and compared in Chapter Five by the inter-site calibrated radiocarbon data and the subsequent Upper Columbia adaptive model that is established in this thesis. It should be noted that the sequence derived by the calibrated radiocarbon data does not fully agree with the settlement pattern characterizations that have been outlined by past regional and sub-area cultural chronologies; these differences are discussed in Chapter Five.

Middle Period (7,000-3,500 BP)

During the Middle Period cooler and wetter conditions with expanded mesic grasslands existed in both the high and low elevations (Hebda 1982). The Middle Period contains one tradition and three cultural phases as outlined below.

Nesikep Tradition (7,000-4,500 BP)

The Nesikep tradition is comprised of two cultural phases: the Early Nesikep and Lehman phases (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). The Nesikep tradition may be a result of multiple human adaptive patterns that appeared at the onset of the cool and wet conditions of the Neoglacial (Pielou 1966) and the Middle Period. Sanger (1969, 1970) concludes that regional occupants focused their subsistence economy on deer and elk; rabbits, rodents, small birds, mollusks, salmon and plants were of secondary importance.

Early Nesikep Phase (7,000-6,000 BP)

The Early Nesikep phase is hallmarked by a type a corner-notched lanceolate hafted biface that is barbed in plan, and exhibits curved or straight margins and a lenticular cross section (Stryd and Rousseau 1996). Other phase defining technologies include microblades and wedge-shaped microblade cores, ground rodent incisors, bone needles and points, and antler wedges (Stryd and Rousseau 1996). The most frequently recovered faunal remains include large mammal deer and elk.

Lehman Phase (6,000-4,500 BP)

The Lehman phase is hallmarked by the Lehman point which is pentagonal in shape and obliquely oriented with distinct v-shaped corner or side-notches (Pokotylo and Mitchell 1998). This phase lacks microblade technology and is characterized by a relatively greater reliance on aquatic resources however, a focus still exists on terrestrial fauna.

Lochnore Phase (5,500-3,500 BP)

Plateau researches offer various interpretations concerning the Lochnore phase. Stryd and Rousseau (1996) suggest that Lochnore is represented by a river and forest-oriented adaptive pattern that developed as a result of the movement of Salish peoples from the Northwest Coast to the Canadian Plateau via the Fraser River. Availability of increased numbers of salmon at the onset of the Neoglacial climate may have catalyzed this interior migrations of Lochnore People (Pokotylo and Mitchell 1998).

The Early Lochnore phase overlaps with the Lehman phase in time and space, and there is evidence that indicates the two phases coexisted in the Canadian Plateau ca 5,500-4,500 BP (Pokotylo and Mitchell 1998). Some researchers hypothesize that the Lehman phase inhabitants were Non-Salish speakers, while the Lochnore phase peoples were ancestral Salish (Stryd and Rousseau 1996). Hayden (2000) argues that the Lochnore phase represents the advent mass exploitation of salmon and associated storage technology. Hayden believes that this technology was later refined during the Plateau Pithouse Tradition of the Late Period. He also asserts that storage and harvesting technologies originated in the interior with Lochnore groups and these technologies may have spread from the interior to the coast (Hayden 2000).

Stryd and Rousseau (1996) argue that the Lochnore phase can be defined by the presence of residentially mobile foragers who exhibit relatively diverse diets. Lochnore foragers used a mapping on approach to obtain resources, which requires frequent residential movements to place the groups near productive resource patches. These groups employed a food-gathering and consumption tactic that appears to have been primarily immediate-return with the occasional use of storage features (storage features are only present at the Baker site during this time). Evidence interpreted by Stryd and Rousseau (1996) suggests that Lochnore groups maintained two residential modes. Some lived in non-pithouse sites indicative of game_processing locales, and others appear to have occupied pithouses such as those recovered at the Baker site which date to ca 4,500 BP. Styrd and Rousseau (1996) suggest that the Baker site represents the start of the Plateau Pithouse tradition (PPT) and is carried on and in direct relation to the Shuswap horizon. While Prentiss and Kuijt (2001) and Pokotylo and Mithcell (1998) feel that the Baker site is a separate cultural entity than the Shuswap and PPT and instead relates to the Nesikep tradition. For the purpose of this study, the Baker site and Lochnore phase will be grouped into the Nesikep tradition.

Late Period (3,500-200 BP)

The Late Period contains three cultural horizons of the Plateau Pithouse tradition: the Shuswap, Plateau, and Kamloops horizons (Richards and Rousseau 1987). The tradition is characterized by logistically-organized, semi-sedentary, hunter-gatherers who lived in pithouses. Evidence indicates that salmon caught in the Fraser River and its tributaries played a role in the subsistence and social economies of these groups and may have caused the evolution of complex hunter-gatherers.

Kuijt (1989) and Stryd (1973) argue that the changing environmental conditions during the Neoglacial maximum, 4,000-3,200 BP, initiated the adaptive response of semi-sedentism and a heavier reliance on salmon in the Mid-Fraser region at the start of the Plateau Pithouse Tradition. Kuijt (1989) postulates that the ungulate population was adversely affected by this colder higher precipitation climatic shift and the numbers of available deer decreased causing hunter-gatherers to intensely rely on salmon to offset the negative impacts on ungulates. Prentiss and Chatters (2001) offer that semi-sedentism, the intense subsistence focus on marine resources, and the emergence of logistical collecting were not unique to the Mid-Fraser, and that hunter-gatherer groups throughout the Northwest Coast and Plateau regions exhibit similar survival responses on the regional scale.

Shuswap Horizon (3,500-2,400 BP)

The earliest cultural horizon belonging to the Plateau Pithouse Tradition is the Shuswap horizon. The Shuswap horizon represents the first major distribution of pithouse sites in this region. Richards and Rousseau (1987) suggest that the average size of pithouses in the Shuswap Horizon is 10.7 meters in diameter. However, new data from Lenert and Goodale (2001) suggests that pithouses were on average smaller than 10 meters in diameter during this time. The houses have side entrances, central hearths, and internal storage and cooking pits. The presence of large postholes indicates that there was a substantial wooden superstructure that provided roofs to the structures (Hayden 1997, 2000; Richards and Rousseau 1987).

Lithic assemblages associated with the Shuswap horizon are less complex in workmanship, composition, and technological sophistication as compared to the later horizons of the Plateau Pithouse Tradition (Richards and Rousseau 1987). Low to medium quality materials were used to make many of the tools and this resulted in their crude appearance. Finely made tools out of vitreous trachydacite (a form of fine-grained basalt), jasper, and chalcedony appear in the Shuswap horizon. Shuswap horizon projectile points have a mean length of 4cm, width of 1.8cm, and an average neck of 1.10cm. These points were most likely used as atlatl or spear tips (Richards and Rousseau 1987). Shuswap point variations resemble Hanna, Duncan, McKean, and Oxbow points of the Northern Plains and may indicate some form of contact between the two regions (Richards and Rousseau 1987).

Other lithic items associated with the Shuswap horizon include: key-shaped unifaces and bifaces, unformed unifacial and bifacial tools, microblades, and cores. Lithic technology that requires more hours to produce such as groundstone, formal scrapers, and artwork is very rare in the Shuswap horizon. The lithic technology during this horizon represents a more expedient organization.

Subsistence was logistically organized (per Binford 1980) in the Shuswap horizon and was focused on deer, elk, black bear, sheep, muskrat, beaver, snowshoe hare, red fox birds, fresh water mussels, trout and salmon, and trumpeter swans (Richards and Rousseau 1987). There is evidence that salmon procurement was becoming more important during the Shuswap horizon than in earlier horizons. The relative importance of various species is in some question, although salmon was most likely an important dietary component.

Trade with the coastal regions becomes evident in the Shuswap horizon with the presence of *Dentalium* shells. Shuswap horizon lithic assemblages consisting of expedient tools, wedges, adzes, and stemmed projectile points also suggest a strong link to the Charles Culture and Lacarno Beach Phase in the Northwest Coast.

Plateau Horizon (2,400-1,200 BP)

The Plateau horizon is the next cultural component of the Plateau Pithouse Tradition and relates to a time period that reflects a climatic shift from cool and moist conditions to warmer and dryer conditions that are still present today (Hebda 1982). Richards and Rousseau (1987) characterize the housepits of the Plateau horizon as smaller than those of the previous Shuswap horizon with an average diameter of 6.14 meters. During the end of the Plateau horizon the first architecturally large housepits are employed. Lenert and Goodale (2001) suggest that small pithouses (5-10 meters in diameter) as well as medium houses (10-14 meters in diameter) were occupied at this time. Lenert and Goodale (2001) concur with the argument that large houses were occupied late in the Plateau horizon at 1,600 cal BP and add that the time period from 1,600 to 800 cal BP contains the most housepit radiocarbon dates for small to large sized houses. The Late Plateau into the Early Kamloops time period provides the most substantial evidence for population aggregations in pithouse village communities in the Canadian Plateau. Houses are circular to oval in plan, they lack a raised earth rim, they have a central hearth feature, and a few small cooking, storage, and refuse pits (Richards and Rousseau 1987; Carlson 1980; and Wilson 1980). The walls tend to be steep and the floors are flat with a basin shaped profile. There is evidence for large postholes, earth roofing insulation, and benches lining the edges. Eldridge and Stryd (1983) and Hayden (1997) give evidence for both side entrances and roof entrances being employed at this time.

The lithic technology employed during the Plateau horizon shares characteristics with the Northern Plains and Northwest Coast. The Plateau horizon projectile points were most likely used as dart and arrow points. The dart points have an average of 4.10cm in length and an average width of 2.60cm. Arrow points have an average length of 2.48cm and an average width of 1.73cm (Richards and Rousseau 1987). The larger dart points were used continually throughout the Plateau horizon. However, the smaller arrow points were only used after ca 1,500 BP (Richards and Rousseau 1987). Plateau points have convex bases, small barbs, and corner notches and are similar to Pelican Lake corner notched points suggesting continuing contact between the Plateau and Northern Plains (Dyck 1983).

Incised and groundstone tools are uncommon during this time with chipped stone tools making up the significant percentage of lithic assemblages. Chipped unifacial and bifacial implements are the most common during this time and an increase in the use of key-shaped scrapers is also evident.

There is an increase in bone, antler, and tooth artifacts recovered in contexts associated with Plateau horizon occupations when compared to the earlier Shuswap horizon. Richards and Rousseau (1987) caution that the elaboration and increased frequency of perishable industries may be illusionary, related to artifact preservation or sampling. Multi-barbed unilateral and bilateral bone and antler harpoons, composite harpoon valves made of bone, and tubular beads or gaming pieces made from sections of small mammal or bird bones have been recovered in Plateau horizon deposits.

There is a paucity of available data on the subsistence economy for the Plateau horizon with the most significant change over the preceding Shuswap horizon is the commencement of intensive exploitation of mid-altitude root resources (Pokotylo and Froese 1983). Salmon intensification seems to be heightened during the Plateau horizon, and based on a small sample size of human skeletal remains, stable carbon isotope analysis suggests that 60-40% of all dietary protein had a marine origin (Chisholm 1986).

The evidence for a Trans-Rocky Mountain exchange network involving the Plateau, the Northern Plains, the Eastern Kootenay, and Rocky Mountain Regions is represented by the presence of nephrite, argillite, top of the world chert, *Dentalium,* and *Olivella* shells. These artifacts represent prestige or trade goods coming into the Plateau from their respective places of origin.

Kamloops Horizon (1,200-200 BP)

The Kamloops horizon is the final segment of the Plateau Pithouse Tradition on the Canadian Plateau. Architecturally, the housepits in this phase have an average diameter of 8.66 meters, but range in size from 5 meters to 22 meters in diameter. The housepits are oval, round, rectangular, and square in plan and usually have raised earth rims. Central hearths, storage pits, and both side and roof entrances are associated with Kamloops housepits (Richards and Rousseau 1987). There are two arguments about the occupation of housepits after 1,000 BP in the Canadian Plateau. First, Hayden and Ryder

(1991) argue for a "cultural collapse" at 1,000 BP and incorporates the dispersion of pithouse communities and the end of complex societies in the Canadian Plateau. Second, Richards and Rousseau (1987) argue that pithouses continued to be occupied during this time and Lenert and Goodale (2001) suggest that the height of population aggregations and socio-complexity comes about during the later stages of the Plateau horizon, lasts briefly until the early Kamloops horizon and ends at roughly 800 cal BP. This hypothesis provides evidence for the abandonment of large pithouses after 800 cal BP and human groups return to relatively egalitarian social system with small and medium pithouses used between 800 and 0 cal BP.

Kamloops side-notched points are the most common projectile points employed during this time period. These points are small and triangular and have small, narrow, opposing side notches with straight to slightly convex or concave basal margins. The points have an average length of 2.04 cm, and an average width of 1.32 cm (Sanger 1970). In the later stages of the Kamloops horizon (ca. 400-100 BP) multi-notched points are found, but rare. These points have up to four additional notches along one lateral blade margin and is slightly larger than Kamloops side-notched varieties (Richards and Rousseau 1987).

Lithic technology during the Kamloops horizon which employed bifacial reduction that is similar to the earlier cultural traditions. It is dominated by fine, pressure-finishing of both points and knives. There is an increase in the quantity, quality, and variety of ground stone artifacts made of nephrite, slate, and steatite and these raw materials were often carved into anthropomorphic and zoomorphic forms. These items are representative of a high degree of workmanship, craft specialization and may have been trade goods.

Non-lithic artifacts that are associated with the Kamloops horizon include: birch bark containers and woven blankets (Teit 1909). There is an increase in the variety and frequency of antler, bone, and tooth artifacts. These items were often highly decorated using a series of geometric patterns.

Subsistence strategies during the Kamloops horizon were logistically organized with a focus on aquatic resources in addition to terrestrial resources including deer, roots and berries. Stable isotope analysis, from a limited number of human remains, indicates that 40-60% of the dietary caloric intake was from salmon (Chisholm 1986).

The Columbia Plateau Sequence

The cultural chronology of the Columbia Plateau is complex due to the fragmentation of research caused by hydrologic reservoirs; each investigated by a different group of archaeologists (Chatters 1995). This section presents the culture history of the Columbia Plateau and is facilitated by presenting the regional synthesis of Ames et al (1998) with adaptation divisions based upon the model proposed by Chatters (1986, 1989, 1995) and a combination of sub-regional chronologies based on Salo (1985), Galm et al (1981) and Grabert (1971).

Period II (7000/6400-3900 BP) (Ames 1998)

Period II marks important changes from the earlier Period I (Paleoindian occupation) in the Columbia Plateau. This period contains evidence for the shift from highly mobile to semi-sedentary (residentially mobile foragers) hunter-gatherers and this transition is represented by two cultural phases: the Cascade Phase and Pithouse I (Ames et al 1998; Chatters 1989, 1995).

Cascade Phase (6,800-5,000/4,400 BP) (Chatters 1989; 1995)

The Cascade phase adaptation characteristics consist of highly mobile foragers that employed simple, uniform, and expedient lithic technologies. Groundstone technologies include tool types for processing small seeds that include slab milling stones, manos, and edge-ground cobbles (Chatters 1995). Dwellings consisted of small, temporary surface structures (Draper 1986 a, b) and there is little evidence to suggest that storage had an impact on the economy of the groups in the Cascade Phase. Site location, assemblage variability, and subsistence availability suggest that these groups employed a "mapping on" adaptation to seasonal and geographic resource variability (Chatters 1995). The Cascade phase is contemporary to Early and Middle Kartar phase in the Chief Joseph Dam area (Salo 1985), the Middle to Late Okanagan phase (Chatters 1986; Grabert 1971) and the Middle to Late Vantage phase in the Mid-Columbia (Galm et al 1981).

Pithouse I (4400-3700 BP) (Chatters 1989; 1995)

During Pithouse I, the first use of pithouses occur in the Columbia Plateau. Pithouses are shallow, seven to eight meters in diameter, and appear to have been occupied year round. Pithouse I sites reflect a foraging adaptation and most closely resemble Binford's (1980) residential mobility and there are three types of sites that exist for Pithouse I occupations including: pithouse base camps, meat processing locations or short term residential camps around animal kills, and residence camps provisioned by the gathering of diverse resources (Chatters 1989; 1995). There is little evidence for storage and this phase is believed to be associated with an immediate consumption adaptation (Chatters 1989, 1995).

During this time there is evidence for increased levels of exploitation of certain edible roots and salmon, projectile points decline in frequency among lithic artifact assemblages, milling stones increase in size and are often found in association with stone pestles, and less investment was made in working chipped stone tools (Ames et al 1998). Dominant projectile point styles include side-notched with deeply convex bases that have been termed Hatwai-eared points and corner notched with expanding stems and barbed shoulders that have been termed Snake River corner-notched points. Associated faunal remains include freshwater mussels, large and small mammal bones from elk, deer, and pronghorn. Fish remains include small numbers of salmon and other resident fish. This time period and the associated presence of pithouses is generally regarded as a region-wide shift in settlement patterns that is represented in the transition from high mobility to some form of sedentism (Chatters 1968, Ames 1991). The Pithouse I adaptation is contemporary with the late Hudnut phase (Salo 1985), the late Cassimer Bar Phase (Grabert 1971; Chatters 1986), and the late Frenchman Springs and early Cayuse Phases (Galm et al 1981).

Period III (3900-200 BP) (Ames et al 1998)

This period is first marked by a 400 year hiatus in radiocarbon dates and then an abrupt reappearance of pithouse occupations around 3,300 BP (Chatters 1989, 1995). The reemergence of pithouses after the Pithouse I occupations during Pithouse II, is characterized as the advent of the collector-type system in the Columbia Plateau (Chatters 1995). This period contains extensive evidence for the mass exploitation and storage of salmon (Chatters 1998) and camas (Thoms 1989). Settlement patterns include seasonal (winter-spring) villages and logistical camps in resource producing locales (Ames et al 1998).

Hiatus (3700-3300 BP) (Chatters 1989; 1995)

Given that this hiatus is nearly as long as the Pithouse I duration, Chatters (1995) argues that this "hiatus" is indicative that sedentism occurred twice in the Columbia Plateau. Moreover Chatters suggests that the "hiatus" provides evidence that the rise to semi-sedentism and the collector type system was not a gradual evolutionary process and in fact, the adaptive characteristics of each Pithouse I and Pithouse II are fundamentally different.

Pithouse II (3300-2200 BP) (Chatters 1989; 1995)

After a 400 year hiatus very limited evidence for human occupation, the Pithouse II adaptation appears with single or small groups of pithouses distributed along the major streams, supported by activities at field camps in areas suitable for fishing, hunting, and root gathering. This settlement pattern coupled with the appearance or greatly increased frequency of processing and storage features indicates a logistically organized, delayed return, collector-type system (Chatters 1995). By 3,000 BP pithouse settlements contain faunal evidence that supports the assumption that salmon was a major dietary staple for Pithouse II. Pithouse II is contemporary with the cultural phases of the Hudnut phase in the Chief Joseph Dam area (Salo 1985), the Cassimer Bar phase in the Okanogan area (Grabert 1971; Chatters 1986) and the Late Frenchman Springs phase in the Mid-Columbia (Galm 1981).

Ethnographic Plateau Pattern (2200-200) (Chatters 1989; 1995)

By 2,200 BP people had begun to reorganize their settlement systems, taking increasing advantage of upland settings and subsequently the number of lowland riverine villages declined. Camas and salmon exploitation declined and there is an increase in bison hunting (Chatters 1992, Schroedl 1972). Storage facilities had become wide spread in caves and rockshelters and in extramural to pithouses. Cemeteries and rock art mark the landscape, and may be indicators of territorial ownership (Chatters 1995; Reid 1991 a, b). Non-residential sites were functionally diverse as they were in Pithouse II; root gathering, fishing and hunting camps are common and show signs of repeated use. Chatters (1995) argues that this is the ethnographic Plateau Pattern and that it had fully developed after 2,200 BP. The Ethnographic Pattern is contemporaneous with the Coyote Creek phase (Salo 1985), the Chiliwist phase (Grabert 1971; Chatters 1986), and the Cayuse and Historic phases (Galm et al 1981).

Upper Columbia Drainage/Arrow Lakes Sequence

The sequence developed for the Upper Columbia Drainage/Arrow Lakes area is representative of CRM projects conducted for hydrologic dam and road construction projects. Excavations in the 1970's by Turnbull and the 1980's by Mohs, proved the basis for the literature that has been previously available for the area. This section presents the chronology from Turnbull (1977) with revisions by Mohs (1982) and Eldridge (1984), and expansions by Prentiss et al (2001). This area is significantly under-researched when compared to the Columbia and Canadian Plateaus.

Deer Park Phase/Winlaw Phase (3500-2450 BP)

The first substantial evidence of settlement in the Arrow Lakes Region has been assigned the Deer Park phase (Turnbull 1977) or the Winlaw phase (Mohs 1982; Eldridge 1984). The pithouses contained in this phase follow a distinct distribution along the immediate river and lake shores in a linear fashion. The housepits excavated by Turnbull and Mohs assigned to this phase are small in size ranging from 7-10 meters in diameter. However, the Slocan Narrows Site (DkQi 1) has revealed a large 16 meter in diameter house, which has an initial occupational component that dates to this time period. These housepits are circular to oval in plan and Mohs (1982) describes them lacking raised earth rims. This may be a characteristic of the small sized pithouse because the large house in DkQi 1 has an obvious raised rim. Mohs (1982) also notes that this cultural phase is not well represented at the Vallican site. This early occupation at the Slocan Narrows site reveals the most detailed knowledge of pithouse architecture from this early phase.

The lithic tool assemblage of the Deer Park/Winlaw phase is marked by the presence of medium-sized stemmed and shouldered projectile points and is characteristically similar to Shuswap horizon points. The most frequently recovered raw materials include: Kootenay argillaceous chert, siltstone, schistose mica-quartzite, and basalt. The lithic assemblage at the Slocan Narrows site associated with this cultural phase is very limited.

Faunal remains are limited to unidentifiable mammal remains with fish and shell completely absent. This is likely due to high acidic properties of the soils in this region.

The Vallican Phase (2450-1250 BP)

The housepits associated with the Vallican phase average 11 meters in diameter from the Vallican site (Mohs 1982). No pithouses associated with this time period have been discovered at the Slocan Narrows site or in the Turnbull (1977) excavations.

Lithic assemblage diagnostic artifacts for this time period include corner and basal notched points and crescent or key-shaped scrapers/perforators. This stylistic variation in the lithic technology is similar to the later Takumakst and early Sinaikst periods at Kettle Falls, the Okanagan Chiliwist phase, and the Plateau horizon. The Vallican phase artifacts differ from the Takumakst in quality of stone working. The Takumakst period in the Kettle Falls Region contains hastily made lithic tools where the Vallican phase contains the presence of high quality tools and exotic goods such as nephrite adzes. Although no housepits dating to this time period were found at the Slocan Narrows site an abundant number (relative to the lithic assemblage size) of Plateau style projectile points were recovered and one key-shaped scraper. Other lithic artifacts from the Deer Park phase include categories such as simple flake tools that continue in use during this phase.

Faunal remains are rare for reasons discussed previously. However, when they are recovered, assemblages include mammal bones and the shells of freshwater mussels (Mohs 1982).

This phase is coeval with the Plateau horizon in the Canadian Plateau (Richards and Rousseau 1987), the last two thirds of the Takumakst period, and the first one third of the Siniakst period in the Kettle Falls Region (Chance and Chance 1982). Parts of the Chiliwist phase in the Okanagan (Grabert 1974) and the Harder phase in the Lower Snake Region (Leonhardy and Rice 1970) also correspond to the Vallican phase.

The Slocan Phase (1,250-Contact)

The housepits that date to this time period have been excavated at the Slocan Narrows and Vallican sites. The houses excavated at the Vallican site that date to this time period are both linearly and non-linearly arranged and they average 8.7 meters in diameter. However, there is great variability with medium and small sized pithouses occurring together. This average is determined by the data set provided by Mohs (1982) and only includes those cultural depressions with a diameter greater than 5.0 meters. The second occupational phase of Housepit 1 at the Slocan Narrows site (DkQi 1) dates to this time period and shows a large house of 16 meters in diameter dating to this phase. Housepit 5 at DkQi 1 also dates to this time period, is 10 meters in diameter, and considerably one of the smallest housepits at the site. This phase employs a wide variety of housepit styles including circular, oval, and rectangular matlodge structures with top and side entrances. Cache pits are also used during this time and are external to the housepits along with extramural hearths and activity areas.

Lithic technological characteristics for assemblages of the Slocan phase include small side-notched points, occasional Columbia corner-notched points, and frequent groundstone items (Mohs 1982 and Eldridge 1984). These points are characteristic of the Kamloops horizon in the Canadian Plateau and the small triangular and side-notched varieties are prominent in the assemblages. However, the Kamloops multi-notched variety has remained undiscovered in the Slocan Valley and Upper Columbia. The material culture during this time also closely resembles materials recovered in the Kettle Falls area.

The Slocan Phase is comparable to the Shwayip period at Kettle Falls (Chance and Chance 1982) the Piqunin Phase on the Lower Snake River (Leonhardy and Rice 1970), and both the Cassimer Bar Phase in the Okanagan (Grabert 1971) and the Kamloops Horizon in the Canadian Plateau (Richards and Rousseau 1982 and 1987).

The Kettle Falls Sequence

The Pre-Takumakst Period (3500-2700 BP)

This time period in the Kettle Falls region is not well understood at this time. There is evidence for low densities of human populations at the Fishery, Ksunku, and Kwilkin sites. Currently, no pithouses have been discovered in this region that date to this time. However, two hearths from the Fishery site have been excavated that date to the Pre-Takumakst period (Chance and Chance 1982).

Lithic assemblages of this time period contain high frequencies of cryptocrystalline artifacts and detritus, some contracting and square stemmed projectile points, and a few cobble cutting tools. Based on limited aquatic faunal remains the Kettle Falls area seems to be used for limited fishing activities during this early time period (Chance and Chance 1982).

The Takumakst Period (2700-1600 BP)

This time period is characterized by a quartzite technology that is "clumsy" when compared to the later periods of occupation in the Kettle Falls. However this raw material can be expediently flaked along the dominant cleavage planes (Chance and Chance 1982). The most diagnostic element of this assemblage is the "Takumakst chopper" which functionally may actually have been a core (Chance and Chance 1982). Flakes removed from this core would probably have been intended for fish butchering or to aid in the construction of fish traps (Chance and Chance 1982). The first extensive period of occupation at the Fishery site seems to be during the Takumakst Period by Salish peoples.

The lithic assemblages that Chance and Chance (1982) associate with this time period were excavated at the China Bend site. This site does contain pithouses, however, none of these houses have been dated at this time. The use of pithouses during the Takumakst period is unknown at this time.

The Sinaikst Period (1600-600 BP)

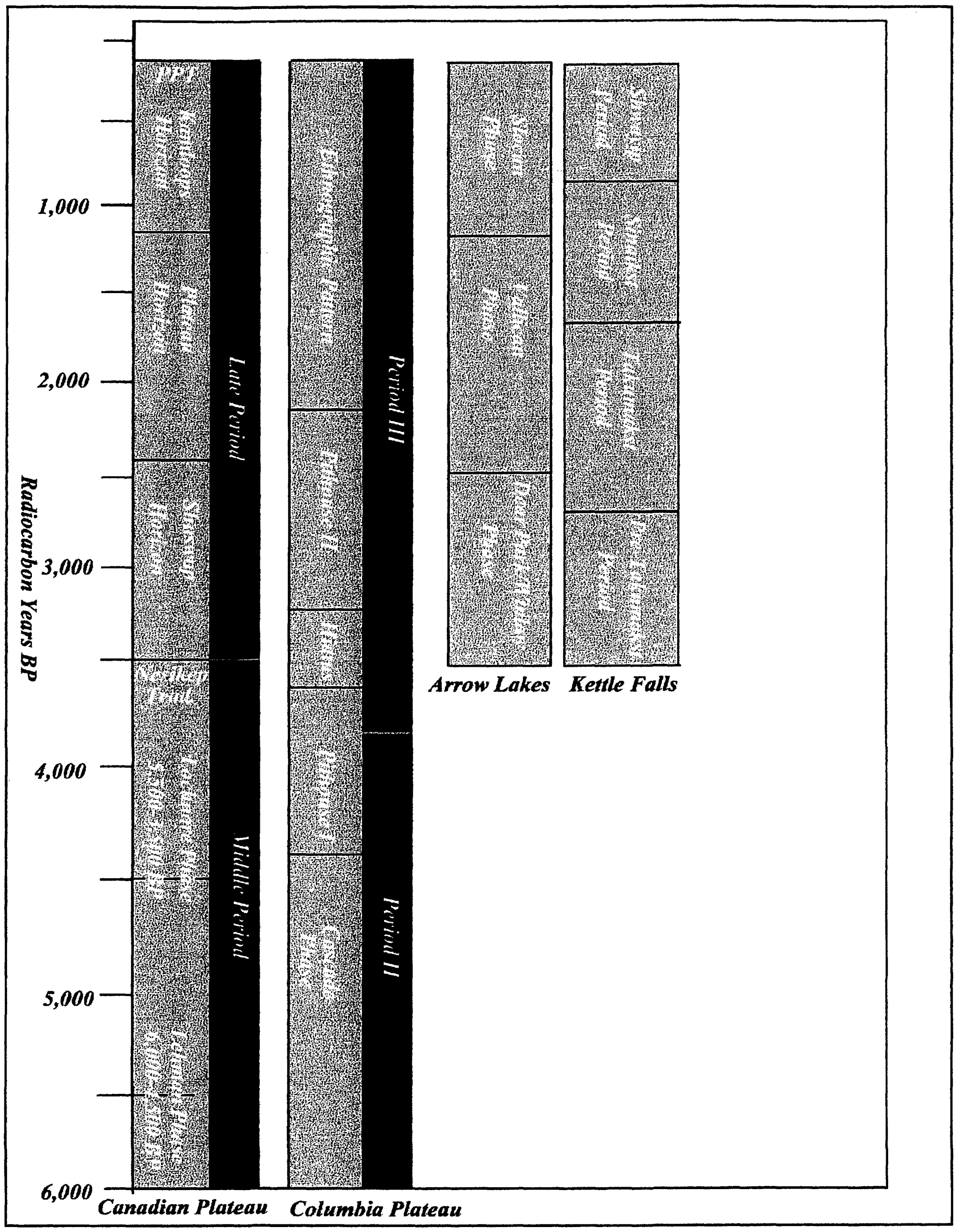
This time period shows large variations in projectile point styles and Chance and Chance (1982) suggest that the variation in the assemblage at the Fishery site is a consequence of many different groups of people using the site. Exotic lithics began to come into the Kettle Falls in significant quantities and then increase very rapidly in frequency until a peak at 1150 BP. This peak in exotics corresponds to peak trade in the area (Chance and Chance 1982).

During the Sinaikst period, deep pithouses were occupied at the Ilthkoyape and Chaudiere sites. A medium sized house (10-14 meters in diameter) at the Ilthkoyape site was dated with multiple occupations at 770+/-90 and 1190+/-70 BP. Chance and Chance (1982) argue that these pithouses were occupied during the summer months based on botanical data. Chance and Chance (1982) also argue that this time period reflects the largest population densities in the Kettle Falls area.

The Shwayip Period (600-200 BP)

This time period is dominated by side-notched projectile points and miniature quartzite knifes (Chance and Chance 1982). These assemblages are found at the Fishery, Ksunku, Ilthkoyape, Chaudiere, Shonitkwu, Kwilkin and Nancy Creek sites. Chance and Chance (1982) argue that this time period reflects a reduction in human populations in the area. The Ilthkoyape site also produced a medium sized pithouse that produced a date of 370+/-70 BP.

Figure 3-1. Regional and sub-area Cultural Chronology Comparisons.



Ethnography and Ethnohistory of the Syngaytskstx (the Lakes Salish)

The Treaty of Washington in 1846 divided the Okanagan territory and moved people in both Canada and the U.S. to the Colville Reservation. In 1872 the reservation boundaries were determined however, by 1880 fewer than half of the Okanagan, Sngaytskstx, and Colville had migrated to the reservation. In the late 1800's a steady influx of gold seekers came into the area. This aided in the push from the government to relocate Natives into the reservations. By 1900 most of the Sngaytskstx Interior Salish resided on the Colville Reservation. However, some of the Sngaytskstx continued to travel seasonally throughout the Arrow Lakes area (Pryce 1999).

In 1902, an Indian reserve near Oatscott on the west side of the Arrow Lakes was set aside by the Canadian government for a small previously scattered group comprised mostly of Sngaytskstx peoples. In 1935 only one woman of this group remained. When this woman died, the Department of Indian Affairs officials concluded that the Sngaytskstx Band had become extinct. The Oatscott reserve in 1953 reverted back to the Canadian Government, becoming the first Indian reserve in British Columbia to be reverted back to governmental land due to the "extinction" of an Indian Band. At this time, there were 257 people registered as Sngaytskstx who were living on the Colville Indian Reservation in the United States (Bouchard and Kennedy 1985).

Ethnographic evidence shows that hunting various sized land mammals provided the main staple of the traditional Sngaytskstx diet and the organizational skills were particularly important to their society. Hunting grounds were located in the upper part of Old Arrow Lake, and the area to its north around Revelstoke (Bouchard and Kennedy

2000). The section near Revelstoke was noted by Teit (1909) to also be used by the Shuswap as a productive hunting territory. Deer was the most important food to the Sngaytskstx and the most plentiful food source in the region. Teit (1930) recorded that the Okanagan-Colville had four great hunts: in the spring for deer and mountain sheep, in late fall for deer, sheep, elk, and bear, in mid-winter for deer, and in late winter for mountain sheep (Teit 1930b: 247; Bouchard and Kennedy 2000: 267). The Sngaytskstx employed the use of dogs in the hunt for deer in tracking strategies and in river game drive traps. Hunts were usually lead by a spiritually gifted person in tracking the seasonal movements of animals.

Ethnographically the Sngaytskstx diet was supplemented by a significant amount of fish (Bouchard and Kennedy 2000). Major fishing locales could be found in the northern parts of their territory at the Arrow Lakes, Trout Lake, Slocan River, Slocan Lake, and the mouth of the Kootenay River, and in the southern portion of the territory at Kettle Falls (Bouchard and Kennedy 2000). During the summer the Sngaytskstx would travel south on the Columbia River about 45 Km below the present day international border in Washington State and join the Colvilles and other aboriginal groups from the Plateau Region to catch chinook and coho salmon which ascended the falls (Teit 1930b; Kennedy and Bouchard 1975). The Chinook salmon run in June through August on the Columbia River provided the most economically valuable fish resource. The sockeye salmon, which came in July, and the coho, which came in October and November, were also fished, however, were considered less economically valuable (Bouchard and Kennedy 2000). Fish were caught with spear, basket, and weir methods. William Kittson noted the presence of a Sngaytskstx weir at the mouth of the Slocan River in

1826 (Bouchard and Kennedy 2000). Ray (1975) reports that basket traps and weirs were individually owned and that any fish caught in that trap was kept by the owner. Teit (1930b) also describes boat-fishing techniques with a weighted line that is very similar to methods employed by the Shuswap.

Plants gathered by the Sngaytskstx included camas roots, tiger lily bulbs, huckleberries, Saskatoon berries, Oregon grape berries, wild strawberries (*Fragaria vesca*), and Native tobacco (*Nicotiana attenuata*). These items could be found in various regions of their territory (Bouchard and Kennedy 2000). Black tree lichen (*Bryoria fremontii*) was gathered from Lodgepole pine and ponderosa pine trees, also the larch and the Douglas-fir (Bouchard and Kennedy 2000). These lichens were apparently made into a sort of bread cake in times of scarce food (Wilks 1959).

Ethnographic dwellings are described as semi-subterranean pithouses. These structures were occupied as late as the first part of the nineteenth century. They were usually quite small with one to two families living in them. The pit was dug in dry, sandy soil to a depth of one to two meters and the entranceway was at the top (Teit 1930b). The structures were usually roofed with mats made of cedar bark during the summer months. During the winter the structures would be covered with greater insulating materials such as layered poles, brush, and large sheets of bark. These structures were also used as a storage facility for dried salmon and other meats.

The social and political organization is described ethnographically as having one chief for all of the Sngaytskstx with each village having a sub-chief (Bouchard and Kennedy 2000). Teit (1907-1910) stated that "I found no trace of division among the Lakes. They were divided in small bands each having a chief and a main headquarters (like the bands of the Shuswap and Thompson)". Status was ascribed along patrilineal lines and the term of office was the same time as the life of the individual. Chiefs were usually male, however, could be female. If the next person in line for chief was considered unsuitable, then the tribal council would deem the new chief. There were also task specific leadership roles for subsistence activities like salmon fishing and hunting; leaders were appointed based on skill, knowledge, and guardian spirit power.

The demographic population for the entire Sngaytskstx society during the late 1700's and early 1800's (including Washington State and British Columbia villages) ranges between ethnographic description with: Mooney (1928) estimated population at 500, Ray (1952) estimated population at 800, Teit (1930) estimated population at 2000. These populations are based on pre-epidemic devastation from small pox in 1820 when the Sngaytskstx population was reduced to less than 150 people.

History of Archaeological Research

Presently little is known about the prehistory of the Upper Columbia Region. Archaeological research in the Kootenay region west of Nelson, British Columbia started in 1961 with Peter Harrison and surveyed 24 pithouse, 30 non-pithouse, 11 burial, 4 pictograph, 4 sweathouse, and 4 historic sites (Harrison 1961). Harrison noted that the majority of the sites (49 sites) were located on the Lower Arrow Lake (Harrison 1961). Between 1966 and 1969, Turnbull conducted excavations at 9 pithouse sites: DiQj 5, DiQm 1, DiQm 4, DiQl 6, DkQm 2, DkQm 5, DiQm 14, DiQm 18, and EbQl 1. A total of 23 housepit depressions were tested; one (EbQl 1) located on the Upper Arrow Lake, one located in the Slocan/Kootenay River Junction (DiQj 5), and the rest are located in the Lower Arrow Lake area (Turnbull 1977). In addition to excavation, Turnbull recorded 43 new archaeological sites within the region, with the majority located along the Kootenay and Slocan Rivers. Based on the information recovered from these excavations, Turnbull (1977) produced a tentative cultural chronology. French (1972), conducted further excavations at a stratified campsite (DiQi 1) on the lower Kootenay River. Galvin (1977) conducted limited excavations at the Taghum pithouse village site (DiQi 2). Mohs (1977) conducted an assessment of archaeological sites within the Arrow Lakes region. It was noted that of the total 152 sites recorded on the Upper and Lower Arrow Lakes only 8% remained intact and above the high water level (Mohs 1977). The Vallican site excavated in the early 1980's represents the first comprehensive excavation of a pithouse village site in the Upper Columbia drainage (Mohs 1982). The excavation at the Vallican site expanded and modified the cultural chronology for the area. Eldridge (1984) and Rousseau (1982) have conducted other research that refined the cultural chronology for the area based on the Vallican data. Choquette (1985) undertook salvage excavations at a pithouse village (DiQj 18) located on the lower section of the Slocan River Valley.

This summary includes all of the archaeological investigations in Arrow Lakes Region. The 2000 field excavation of the Slocan Narrows Archaeological Project represents the most current work in the Upper Columbia Drainage. This work was conducted as a joint effort between the University of Montana, the University of Lethbridge, and the University of Notre Dame. This excavation focused on testing a major pithouse village (101 recorded pithouses) in the Slocan Valley (Prentiss et al 2001).

The southern portion of the study area has received two thorough archaeological excavations. From 1984 to 2000 survey, testing, and excavations were conducted for the Calispell Valley Archaeological Project headed by the Anthropology Department at Washington State University. This project tested nine sites near Usk, Washington and the sites include various camas processing, non-residential, and residential sites (Andrefsky et al 2000). Chance and Chance conducted excavations at numerous sites in the Kettle Falls and Lake Roosevelt areas during the late 1970's and early 1980's. Excavated sites include fisheries, camas production sites, and residential pithouse villages (Chance and Chance 1982).

CHAPTER FOUR:
Research Methods and Objectives

Introduction

The Upper Columbia is a region on the eastern fringe of the Canadian and Columbia Plateaus and the northern and southern sections of this area have been respectively lumped together with these larger regions. The Upper Columbia has never been regarded as a culturally "unique" area for its prehistoric hunter-gatherer inhabitants and the transition from forager to collector systems and the emergence of social complexity have not been previously discussed in the literature. The goals of this chapter are to discuss the methodology for recognizing changes in hunter-gatherer socioeconomic systems. This is accomplished by presenting the 1) archaeological indicators for recognizing forager versus collector systems, 2) recognizing a complex social system in the archaeological record, and 3) the methods that I used to construct and test a model of adaptive change for the past 6,000 years in the Upper Columbia Region.

Research Objectives

The first goal of this study is to establish a model of change in hunter-gatherer adaptation(s). The proposed model enables me to first identify the timing of the advent, the rate in which it developed, and the archaeological correlates of the collector system in the Upper Columbia Region and then compare these events to Canadian and Columbia Plateaus. This model also should indicate, on a large scale, the emergence of complex social organized indicated by associated cultural features. Second, I examine correlations between wild plant food production, fishing, and hunting in the evolution of regional economic systems and the role that subsistence plays in the development of aggregated complex communities. These goals are achieved by examining calibrated radiocarbon dates and their associated provenience from the literature for the Upper Columbia and greater Canadian and Columbia Plateau Regions.

The Archaeological Record of the Forager versus the Collector

The concept of the forager and collector-type systems originates from the work of Binford (1980, 1982) who argued that there is a continuum of hunting and gathering subsistence and mobility adaptations that plots the forager at one end of the scale the collector at the other. Binford (1980) argues that this distinction and aspects of mobility are directly linked to ecological conditions, the availability of resources, and the technology employed to harvest these resources. These conditions imply that this continuum can range from sedentary foragers to highly mobile collectors.

Foragers employ a subsistence adaptation with a "mapping on" tactic to resource "patches" and rely on immediate-return or daily food gathering events (Binford 1980). Foragers are generally described to be residentially mobile rarely staying in one residential base for more than a couple of weeks; a lack of storage feature technology, low group populations, and economically egalitarian. Seasonal resource variability and availability is mitigated by foragers with residential mobility and a broad-spectrum diet that rarely focuses on a specific item. The archaeological record for foragers includes residential base camps, resource procurement locales, and expedient or informal technology (Binford 1980; Kelly 1983). In the Upper Columbia evidence for forager-type systems would include low investment structures that are easily moved (signified by tipi rings or small, low rimmed, and ephemeral pithouses) and resource gathering locales associated with food or lithic raw material acquisition. These characteristics combined with lack of evidence to suggest long-term residences with aggregated populations that exploit and store specific resources, may signify a forager-type adaptation in the Upper Columbia.

The collector-type system is characterized as residentially less mobile with "communities" that are often occupied on a seasonal basis and a logistically oriented adaptation (Binford 1980, 1982; Kelly 1983). Logistical organization requires the collection of specific resources facilitated by specialized task groups. These specific resources are mass-harvested and large potions of the resources may be stored for delayed consumption allowing hunter-gatherer groups to control for seasonal resource variability and availability. Collector-type groups in the Pacific Northwest generally have larger group populations that may feature some form of social organization (Hayden 1992, 1995, 2000; Ames 1995). The archaeological record of collector-type systems includes formalized long-term or seasonal "communities", logistically oriented sites for mass harvesting specific seasonal resources (i.e. fishing weir locales), and a more formalized technology for procuring these specific resources. In the Upper Columbia region the collector-type system should include such characteristics as single or clustered semi-subterranean pithouses, logistically oriented sites such as fishing locales, hunting stands, or extensive root processing sites, all of which can include storage features.

The Archaeological Record of Complex Hunter-Gatherers

Many researchers link sizes of dwellings to aspects of social organization (Hayden 1992, 1997; Richards and Rousseau 1987; Lenert and Goodale 2001) based off of ethnographic evidence (Teit 1909, 1930a; Ray 1952). For the purpose of this study, which is trying to examine the advent, duration, and fall of complex social organization the sizes of living structures will be a focal point in identifying if and when complex hunter-gatherers inhabited the Upper Columbia and Interior Northwest. Under these guidelines differences in pithouse size will reflect (1) ranking in a village (the large houses may have been occupied by "noble" / wealthy families), and (2) permanency of a family within a winter social group (the more "stable" households reside in the large dwellings) (Stryd 1973: 83). Therefore, complex communities will be archaeologically recognized by identifying high frequency clusters with variability in the sizes of contemporaneously occupied pithouses. Under this model commoners would have resided in small structures with elite(s) living in large dwellings. Subsequently, single or low-density clusters of pithouses that are small in diameter will identify egalitarian or generalized social systems.

Methods

Housepit sites are only one piece of a temporal sequence of specific places on the Plateau landscape that were used for various purposes, during different seasons, and at different scales and intensities by regional hunter-gatherers (Binford 1980, 1981, 1982). Gerlach and Mason point out that:

> "...individual site formation processes result from the logistic and mobility characteristics of hunter-gatherers. Individual sites are part of a temporal and seasonal land use sequence, in combination with local geological and environmental factors. Archaeological sites may therefore represent multiple seasonal and annual occupations by the same or different groups of people, facts that clearly strengthen the need for assessing site context and association while evaluating radiocarbon dates."
>
> (Gerlach and Mason 1992: 61)

For the purpose of this study I remained in the geographic area that was ethnographically occupied by the Syngaytskstx and acknowledge that other human groups also used this area (the southern part of the study area was most heavily used by multiple groups during the summer and fall months). However, I believe that during seasonal times in which the Syngaytskstx were in the southern portion of the Upper Columbia, that a similar attraction brought other groups to mass harvest certain resources such as roots and fish.

I collected and calibrated (N=236) relevant radiocarbon dates from archaeological contexts in the published and unpublished literature for the Upper Columbia and Interior Northwest. These radiocarbon assays date various cultural features including housepits, cultural earthworks, root processing ovens, storage pits, hearths associated with non-residential sites, and associated faunal assemblages (Appendix A, Tables 6-1—6)

Radiocarbon assays are treated as individual sets of related dates for archaeological sites and are calibrated using CALIB Version 4.3 (Stuiver et al. 1999).

This program converts dates from radiocarbon age to calibrated calendar years according to the Stuiver et al. (1998a) decadal atmospheric/inferred atmospheric curve. The calibration data sets used for converting the dates are products of the works of Stuiver et al. (1998a), Stuiver et al. (1998b), and Stuiver and Braziunas (1993).

Housepit Dating

Housepit dates are represented as wood charcoal from hearths or burnt superstructure remains in immediate association with housepit floors. The stratigraphic context of housepit dates is critical for insuring that a date reflects a direct occupation of the house and not an unrelated cultural or natural event. Dates for housepits that were excluded in the data set (Appendix A) are those that lack stratigraphic integrity (i.e. those obtained from housepit rim deposit). Multiple dates associated with individual dwellings are included in this study. These imply that a house may have had a lengthy occupation history, or that it was used on more than one occasion. Dated samples collected from hearths within uppermost floor deposits and roof collapse deposits should roughly measure occupations of their associated housepits. Housepits are divided based on size: small houses have a mean dimension of less than 9.99 meters, medium houses have a mean dimension between 10.0 and 14.99 meters, and large houses have a mean dimension greater than 15 meters as defined by Stryd (1973: 76).

Cultural Earthworks

Cultural earthworks have been recovered at the Slocan Narrows and Vallican Sites. Currently, we have limited knowledge to asses the cultural features function to of the house. The storage pits represented in this study are most likely related to the storage of camas root and fish.

Non-residential Sites

Hearth dates reflect those that are associated with non-residential sites and are considered to be short term, seasonally occupied sites, where no permanent structures were constructed. These sites were most likely used during seasonally mobile periods when human groups were logistical collecting edible and non-edible resources.

Faunal Assemblages

45PO137 in northeastern Washington is the only site, that I was able to find in the available literature, that contains a well dated faunal assemblage. Due to high acidic levels in the soils of the Upper Columbia, faunal remains do not preserve well. Fish remains are almost non-existent while mammal bones are only slightly more frequent. Assumptions based on these remains should not be regarded as substantial evidence for the use of fish and mammal resources through time and instead I use these data in a general manner.

Calibrated Dates

New measurements were calculated to construct an adaptive settlement pattern model for the Upper Columbia Region that can be utilized to compare the inter-regional adaptive changes during the past 6,000 cal BP years in the Interior Northwest. Calibrations standardize a suite of radiocarbon dates that establish ^{14}C ages as temporal ranges, not as calendar ages in themselves (Gerlach and Mason 1992). The rationale for calibrating dates is "provided by the fact that systematic fluctuations in ^{14}C concentrations introduce perturbations in the one-to-one correspondence between ^{14}C and "real" time" (Gerlach and Mason 1992; Taylor 1987).

Gerlach and Mason (1992: 60) note that modern archaeologists and geologists recognize the need for evaluating, calibrating, and standardizing radiocarbon ages (Dean 1978; Gal 1982; Porter 1989; Rick 1987). Examples of published works that integrate calibrated radiocarbon dates include: Aitchison et al. (1991), Buck et al. (1992), Ceci (1990), Gerlach and Mason (1992), Hertelendi et al. (1995), Hoffman (1999), Little (1993), Maschner (1999), and Pendergast (1993). Radiocarbon dates are in fact not calendar dates but statistical statements of probability that an age of a sample is assigned within a range of error (refer to Gerlach and Mason 1992: 60-61 for additional discussion regarding the use of archaeological dates).

The graphs presented in this study contain the average of intercept values at a two-sigma or 95% confidence range. The raw data set in Appendix A lists the original radiocarbon date as well as the associated calibrated date with the full range of the intercept value at a two-sigma range.

CHAPTER FIVE: Proposed Upper Columbia Chronology and Inter-Regional Comparisons

Introduction

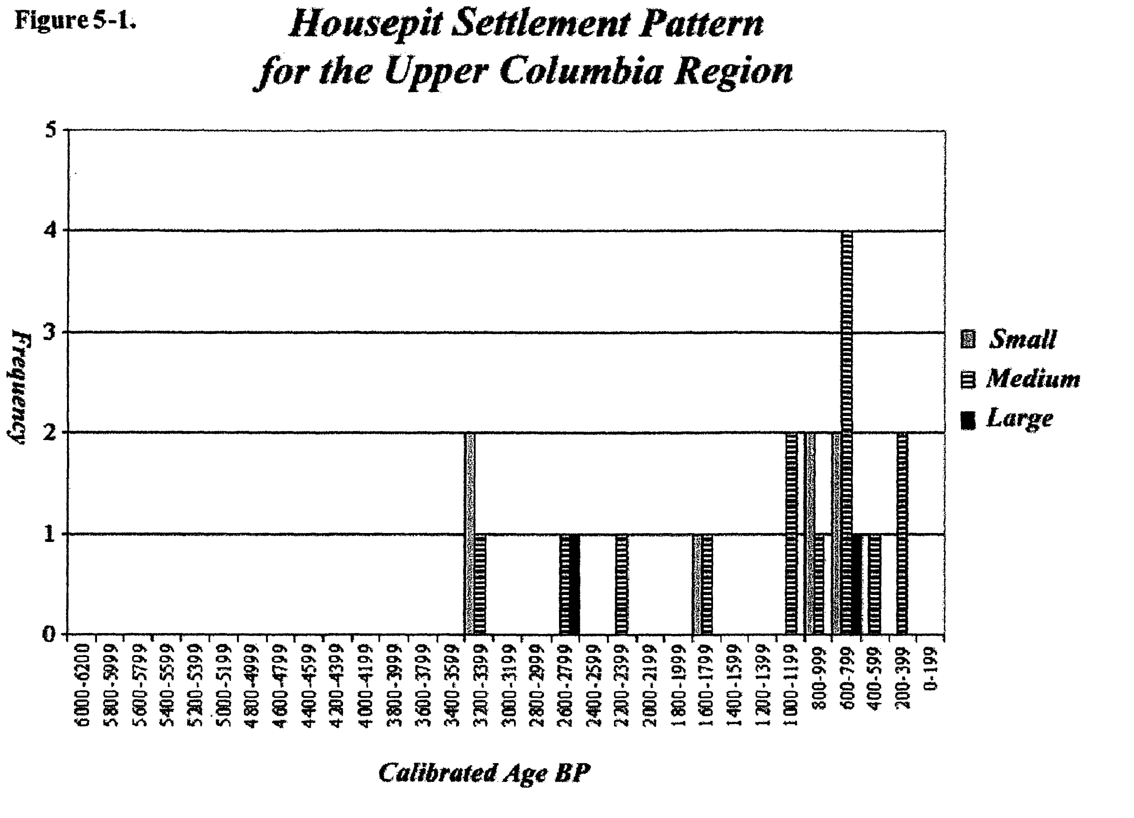
This chapter presents the results of the study and is organized into a series of graphs for each cultural feature that is represented in the data set for the Upper Columbia. These data are then combined to create a adaptive settlement pattern model for the region and establishes the framework for later comparisons to the Canadian and Columbia Plateaus.

Results for the Upper Columbia

Housepits (Figure 5-1)

In the Upper Columbia Region the first pithouses appear ca 3400-3200 cal BP. The early houses between 3400 and 1800 cal BP range in size from small to large. The Slocan Narrows site contains a large, 16 meter diameter house, dating to 2700 cal BP and is the largest pithouse recorded at this early date. Between 1200 and 200 cal BP the greatest concentration of occupations occur as small, medium, and large pithouses. In this region small pithouses occur between 3400 and 600 cal BP, medium pithouses occur between 3400 and 200 cal BP, and large pithouses occur between 2800 and 600 cal BP.

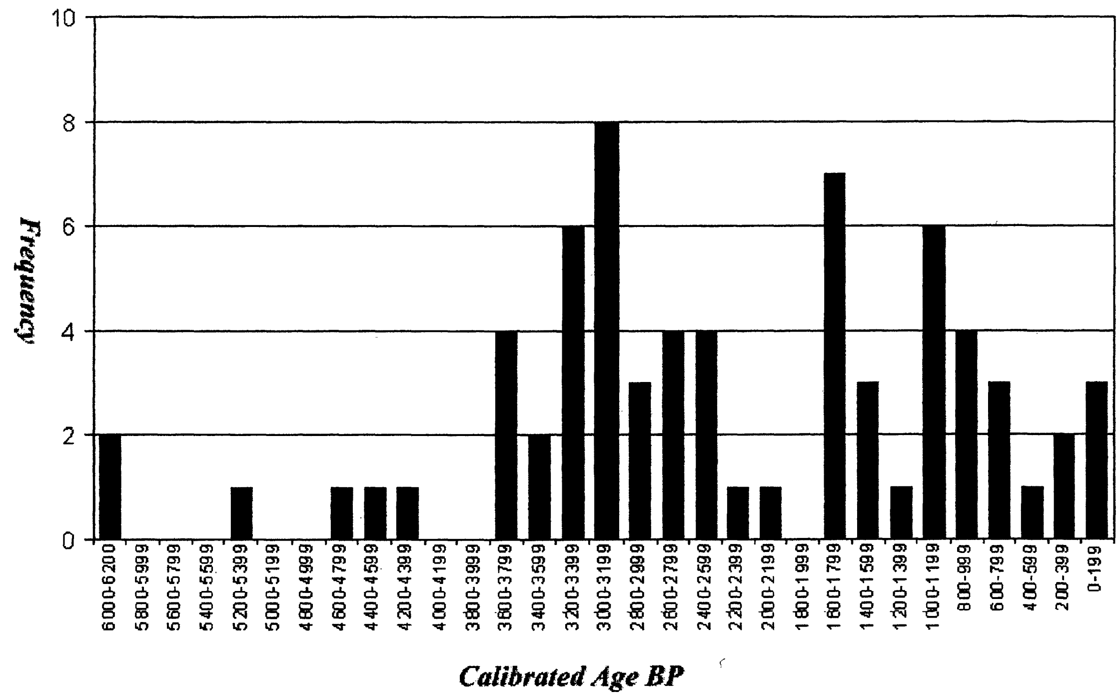
Figure 5-1.



Root Processing (Figure 5-2)

In the Upper Columbia Region the root processing record begins ca 6200 cal BP. Their associated dates were obtained from sites in the southern part of the study area in the Kettle Falls and Calispell Valley. The interval from 6200 to 3800 cal BP is characterized by limited use of root processing ovens. Two periods of intense use of root processing ovens appear to correlate with rising use-frequencies of pithouses ca 3800 to 0 cal BP. The first peak in oven frequencies occurs ca 3800 cal BP and continues until 2400 cal BP, and the second occurs between 1200 and 600 cal BP. During the 3800 years of extensive root processing, small fluctuations occur in oven frequencies. It has not been determined if these small perturbations are a consequence of human activity or are due to sampling bias.

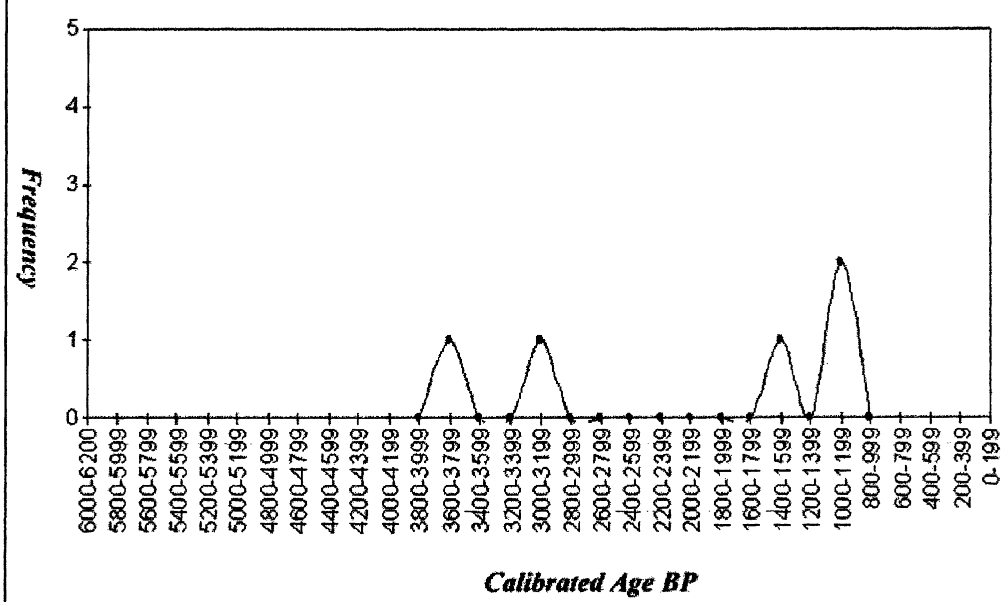
Figure 5-2. ***Root Processing Frequencies for the Upper Columbia***



Storage Pits (Figure 5-3)

The calibrated data for the use of storage pits in the Upper Columbia is very limited (N=5). The storage pit features that have been dated for this region are believed to have been used for storing edible plants such as camas. All of these dates come from sites in the southern part of the study area in the Kettle Falls and Calispell Valley. Storage pit features occur during intervals when root processing peaks however, contain a variety of stone tool artifacts, mammal bone and some camas root remains (Andrefsky et al 2000). This tentatively supports Peacock's (1998) argument that wild plant foods were harvested in mass quantity and stored for delayed consumption.

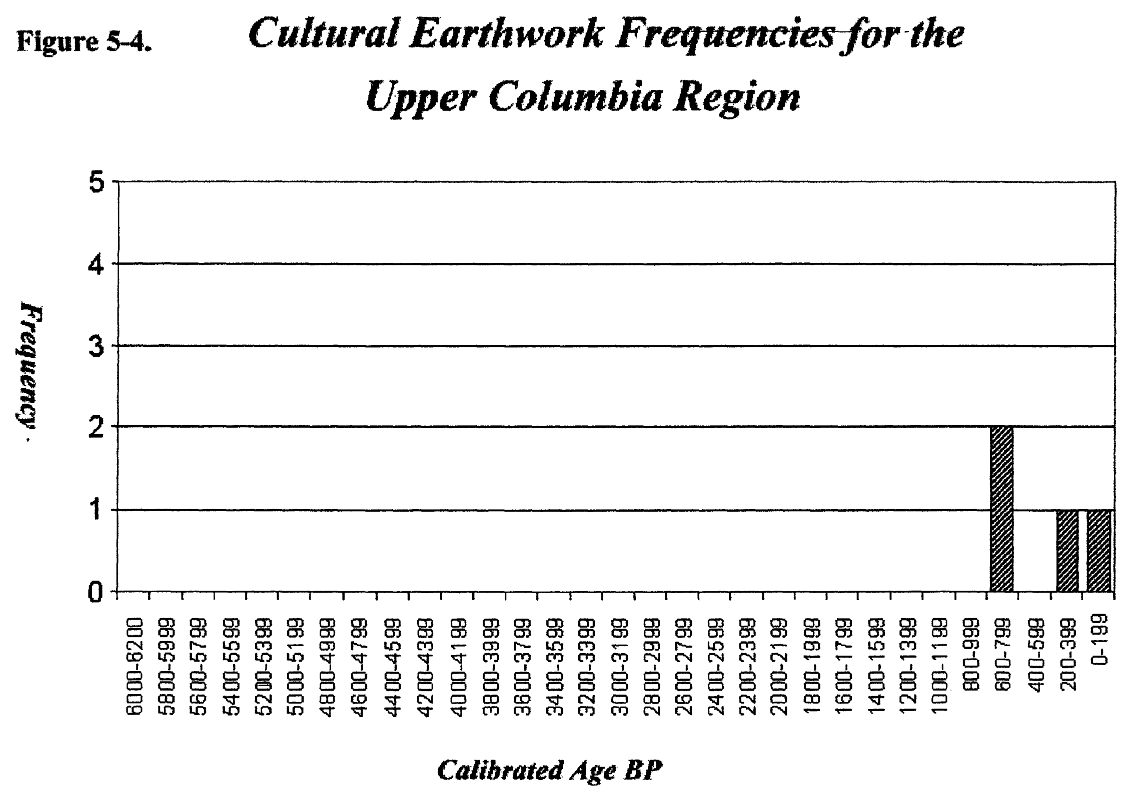
Figure 5-3. ***Storage Pit Frequencies for the Upper Columbia Region***



Cultural Earthworks (Figure 5-4)

Cultural earthworks have been identified at the Slocan Narrows and the Vallican site in southeastern British Columbia (N=4). These cultural earthworks appear in the late prehistoric during 800 to 0 cal BP. The dates for these structures bracket the earliest and latest possible construction and therefore indicate that their temporal use falls sometime between this interval. It should be noted that the appearance of these features corresponds with changes in aspects of environment and behavior corresponding to onset of the "Little Ice Age" and a decline in root processing activity.

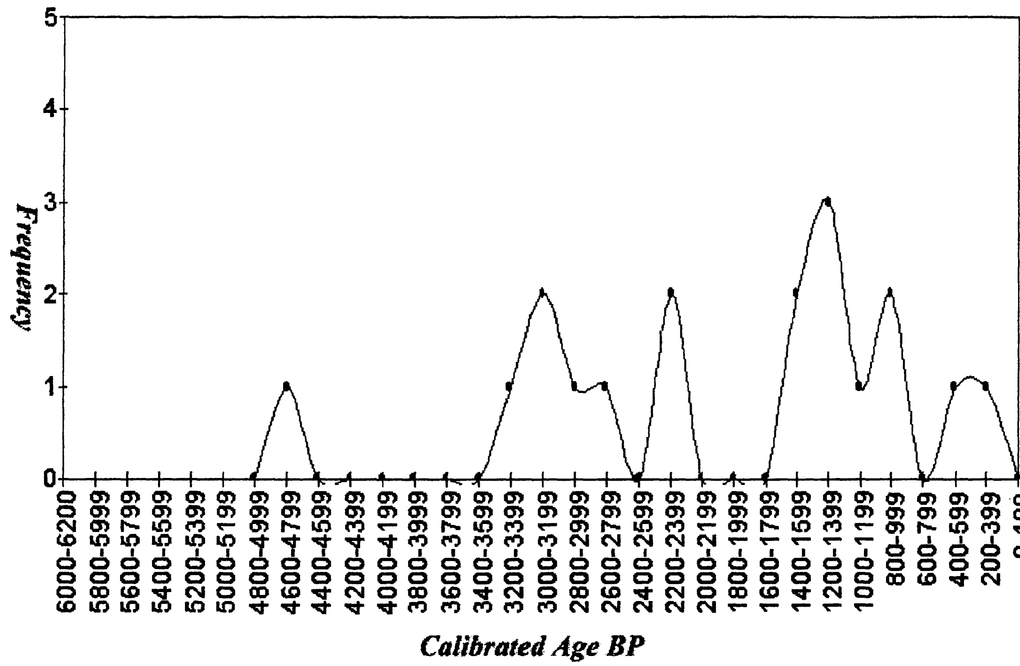
Figure 5-4.



Non-Residential Sites (Figure 5-5)

The dates reflected for hearths located in non-residential sites (N=17) show a bimodal distribution for their use. The first peak occurs between 3600 and 2200 cal BP and the second occurs between 1600 and 0 cal BP. These intervals correspond to a temporal peak in housepits, storage pits, and root processing ovens.

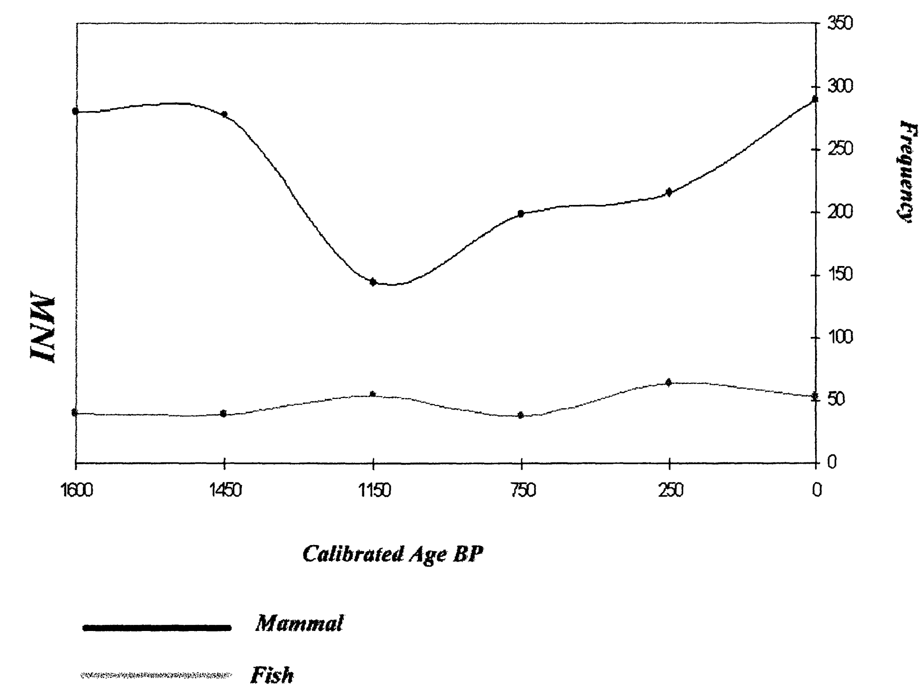
Figure 5-5. ***Hearths Associated with Non-Residential Sites in the Upper Columbia Region***



Dated Faunal Assemblage (Figure 5-6)

High acidic concentrations in regional soils have left faunal assemblages very scarce in the Upper Columbia. 45PO137 in the Calispell Valley contains the only dated faunal assemblage that I was been able to recover in the available literature. This site reveals a stable use of mammal and fish resources from 1600 to 0 cal BP. Ethnographically, mammals were a critical resource for the Sngaytskstx indigenous group. The calibrated evidence supports this assumption and suggests that mammals were relatively an intensive utilized food staple from 1600 to 0 cal BP. However, this difference may also be a consequence of preservation factors with larger mammal bones withstanding acidic soils more frequently than small fish remains. This evidence also corresponds to the ethnographic evidence that aquatic resources were less utilized than terrestrial ones.

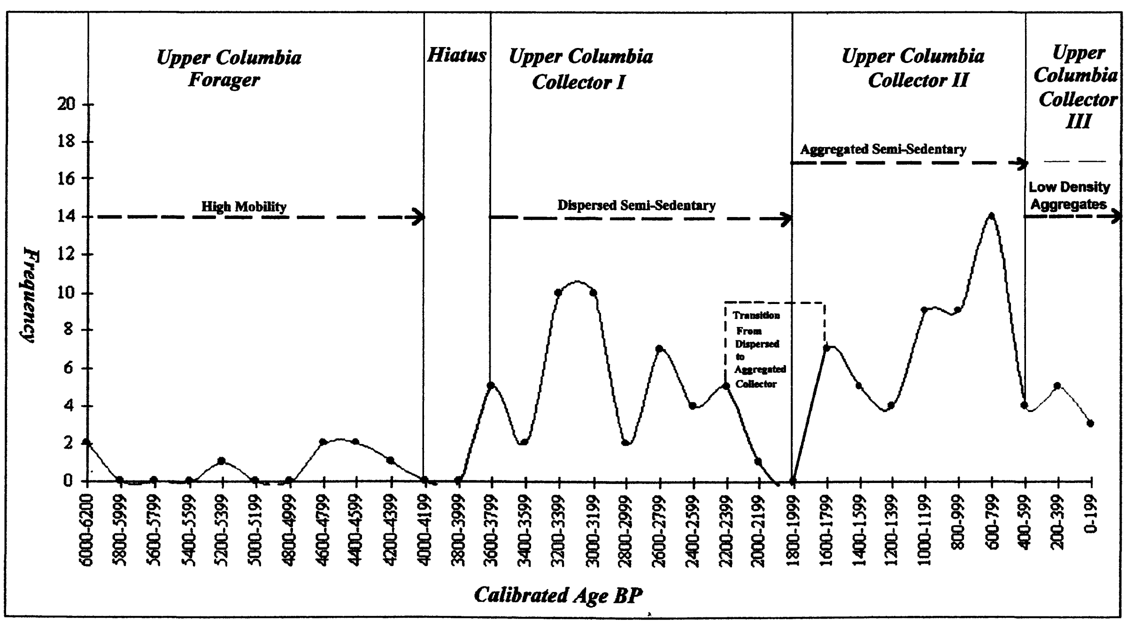
Figure 5-6. ***Dated Faunal Assemblage from 45PO137 in the Upper Columbia Region***



Adaptive Settlement Pattern Model for the Upper Columbia

The calibrated evidence posits an interesting picture of the evolution of hunter-gatherer groups in the Upper Columbia Region. I believe that six intervals characterize the past 6200 cal years of occupation for the Upper Columbia Region (Refer to Figure 5-7 for the corresponding radiocarbon frequencies to the time periods and Figures 5-8 and 5-9 for the summary and characteristics of the Upper Columbia cultural chronology). This data set suggests a bimodal distribution for two major phases of prehistoric occupation. The intervals include: 6200-4200 cal BP, 4199-3800 cal BP, 3799-2200 cal BP, 2199-1800 cal BP, 1799-600 cal BP, and 599-0 cal BP.

Figure 5-7. ***Calibrated Radiocarbon Date Frequency for the Upper Columbia Region***



The Upper Columbia Forager (6200-4200 Cal BP)

The Upper Columbia Forager represents a high mobility forager adaptation that is suggested by the lack of evidence for any permanent residential structures. This period contains dates for the first use of root processing in the Upper Columbia Region and dates are represented by six dates in the Calispell Valley: five dates from 45PO139 and one date from 45PO141 (Appendix A, Figure 6-2). Roots seem to have been a fairly stable resource base during this time and were probably used in a limited manner. The Upper Columbia Forager period also contains one date from the Fishery site in the Kettle Falls area that is in association with a non-residential site. This period represents a "forager" adaptation similar to the Middle Holocene Nesikep tradition of the Canadian Plateau and the Cascade phase in the Columbia Plateau.

"Hiatus" (4199-3800) Cal BP

Currently this interval lacks calibrated radiocarbon evidence and represents a brief archaeological gap that separates the forager to collector adaptation. This hiatus temporally corresponds to a similar lack of archaeological data in the Canadian and Columbia Plateaus.

The Upper Columbia Collector I (3799-2000 Cal BP)

The Upper Columbia Collector I represents the first of two peak occupational horizons and the advent of the collector-type system in the Upper Columbia. The first semi-subterranean pithouses were established and occupied during this interval and vary in size from small to large. Pithouses dating to this time are found in single or low density clusters in the Upper Columbia landscape and is representative of dispersed collector adaptation. The first extensive root processing occurs with an intensified focus on camas root. Storage pits appear at this time and correlate with mass harvests of camas. This time period indicates the start of a delayed consumption tactic and a narrowed spectrum diet on specific resources to create food surplus for the cold season. Hearths appearing in association with non-residential sites increase in frequency during this period. This tradition likely marks the beginning of the "collector" adaptation in the Upper Columbia and is concurrent to similar behaviors at the advent of Pithouse II and the Shuswap horizon.

Transition

Between the Collector I and Collector II adaptations there is a decline in radiocarbon dating. I feel, based on later discussion, that there is a lower radiocarbon date frequency and site density during this transition between dispersed and aggregated collectors. However, I believe that this is somewhat over amplified in figure 4-7 and the absence of dates during 1,999 and 1,800 is due to sampling bias.

The Upper Columbia Collector II (1999-600 Cal BP)

The Upper Columbia Collector II corresponds to a second major occupation of the Upper Columbia. Housepit occupations occur in small, medium and, large sized houses, and the greatest abundance of pithouses are found to date to this time. The calibrated evidence suggests that if aggregated communities existed in the Upper Columbia, it was during this time period (Figure 4-1). Moreover, this time period reflects the most probable evidence for aggregated complex villages, which appear at 1,200 cal BP and lasts until 600 cal BP. This period also corresponds to the late peak in root processing and storage pits for mass harvested resources. Hearths associated with non-residential sites also peak at this time. Fish and mammal assemblages from 45PO137 in the Calispell Valley, show a continuous use of both fish and mammal resources during this time with a relatively more intensive use of mammals over of fish.

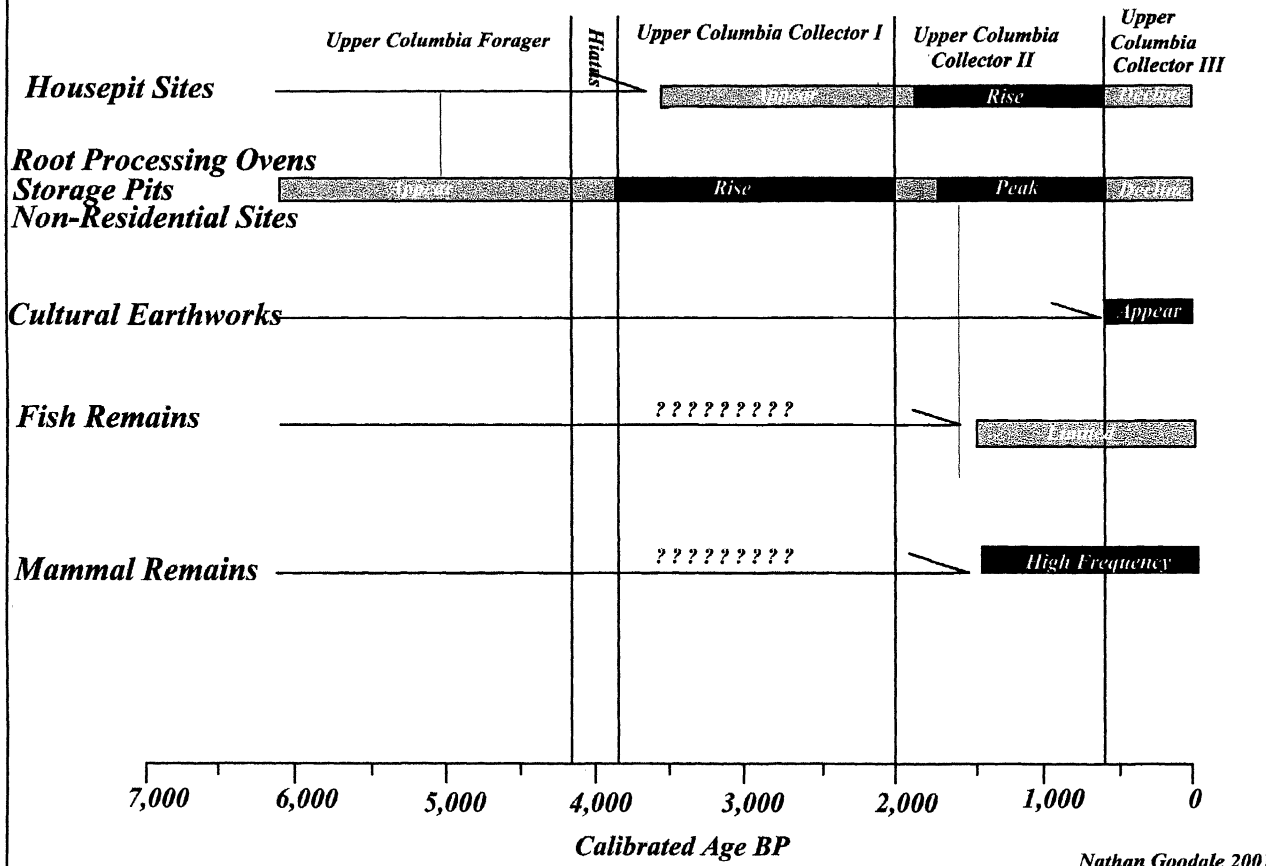
The Upper Columbia Collector III (599-0 Cal BP)

The beginning of this interval corresponds to the start of the "Little Ice Age" and marks the maximum extent of glaciation since the end of the Pleistocene. This interval is indicated by a decline in radiocarbon dates; however, pithouses remain occupied at this time and medium sized structures dominate the record. The use of root processing ovens appear to decline and may be consequent to the onset of the "Little Ice Age" and the associated effects on the availability of resources. During this time cultural earthworks appear in the archaeological record. The appearance of these features may be due to a decrease in the resources that were stressed by cooling temperatures. Subsequently, previously reliable resources declined in availability and may have spurred hunter-gatherer groups to defend locales where resource acquisition was possible under the climatic change.

Figure 5-9. Time period characteristics of the Upper Columbia Region Chronology

Time Period	**Characteristics**
6200-4200CalBP *"The Upper Columbia Forager"*	Limited root processing and non-residential sites. High mobility forager adaptation.
4199-3800 Cal BP *"Hiatus"*	Hiatus in the archaeological record with a 400 year lapse of radiocarbon dates.
3799-2000 Cal BP *"The Upper Columbia Collector I"*	Small, medium, and large pithouses are occupied, extensive root processing, storage pits appear, and non-residential site use rises in frequency. Advent of semi-sedentary dispersed collector system.
1999-600 Cal BP *"The Upper Columbia Collector II"*	Small, medium, and large pithouses are occupied, extensive root processing, storage pits are used, non-residential site use rises in frequency, and fish and mammal resources seem steady throughout the interval. The advent of the aggregated collector adaptation and complex hunter-gatherers existed from 1,200-600 cal BP.
599-0 Cal BP *"The Upper Columbia Collector III"*	Onset of the "Little Ice Age ", only medium sized pithouses are occupied with a decline in root processing, storage pit frequencies, and non-residential sites. Cultural earthworks appear during this interval as a possible defense mechanism. Fish and mammal remains stay constant throughout this interval. Dispersed complex collectors.

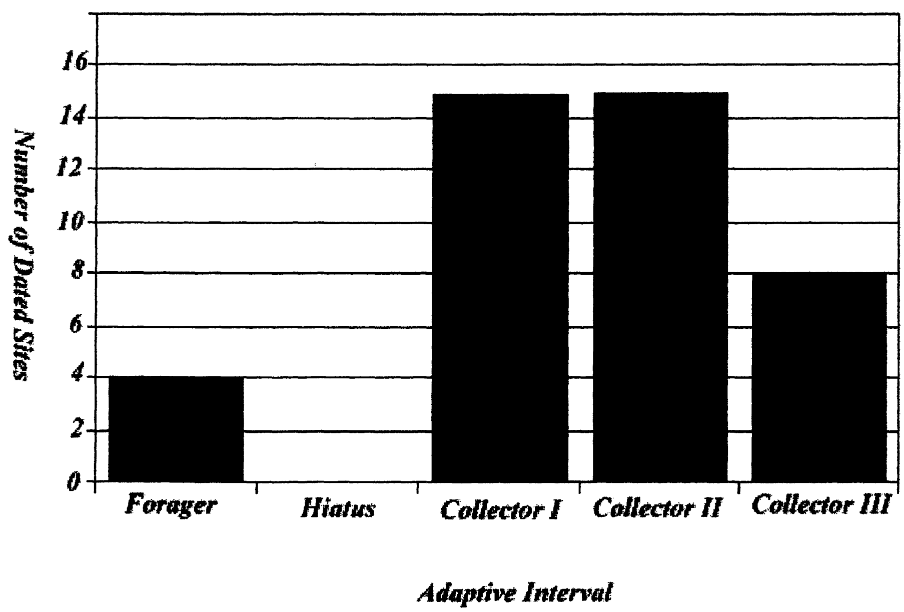
Figure 5-8 **Summary for the Upper Columbia Region**



Testing the Adaptive Model

During the course of this study I will be referring to Figure 5-7 to provide the conclusions supported by the calibrated data for proxy measurements of population densities and adaptive pattern changes throughout the occupation of the Upper Columbia. To substantiate this as a model of population and adaptation changes through time, a couple of tests are required. This section statistically tests the calibrated two-sigma range of radiocarbon date frequency representative of the region.

Figure 5-10. Number of Sites Dating to Each Interval



First, to support Figure 5-7 as a population proxy the calibrated evidence should indicate that the percentage of radiocarbon dated sites is roughly equal to the percentage of sites occupied for each given adaptive interval. In this model higher site frequency should represent higher population densities. Therefore, the highest density of occupied sites should correspond to the Upper Columbia Collector I and II, with relatively lower densities during the Collector III adaptation, and even lower during the Forager adaptation. Figure 5-10 agrees with this conclusion and supports the use of Figure 4-7 as a population proxy. Interestingly, Figure 5-10 also shows that the site density for the Collector I and II are roughly the same. However to further support the population proxy model the total time span of each interval must be taken into consideration to examine site frequency per year(s). The Upper Columbia Forager adaptation endures for 2000 calibrated years and there is evidence for four sites being occupied which corresponds to a ratio of sites to years of 1:500 (Table 5-1). The Upper Columbia Collector I adaptation lasts for 2000 years and there are 15 sites that date to this time period corresponding to a ratio of sites to years of 1:133.3. The Upper Columbia Collector II endures for 1400 calibrated years and 15 sites are dated to this time period corresponding to a ratio of sites to years of 1:93.3. The Upper Columbia Collector III endures for 500 calibrated years and 8 sites are dated to this time period corresponding to a ratio of sites to years of 1:62.5. This data reveals the highest site density during the Collector II and III adaptations. However the past section presented evidence to argue that large sized pithouses were abandoned and root processing features declined in frequency during the Collector III adaptation. There is also a significant decline in the frequency of radiocarbon dates and site occupation frequency correlating to this interval suggesting that even though there is a higher site to year ratio for the Collector III adaptation, Collector II most likely had the highest population densities in the aggregated large villages. It is possible that Collector III may have higher population densities throughout Upper Columbia landscape however, they were spread out more evenly in lower population density aggregates with the large villages dispersing into smaller villages that filled other ecological niches.

Table 5-1. Adaptive interval and site density in the Upper Columbia.

Adaptation	Total Time Span in Years	% of Total Time	Total # of Sites	% Total Sites
Forager	2000	32.8	4	9.5
Hiatus	400	6.5	0	0
Collector I	2000	32.8	15	35.7
Collector II	1200	19 7	15	35.7
Collector III	500	8.2	8	19.0
Total	6100	100%	42	100%

Second, Figure 5-7 is plotted with the mean of the total two-sigma (95% confidence interval) range of the calibrated date. As discussed in the previous section there is a series of high and low frequency radiocarbon date clusters that I have divided into adaptation intervals based on ^{14}C date frequency and material culture. However, to demonstrate that there were significant changes taking place during the past ca. 6000 cal years BP in the region, the full range of the calibrated dates should correlate to Figure 5-7. In Figure 5-11 the full range of each calibrated date (N=116) is plotted and coded per interval. This picture reveals a fairly continuous relationship of the calibrated dates with the range of the dates overlapping from 7,200 to 0 cal BP. This is especially evident during the Collector I, II and III intervals where the centroids (means) overlap in many instances. A couple of exceptions occur. First, between the Forager and Collector I adaptations, the high two-sigma range of the youngest Forager date and oldest Collector I date is the reason they overlap. This time period of overlap, from 4,200-3,800 cal BP which will be discussed in the coming chapters, roughly correlates to a brief "hiatus" associated with the transition from forager to collector in the Canadian and Columbia Plateaus. This time period also contains the lowest number of overlapping date ranges for the entire sequence. For these reasons I have termed this time period a "hiatus" in the archaeological record for the Upper Columbia. Second, Figure 5-11 reveals that there is a statistical event that takes place during the transition from Collector I to Collector II by the relatively lower frequency of overlap and the offset of the date means. The date in the middle of the transition I have associated with Collector I because it comes from a root processing hearth that is temporally associated with the decline in these features at the end of the Collector I adaptation. Moreover, after this time in the Collector II adaptation the first evidence is apparent for housepits to be continuously occupied and possibly in an aggregated manner. Consequently I have termed this time period from 2,200 to 1,800 cal BP a "transition period" associated with the decline and reorganization of the dispersed Collector I adaptation and the rise of the aggregated Collector II adaptation. These ideas of aggregated versus dispersed groups in the Upper Columbia will be further discussed in the forthcoming chapters. Figure 5-11 reveals a continuous overlap of dates associated with the transition from Collector II to Collector III. This supports my argument that Collector III was essentially the same as Collector II by maintaining semi-sedentism, aggregation, and a collector-based economy, however at a smaller demographic scale.

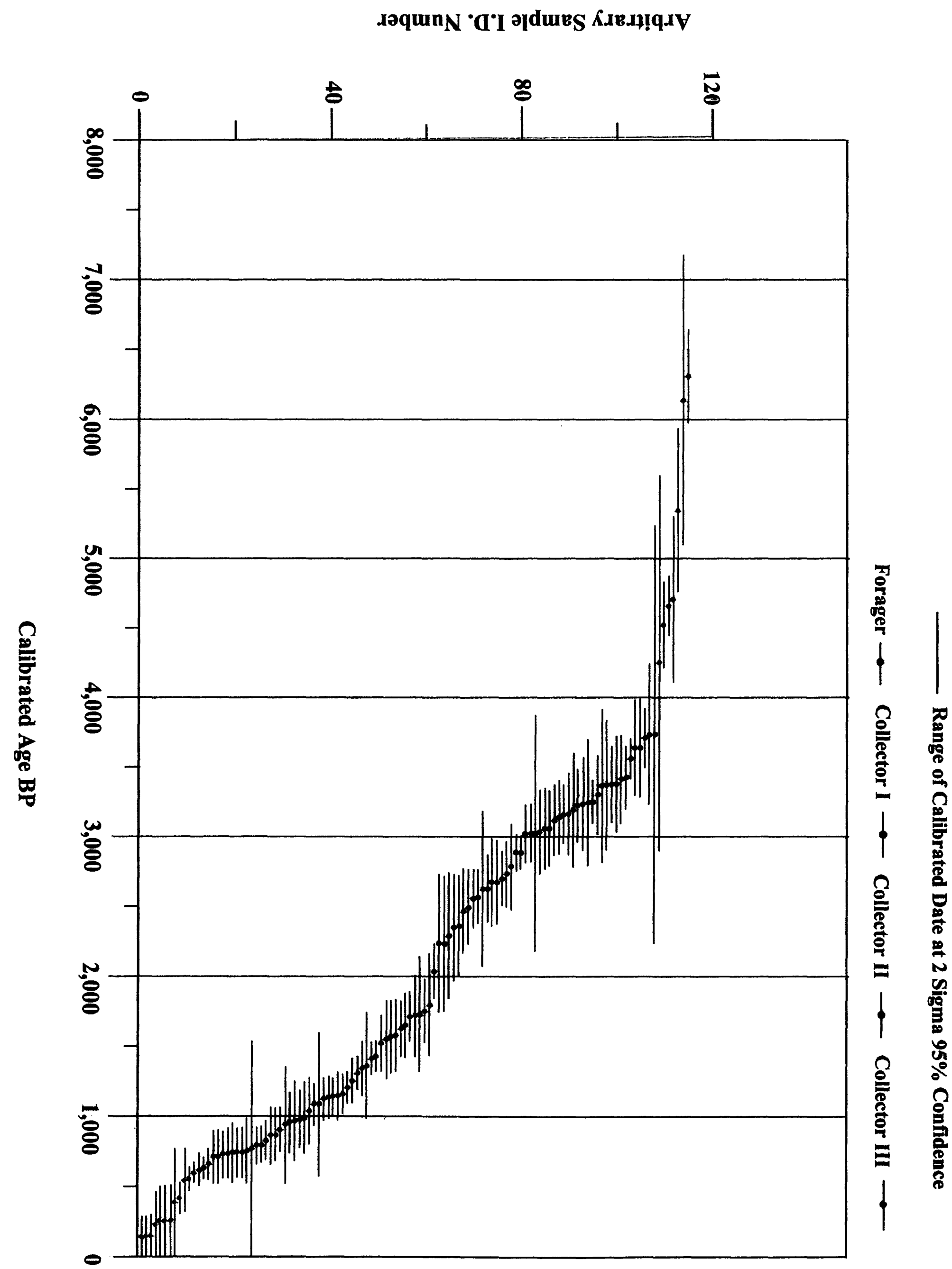


Figure 5-11. Two Sigma Range of Calibrated Dates

Summary

The calibrated evidence reveals a bimodal distribution for occupation in the Upper Columbia. The advent of the collector-type adaptation is present by 3799 cal BP and continues until the ethnographic times with increased populations during the Collector I and II adaptation. Based on housepit morphology data, I have argued that aggregated villages start to appear at 2,000 cal BP and then lead into large village sizes and a complex social organization that appeared between 1,200 and 600 cal BP. After 600 cal BP the high population density villages disperse into smaller aggregates occupying the Upper Columbia and retain the settlement characteristics and a complex social organization, yet at a smaller scale, as the Collector III adaptation. This sequence of prehistoric cultural events and associated time periods closely resembles the adaptive patterns in the Canadian and Columbia Plateaus.

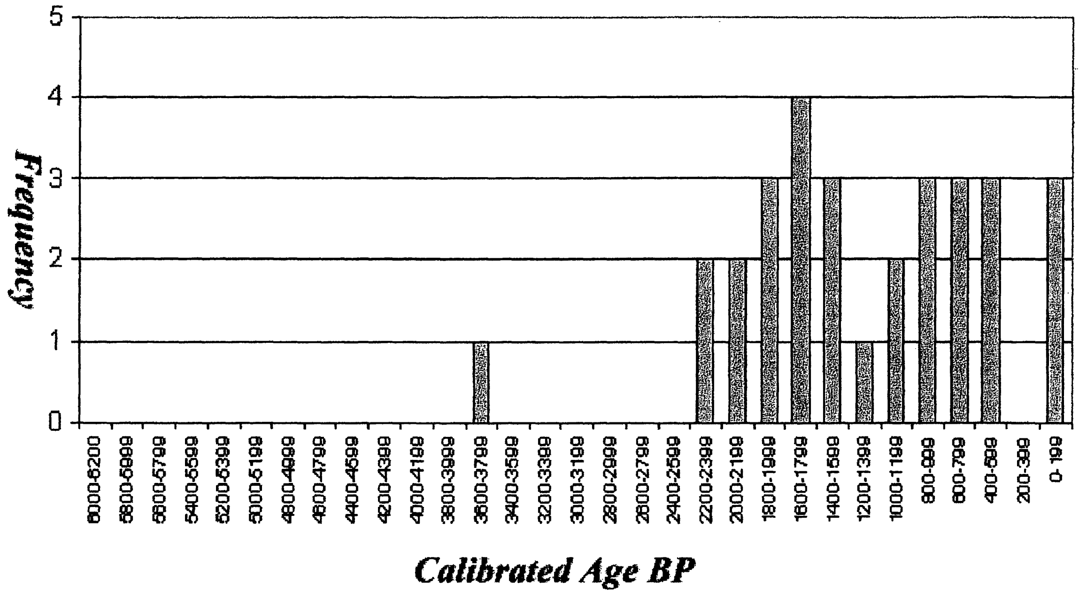
Inter-Regional Comparisons

This section is intended to compare the Upper Columbia adaptive model to similar data sets from the Mid-Columbia and Fraser-Thompson in order to asses the degree of similarity and difference between the human adaptive history on a regional scale in the Interior Northwest. This section also provides the basis to conclude that inter-regional socioeconomic adaptation changes took place in similar temporal and cultural contexts during the prehistory of the Interior.

Mobility and Settlement

During the Upper Columbia Forager, the Cascade phase, and the Early Nesikep-Lehman-Early/Middle Lochnore phases, the Interior Northwest was occupied by highly mobile forager-type hunter-gatherers (Chatters 1995; Stryd and Rousseau 1996). These groups employed high residential mobility and utilized residential bases with resource gathering locales (Chatters 1989, 1995) to harvest a broad spectrum of resources with a "mapping on" tactic. Residential locales during high mobility forager adaptation in the Columbia Plateau are indicated by the presence of milling stones and hopper-mortar technology with associated floral and faunal remains (Chatters 1995). Resource gathering sites are found in the Upper Columbia in association with camas root harvesting locales which evinces between 6,200 and 6,000 cal BP (Figure 5-2). In the Canadian Plateau, foragers emphasized other resources such as mammals, fish, or other gathering staples that did not require processing features. Root processing features appear at the earliest between 3,600 and 3,800 cal BP in the Canadian Plateau (Figure 5-12).

Figure 5-12. **Root Processing Oven Frequencies for the Canadian Plateau**



At approximately 4,500-4,400 BP, hunter-gatherers appear to have reorganized their mobility strategies and shift into a semi-sedentary forager-type adaptation in localized areas in the Columbia Plateau. The first sign of this system and semi-permanent residential structures appears ca. 4,400 BP during Pithouse I in the Columbia Plateau at 45KT285 and 45OK287/8 (Chatters 1995). Pithouse I sites contain single or small clusters of houses that are small and shallow averaging 40-60 cm in depth and seven to eight meters in diameter (Chatters 1995, Stryd and Rousseau 1996). Seasonality evidence indicates that the pithouse sites during this interval ca. 4,500/4,400 – 3,800 BP were occupied on a year-round basis (Chatters 1995). The forager adaptation resembles

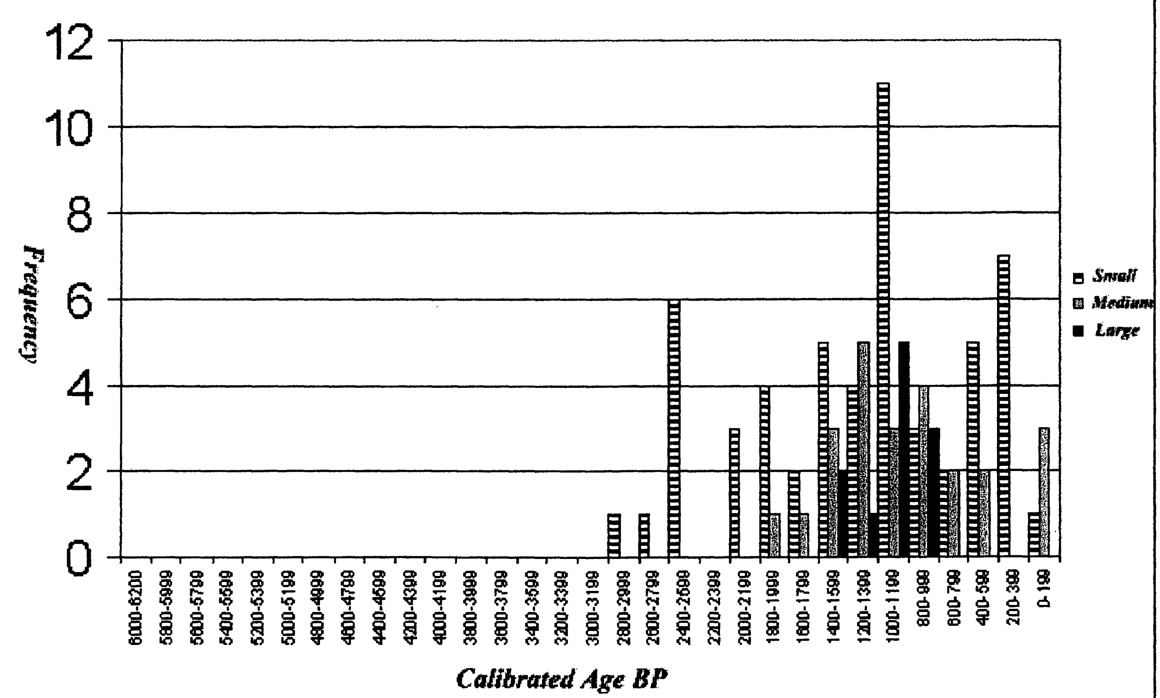
Binford's (1980) residential mobility with frequent movements that began to utilize root resources in the area by 3,800-3,600 cal BP.

The semi-sedentary forager system is also present ca. 4,500 BP during the later Lochnore phase in the Canadian Plateau at the Baker site (Stryd and Rousseau 1996). However, there is still debate surrounding the origins of the people that occupied the Baker site; it is the only pithouse site that dates this early in the Canadian Plateau and may be a reflection of people "exploring" the interior from the coast or Pithouse I people "exploring" north. Prentiss and Kuijt (2001) argue that the anomalous patterns seen at the Baker site owe much more to developments on the coast or on the Columbia than that of the Lochnore or Lehman phases of the Canadian Plateau. Moreover, the abrupt disappearance of the Lochnore phase and its lack of temporal continuity with the Shuswap horizon may indicate the movement of a new population in the Interior. The movement of the new population brought traits that were adaptively and stylistically unlike earlier Plateau patterns and as a consequence the collector adaptation emerged abruptly in the Interior (Prentiss and Kuijt 2001). For the remainder of this paper I will argue, based on Prentiss and Kuijt (2001), that the people who resided at the Baker site were most likely culturally tied to the coast or southerly Plateau. However, the key importance is that people were in the Canadian Plateau possessing a semi-sedentary adaptation with storage that succeeded from 5,300-4,200 cal BP predating the advent of stable collector systems by 700 calibrated years in the Canadian Plateau.

The semi-sedentary forager adaptation is not indicated in the archaeological record for the Upper Columbia. In this area highly mobile forager-type adaptations appears to abruptly shift into semi-sedentary collector-type adaptations after a brief 400 year hiatus ca 3,800 cal BP. The absence of these transitionary characteristics, a semi-sedentary forager adaptation, and the presence of this brief hiatus may also be indicative of new populations that were migrating into the Upper Columbia possessing a collector-type system and corresponding technology after ca 3,800 cal BP much like Prentiss and Kuijt (2001) and Prentiss and Chatters (2002) argue for the Canadian Plateau.

Evidence suggests that the economic change in forager to collector systems takes place ca. 3,450 cal BP in the Canadian Plateau at the start of the Shuswap horizon (Stryd and Rousseau 1996; Prentiss and Chatters n.d), ca. 3,500 cal BP in the Columbia Plateau at the commencement of Pithouse II (Chatters 1989, 1995), and 3,800 cal BP in the Upper Columbia with the commencement of the Upper Columbia Collector I. This transition is associated with evidence that suggests the first examples of delayed food economy indicated by storage features, a morphological change and increase in frequency of pithouses, and an increased focus on a narrow spectrum of resources (i.e. salmon and roots). This transition represents a semi-sedentary collector economy with dispersed groups or families of hunter-gatherers situating themselves in non-communal relationships occupying pithouses throughout the landscape. During this time pithouses increase in depth and diameter ranging from 1-2 meters in depth, up to 16 meters in diameter, and are found throughout the Interior Northwest. Sites in the Canadian Plateau that contain pithouses dating to the Shuswap and early Plateau horizon include Mitchell, Marron Lake, and Natwantlun (Lenert and Goodale 2001). The broader adaptive model for cultural change developed by Lenert and Goodale (2001) indicates that the first pithouse use associated with dispersed collectors in the Canadian Plateau is after ca. 3,000 cal. BP (Figure 5-13). Sites in the Columbia Plateau that contain houses that date to Pithouse II include 45DO189 (Galm and Lyman 1988), 45DO250 (Miss, 1984a), 45DO258 (Jaehnig 1984a), 45OK4 (Miss 1984a), 45DO211 (Lohse 1984b), 45DO242 (Lohse 1984c), and 45DO372 (Moura 1986). Sites in the Upper Columbia that contain houses that date to this time period include Slocan Narrows (Prentiss et al 2001) Vallican (Mohs 1982), Deer Park (Turnbull 1977), Inonoaklin (Turnbull 1977), and Cayuse Creek (Turnbull 1977). The pithouse sites occupied during this period indicate they were on average small in diameter (however Housepit 1 at the Slocan Narrows site is considered large under the criteria described in Chapter Four) and occur as single houses or in low frequency clusters.

Figure 5-13. ***Housepit Settlement Pattern in the Canadian Plateau***



At approximately 2,200 cal BP the first evidence exists that suggests the aggregated pithouse village communities were inhabited by the prehistoric hunter-gatherer occupants in the Interior Northwest. This transition can be viewed as the change from the earlier dispersed collectors to the later aggregated collectors. This change takes place in the Canadian Plateau during the later Plateau horizon at approximately 2,200 cal BP (Lenert and Goodale 2001), 2,200 cal BP in the Columbia Plateau with the start of the Ethnographic Pattern (Chatters 1995), and 2,000 cal BP in the Upper Columbia with the commencement of the Upper Columbia Collector II. The calibrated evidence indicates that this adaptation starts at 2,200/2,000 cal BP, peaks between 1,200 and 1,000 cal BP, then declines by 800/600 cal BP in the Interior Northwest (Figure 5-17). This adaptation is characterized by the largest structures, the most convincing evidence for contemporaneous structures, the most abundant data on food storage, and the best evidence for social inequality in the Interior Northwest. Based on housepit morphology data, complex social organization has been argued to take place in the Canadian Plateau between 1,600 and 800 cal BP (Lenert and Goodale 2001), 1,200 and 800 cal BP in the Columbia Plateau (based upon Chatters 1995 data) and between 1,200 and 600 cal BP in the Upper Columbia. Sites in the Canadian Plateau that contain pithouses associated with this adaptation are Lochnore Creek, Mitchell, Bridge River, Gibbs Creek, West Fountain, Bell, Keatley Creek, Lake Corner, Marron Lake, Monte Creek, Tate, Harper Ranch, Curr, Potlatch, Kamloops Reserve, Daniktco, Nakwantlun, EkRo-48, EkRo-18, Taseko Lakes, and Stafford Ranch (Figure 5-13). Sites in the Upper Columbia include Slocan Narrows (Prentiss et al 2001), Vallican (Mohs 1982), and Ilthkoyape (Chance and Chance 1982).

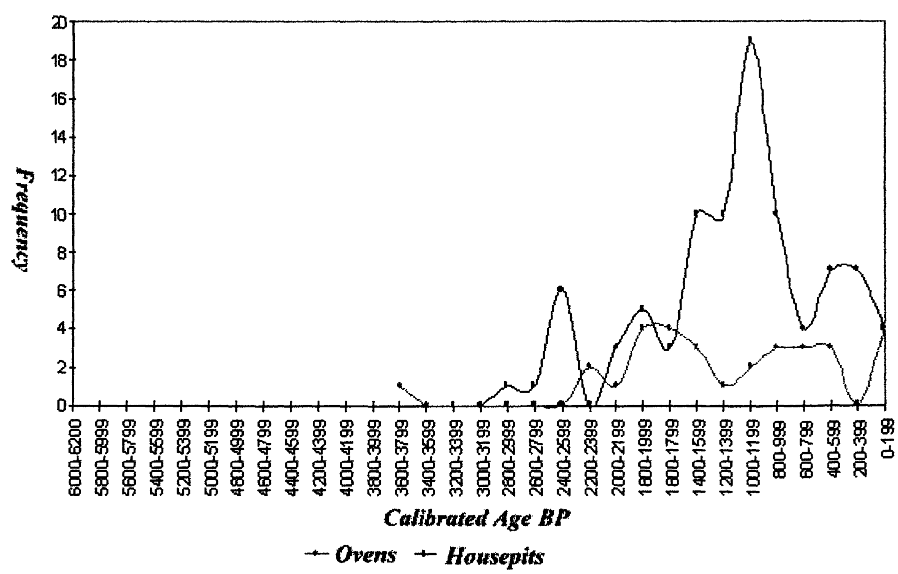
Between 800 and 600 cal BP the calibrated evidence suggests that a large scale decline in populations took place as indicted in an associated decline of pithouse occupation frequency and food processing features. The large pithouses occupied during the last aggregated collector adaptation were abandoned (Lenert and Goodale 2001) and the large villages were probably also abandoned or occupied to a lesser extent. However, the evidence suggests that the hunter-gatherers in the Interior retained a collector-type adaptation with a semi-sedentary lifestyle occupying small and medium sized houses (Figures 5-1 and 5-13). Tentatively and based on a limited sample, it may be suggested that during this time defense wall features appear in the region (at least in the marginal residential sites of the Upper Columbia) and may represent problems relating to resource availability causing hunter-gatherers to defend certain resource locales from neighboring groups.

Subsistence and Settlement

During the past 6,000 years in the Interior Northwest, settlement patterns can be directly correlated with the use of certain highly productive resources. These resources, represented in different levels throughout the region, are regionally represented as species of edible roots, anadromous salmon, and terrestrial mammals. During the early highly mobile forager period subsistence was gathered in a "mapping on" strategy and consumed on an immediate basis (per Binford 1980). Edible roots were gathered and processed in a limited manner in the southern Plateau and salmon are documented in limited amounts throughout the interior in archaeological contexts. It is also assumed through archaeological faunal assemblages and ethnographic evidence for the region that large and medium sized mammals were used as another means to provide dietary resources and economic stability (Teit 1909; Bouchard and Kennedy 2000). After 5,000/4,500 cal BP resources seem to rise slightly in productivity and enable high mobility foragers to settle in one area on a yearly basis and start to utilize a semi-sedentary forager adaptation in specific areas of the Canadian and Columbia Plateaus. Fish remains rise slightly in faunal assemblages throughout the interior and foragers were able to use a relatively smaller landscape to be economically successful. By 3,500 cal BP in the Canadian and Columbia Plateau and 3,800 cal BP in the Upper Columbia, stable collector-type systems started to utilize a narrower spectrum of resources relying on intensified salmon and roots in the Interior. These focuses however, would have no doubt, been supplemented with other available resources. Salmon remains are documented at this time to rise in frequency in archaeological contexts (Richards and Rousseau 1987, Chatters 1989, 1995). Edible plant roots are intensified in their use especially in the Upper Columbia and probably in the greater southern portion of the study area. The first evidence of plant root processing in the Canadian Plateau is indicated by a single radiocarbon date and suggests that root processing is used on a limited basis however, this early date may be a bias in limited sampling or this date may be dating an earlier cultural or natural event (Figure 5-12). In the Upper Columbia root processing oven frequencies increase with the advent of a semi-sedentary lifestyle indicated by the occupation of pithouses. During the semi-sedentary dispersed collector and the advent of aggregated collectors at ca. 2,200 cal BP, there are interesting inter-regional comparisons between the occupation of pithouses and the processing of edible plant roots.

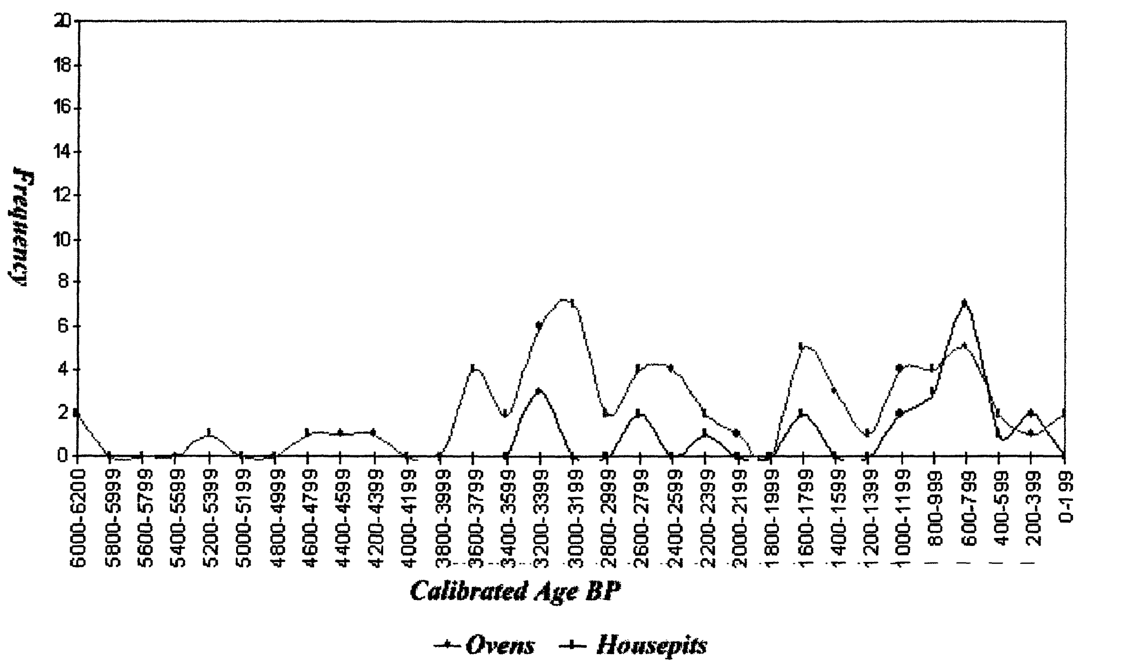
In the Canadian Plateau root processing appears to be utilized as a stable resource by 2,400 cal BP (Figure 5-12) (Peacock 1998). The increased utilization of roots corresponds to the increase in the occupations of housepits until 1,600 cal BP (Figure 5-12, 5-13, and 5-14). At 1,600 cal BP there is an abrupt increase in the use of pithouses that signifies the large aggregated communities in the Canadian Plateau (Lenert and Goodale 2001). During this time plant processing features are stable in frequency and highly ranked salmon species increase abruptly in appearance in the archaeological record. This suggests that salmon most likely facilitated a large percentage of the dietary requirements to feed large aggregated populations with supplementary calories from roots (Figure 5-14). Moreover, this corresponds to bone stable isotope analysis that suggests salmon constituted 60% of the dietary caloric intake by people in the Canadian Plateau during the dispersed and aggregated collector adaptations (Chisholm 1986).

Figure 5-14. ***Housepit to Root Processing Oven Frequencies in the Canadian Plateau***



In the Upper Columbia Region root resources were utilized and intensified at the start of the dispersed collector adaptation. They appear to be a constant food staple between 3,800 and 2,000 cal BP. During this time the first pithouses are occupied in single or low density clusters in the Upper Columbia landscape. Following a brief decline, root production again increases at 1,800 cal BP and continues throughout the aggregated collector adaptation through the Upper Columbia Collector II. The calibrated evidence for the dispersed and aggregated collector adaptations in the Upper Columbia region suggest that root processing features and housepit occupation frequencies are integrally connected (Figure 5-15). These data suggests that edible roots were an intensified resource of the collector system in this region. However, there is a major difference in the correlation of housepit occupations and root processing feature frequencies in the Upper Columbia and the Canadian Plateau (Figures 5-14, 15). Based on these data to provide a hypothetical reason for the differences, the Upper Columbia region may have utilized a more even distribution of resources with roots, salmon, and large mammals. Hunter-gatherers in portions of the Canadian Plateau may have had a more uneven utilization of salmon over roots and mammals as Hayden (1992, 1995, 1997, 2000) indicates. This may be a reflection of different levels of social organization in the two areas. The Fraser-Thompson hunter-gatherers may have had more individuals aspiring to accumulate wealth in the form of subsistence (per Hayden 1997, 2000) while Upper Columbia residents were hierarchically organized yet in an area that did not require the competitive aspects evident in the Canadian Plateau with the Northwest Coast. I argue that the aggregated collector adaptation appeared in the marginal Upper Columbia however, probably not to the scale that it appeared in the Canadian Plateau and the reasons for this may be a consequence of social organization. As aforementioned, the faunal preservation in the Upper Columbia is very poor and this problem prevents a test of alternative models at this time. For now it appears to me that Upper Columbia hunter-gatherers were intensively utilizing edible roots and were probably also using mammal and fish resources in approximately the same degree however, preservation limits our ability to test this hypothesis.

Figure 5-15. Housepit to Root Processing Frequencies in the Upper Columbia Region



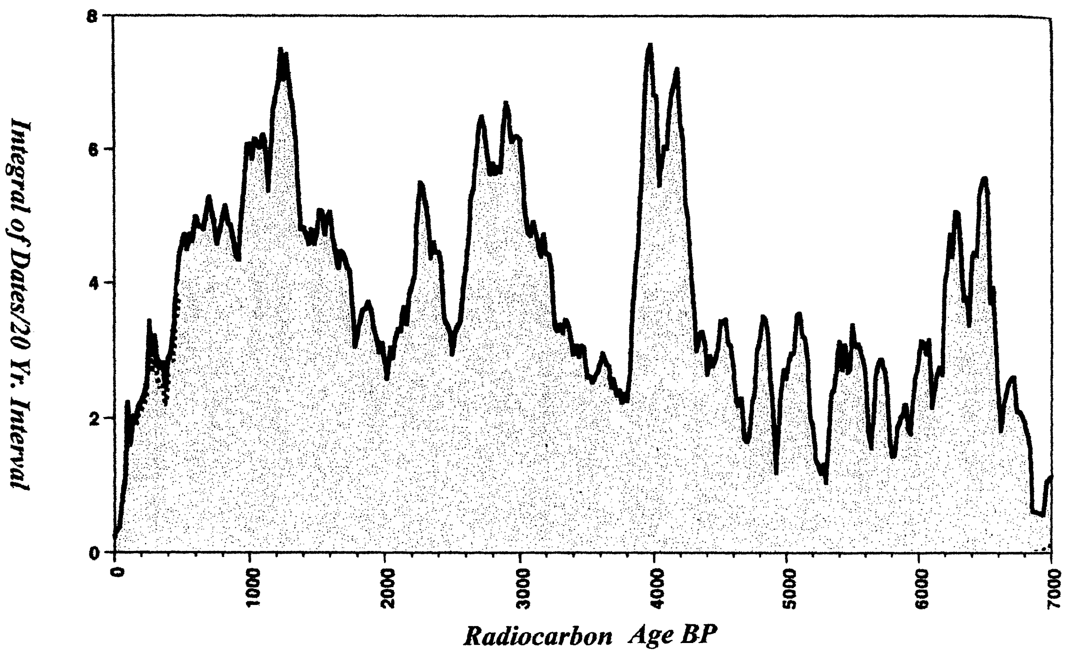
At approximately 1,000-800 cal BP in the Canadian and Columbia Plateaus and 800-600 cal BP in the Upper Columbia there is a large scale decrease in the frequency of radiocarbon dates for the Interior Northwest. In the Canadian Plateau housepits decrease in size and frequency of occupation however, root processing oven dates remain fairly stable (Figure 5-14). This level of intensity may be indicative of what the settlement pattern may have looked like in the Canadian Plateau without salmon as a main dietary staple. In the Upper Columbia housepits and root processing features decline together in frequency indicating again that these two cultural features were strongly linked to the adaptive patterns in the area.

Demography and Settlement

Plateau researchers rely heavily on the frequencies of radiocarbon dates from archaeological contexts as an approximation of human populations through time (Ames 1991, Chatters 1991 and 1995, Lyman 1992; and Reid 1991). This approach employs the hypothesis that the greater a given population, the more carbon samples are deposited into archaeological contexts. Chatters (1995) analysis of 850 radiocarbon dates from the Columbia Plateau produced a population curve for the past 6,000 years (Figure 5-16). These radiocarbon dates were corrected by adding a statistical curve to include the full probability that the standard deviation of the dates falls within the given interval. This analysis for an entire data set closely resembles the result given for an individual date by the CALIB 4.3 program. However, CALIB 4.3 adjusts for inconsistent levels in the radiocarbon reservoir while Chatters analysis adjusts for differences in decay rates.

Population sizes have long been thought to be "controlled" by the economic system adaptations of hunter-gatherer groups (Binford 1980, Binford and Chasco 1976, Hayden 1972; Hassan 1981). Foraging-type adaptations are thought to have had low population densities while collector-type systems are thought to be able to support larger populations. Based on the model described above, this section uses proxy calibrated radiocarbon measurements to examine hunter-gatherer group population sizes during the past 6,000 years in the interior northwest.

Figure 5-16. Population Estimates For the Columbia Plateau from Chatters 1995

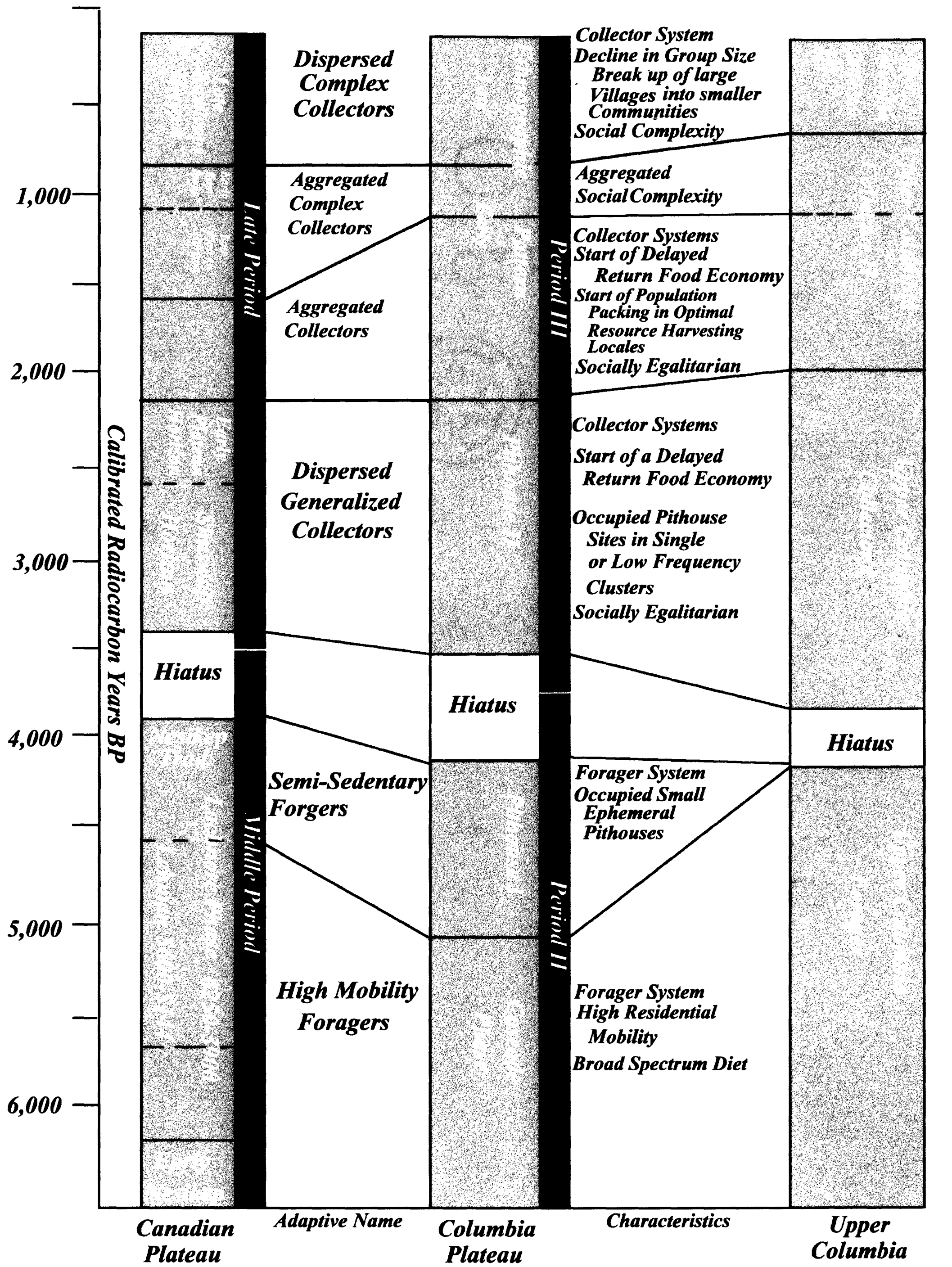


During the high mobility forager-type adaptation from 6,000 cal BP to 4,200 cal BP in the Upper Columbia, 4,000 cal BP in the Canadian Plateau, and 5,000 cal BP in the Columbia Plateau, the limited radiocarbon evidence suggests that hunter-gatherer groups maintained low density populations (Figures 5-7 and 5-16). However, in all three regions there are slight increases in populations indicated between ca 5,000 and 4,000 cal BP. In the Columbia Plateau this increase is associated with semi-sedentary peoples of Pithouse I while in the Upper Columbia and Canadian Plateau this increase is associated with the high mobility foragers of the Upper Columbia Forager and Lochnore Phase. Following a brief hiatus in the archaeological record for all three of these regions, populations start to rise again at 3,800 cal BP in the Upper Columbia (Figure 5-7), 3,500 cal BP in the Columbia Plateau (Figure 5-16), and 3,450 in the Canadian Plateau (Figure 5-14). In the Upper Columbia this population peak is associated with the dispersed collector-type adaptation and peaks between 3,400 and 3,000 cal BP then declines and appears to end at 2,000 cal BP with the end of the Upper Columbia Collector I. In the Columbia Plateau the population increase peaks later between 3,000 and 2,800 cal BP and ends ca. 2,200 cal BP at the end of Pithouse II. In the Canadian Plateau populations appear to gradually rise until 2,400 cal BP where a small, however abrupt, decline takes place during the Shuswap horizon (Figure 5-14). At the start of the aggregated collector-type adaptation at ca. 2,200 cal BP in the Canadian Plateau during the Plateau horizon and at the start of the Ethnographic period in the Columbia Plateau and 2,000 cal BP in the Upper Columbia at the start of the Upper Columbia Collector II, populations again start to rise and peak at ca. 1,000 cal BP in the Canadian and Columbia Plateaus and 800 cal BP in the Upper Columbia. At 800 cal BP a gradual large scale decline in populations takes place in the Canadian and Columbia Plateaus and then becomes more abrupt at 600 cal BP were populations continue to decline into the ethnographic period. In the Upper Columbia after the population peak at 800 cal BP populations abruptly decline until 600 cal BP. After 600 cal BP there is little evidence to suggest that populations sizes changed through the ethnographic period in the Upper Columbia. As discussed earlier in this chapter, this period may mark higher regional populations in smaller aggregated communities. If viewed in this light, the decline in radiocarbon dates is a consequence of where archaeologists choose to excavate. Focusing excavations on the large villages will provide a lower frequency of radiocarbon dates for that particular site, however, it is possible that the overall landscape population density was higher indicating dispersed populations throughout the Interior. In fact, the data indicates that in the Upper Columbia, all of the pithouse sites that date to the 800/600-0 cal BP interval were also occupied during the height of the large aggregated villages. To test the hypothesis of higher dispersed populations during 800/600-0 cal BP, archaeologists will have to excavated pithouse sites that are not associated temporally with the earlier large villages.

Summary

This section has presented inter-regional calibrated radiocarbon data for mobility, subsistence, and demography examined under issues of settlement. The temporal picture that is evident by these data for the Interior Northwest is representative of intra-regional scale adaptation changes, rather than localized events in a specific area(s), throughout the Canadian and Columbia Plateaus and the Upper Columbia. The timing and cultural indicators of these adaptationary changes is consistent in the region and suggest that close to the same changes were taking place at approximately the same time in the Interior (Figure 5-17). The cause(s) of these changes is probably one of the biggest debates in Plateau archaeology. In the next chapter I will examine these intra-regional radiocarbon data sets to explore theoretical discussions on the emergence of collector systems and the emergence of complex aggregated communities in the Interior Northwest.

Figure 5-17. Comparative Adaptive Modeling for the Interior Northwest



CHAPTER SIX:
Inter-Regional Transitions and Socioeconomic Evolution

Introduction

This chapter presents and evaluates theoretical hypotheses that have been entertained by researchers to discuss the advent of collector systems and aggregated "complex" hunter-gatherers. These theoretical frameworks include discussions of 1) functional models centering around problem solving related to population pressure, climatic stress, communication, and declines in resource availability (Schalk 1981, Croes and Hackenberger 1988, and Loshe and Sammons-Lohse 1986), 2) a population packing model centering around issues of ecological productivity for aggregating around and defending resource locales (Binford 2001), 3) political models centering around prosperity due to optimal environmental conditions and the recognition of advantageous individuals that take control of resource production (Arnold 1993, 1996; Hayden 1995, 1997, 2000), and 4) evolutionary perspectives concerned with the rate of change and the selection of highly productive traits providing a competitive condition among hunter-gatherer groups (Prentiss and Chatters n.d., 2002; Richerson et al 2001).

After presenting these theoretical ideas, I will draw upon the paleoenvironmental evidence presented in Chapter Three to examine environmental fluctuations/stability that correspond temporally to the transitions from forager to collector economic systems and generalized to complex social organization in the Interior. I will examine the transitions in order of their appearance in the archaeological record of the northwest starting with the transition from high mobility to semi-sedentism. These shifts in economic and social organization, indicated by the calibrated evidence, will then be compared and tested under the theoretical hypotheses entertained by Plateau researchers.

Models of Cultural Change

This section presents theoretical models that attempt to explain the causes in socioeconomic shifts among hunter-gatherers. These models are subdivided into basic groups based on what the researcher argues is the cause for the shift in socioeconomic systems.

Agency/Political Models

Two models take into account agency or political action that rely on relatively the same basic assumptions: 1) environment (stability or fluctuation) causes technological advancements leading to intensification of specific resources and the foundations for collector systems and 2) aspiring elite individual(s) manipulate control over resource production and labor organization, which facilitates hierarchical differences in the social rankings of group members.

Prosperity under Competitive Action

Under this model Hayden (1994, 1995, 1997, 2000) argues that in times of high resource availability, favorable conditions bring an end to traditional sharing practices. With the halt of sharing practices, ambitious individuals (ambitious, aggressive, and accumulative or triple-A personality types, which he argues are inherent in human genetics) begin to work harder and restrict access to new capital investments in resource procurement localities such as fishing weirs. He argues that accumulators develop a hearty appetite for personal gain through commanding excess resources. Food surpluses are eventually expanded to also focus on stores of other scarce and desirable goods (Hayden 1994:225-227). Accumulators then manage to seize highly productive food resources, but never at the expense of others. Instead, elite(s) entice other people to cooperate in producing surpluses that they use in competitive feasting, while also employing newly developed status foods (i.e. dogs) to assert and validate their leadership role. The feasting process eventually creates permanent inequality through the burden of debt repayment that enforces higher competitive feasting practices between aggrandizer elite(s) in different groups. This model requires climatic conditions favoring abundant and stable resource availability and, if Hayden is correct, conditions where severe resource fluctuations occur, complexity is not possible. Hayden's model also contends that complexity emerges from the competitive process abruptly at first and then gradually rises in intensity. If Hayden's model is correct then aggrandizers and "complex" hunter-gatherers should be evident by 2,500 BP and maybe as early as 3,500 BP in the Canadian Plateau at the Keatley Creek site. This is based on Hayden's (1997, 2000) findings of a series of Shuswap horizon diagnostic artifacts and radiocarbon samples recovered in association with rim deposits of Housepit 7. Hayden links these artifacts with the occupation of this 20+ meter diameter house, associated massive storage capacities per person for the house, and extramural roasting pits possibly used in feasting activities as evidence that the house was occupied by a "corporate group" as early as 3,500-2,500 BP until its demise and "abandonment" at approximately 1,000 BP. Moreover, if Hayden's hypothesis is correct, this occupation sequence should also be evident in other pithouse sites that contain variability in house sizes from small to large. This would-be apparent in the calibrated data set with large houses occupied starting between 3,500 and 2,500 cal BP. The time sequence that Hayden offers for the advent of complex hunter-gatherers is different than other Plateau researchers have suggested. Richards and Rousseau (1987) and Fladmark (1982) hypothesize that the Big Village Pattern, or the equivalent aggregated collector, existed between 2,000 and 1,000 years ago and then potentially peaked during 1,500 and 1,000 years ago in the Mid-Fraser Region of the Canadian Plateau. This temporal peak is thought to have occurred tantamount with complex social organization.

Punctuated Prosperity under Competitive Action

Arnold (1993, 1996) argues that there are direct correlates between political and functional models in the rise of complex hunter-gatherers. Arnold contends that demographic rise played a role in rising complexity in many societies however, there is an absence of evidence to suggest that simple population growth acted as a direct cause of emergent complexity (Arnold 1993: 82). Arnold suggests that the mechanism by which change occurs from egalitarian to non-egalitarian relations, involves the changing organization of human labor, specifically in the institutionalized separation of some labor and products from sole family or kin-group control that are placed into the hands of higher authority figure(s) (Arnold 1996). This model requires that with a simple collector system in place, responses to major environmental or political perturbations may require or facilitate rapid administrative or entrepreneurial changes orchestrated by opportunists.

In crisis situations that demands quick recruitment of allies and kin; aspiring elites slow to capitalize will fail (Arnold 1993: 90).

Under this model, the advent of complex hunter-gatherer groups should come about very rapidly under conditions of climatic fluctuation. During climatic fluctuation, aspiring elite(s) seize control of limited resources and manipulate the labor for their procurement. With a hierarchically based social structure in place, stability in resource availability will facilitate competitive feasting which, in turn, will produce more complex inter-relations between hunter-gatherer groups.

Functional Models

Contrasting to the idea that conditions of abundance are essential to elite emergence (Hayden 1994, 1995; Arnold 1993, 1996), Keely (1988), Halstead and O'Shea (1982), Lohse and Sammons-Lohse (1986) and Cohen (1981, 1977) have identified population pressure, socioeconomic and environmental stress as the main reason for the advent of complex hunter-gatherers. Functional models can be subdivided into two basic groupings with one relying more on environmental stress and one relying more on population growth. However, both hypotheses are usually entertained together.

Climatic Stress

Climatic stress models rely on environmental fluctuations causing decreases in resource availability to determine when human groups will experiment with new economic systems and subsequently, innovations are a consequence of necessity during changes in environmental conditions. Archaeologists and ethnographers have documented several cases in which complex hunter-gatherers were subject to spatial and inter-annual variability in food resources, episodic and severe resource deficiency, and other occasional stresses (i.e. Donald and Mitchell 1994, Shnirelman 1994; Yesner 1994b). Under this hypothesis, new innovations come about during times of stress eventually leading to elite emergence due to an uneven distribution of restricted food resources throughout the group. This hypothesis has been utilized to explain the rise of agriculture in the Near East after the terminal Pleistocene (Childe 1951, Wright 1977, Bar-Yosef 1998; Moore and Hillman 1992) and also the advent of collector systems and complex hunter-gatherers in the Northwest Coast by Schalk (1981), and Croes and Hackenberger (1988).

Under this model, the development of collector systems will come about during climatic stress and the development of hierarchically organized groups will emerge due to a diminished level in resource availability. If this hypothesis is true, the archaeological record should indicate that the collector system would advent during times gradual climatic stress. During this time, with a delayed food economy employed, elite individual(s) will seize highly productive resource locales and the labor organization/technological innovations to mass harvest the resource (Matson and Coupland 1995).

Population Stress

In many instances this hypothesis is used in conjunction with climatic stress models. Cohen (1977) argues that slow large-scale population pressure/growth is responsible for the eventual change in economic systems particularly the origins of agriculture. Cohen hypothesized that subsistence innovation is driven by increases in population density and based on a necessity to feed growing group size. Based on Cohen (1977), researchers such as Schalk (1981), Croes and Hackenberger (1988), and Lohse and Sammons Lohse (1986) argue for Middle Holocene population rise leading to intensification of fish resources and associated development of storage and semi-sedentism. The advent of the collector system then eventually develops, under population stress, into "complex" hierarchically organized hunter-gatherer groups. If this hypothesis is true, then the archaeological record should indicated slow population rises throughout the prehistory of the Interior Northwest.

Population Packing

This model is explicitly tested in an account of numerous ethnographic hunter-gatherer groups throughout the world that range from forager to collector economic systems and generalized ("generic") to complex social systems by Binford (2001). This model contends that the transition from forager to collector systems comes about with widened niche variability producing differences in the timing of highly productive resources. In this sense, and an issue that Binford has argued in previous works (i.e. 1968), the cultural system will mimic the ecosystem; in other words the cultural system will change concurrently with climatic shifts. Coupled with slow population rise that reduces mobility options for the whole group, hunter-gatherers will adopt a semi-sedentary lifestyle. This facilitates logistical mobility and specialized task groups to procure resources while the larger population is residentially centered in an ideal locale for procuring other resources. As "generic" collectors start to intensify on a specific resource they inevitably pack their group into that specific locale associated with the intensified resource and therefore, a heightened need for security or defense of the resource comes about. At this point there are a three options to compensate for the decline in mobility and subsequent loss of variation in the groups diet: 1) they can make use of highly productive aquatic resources, 2) they can establish mutualistic relationships with neighboring groups that procure different resources and in a sense share the responsibilities of harvest by trading resources to meet the dietary requirements of each group, or 3) they can establish "forest producer" or trade relationships with groups outside of the local geographic area to meet dietary requirements (Binford 2001). With the defense of certain resource-rich locales comes a sense of territorialism and this ultimately leads to ownership rights of the locale and the technology used to acquire the resource by certain individual(s). The linkage between labor organization and ownership monopolies over resource-yielding venues forms the basis for further differentiation in social ranking by increasing the ratio of elite(s) to disenfranchised persons. Binford (2001) views this as a pay off to add willing people to the labor force by enticing a kin and non-kin work force that ultimately establishes generalized factions within the community based on elites and "slaves". This "labor crunch" causes hierarchical social relations within a community and could ultimately have the same effect on a regional scale. Binford (2001) also looks at the reasons for the break down in aggregated communities. He argues that there is a packing density threshold where there is a limit to the amount of mouths that the intensified resource can feed (due to overexploitation or declines correlated with climatic change) or the extra-mural trade relations loose their effectiveness. At this time there will be a division of the large aggregated community to other smaller aggregated locales. However, this does not mean that populations decline in fact, there may be higher populations densities in a person to square mile ratio in the landscape; the populations are spread more evenly throughout the area.

If this model is correct then the archaeological record should indicate somewhat gradual population rise, although populations could fluctuate, there should be a overall general increasing trend. Population packing should occur around highly productive resource locales, there should evidence for large scale village communities, and wealth or status markers such as high time investment goods or trade items that may indicate status differentiation or elite ownership. There may be an indicator that the beginnings of aggregated communities were building up traits such as territorialism and ownership before the onset of complex social organization with the appearance sometime after the start of aggregation. There may also be indications of an aggregated community "breakdown" as Binford (2001) indicates with populations crossing a packing threshold and dispersing throughout the landscape in lower density aggregates and possibly retaining sociocomplexity. This system may also be indicative of higher population densities throughout the landscape.

Evolutionary Prospectus Models

These models may be more useful in examining changes in economic systems rather than the advent of complex social organization. Perhaps future research by Richerson et al (2001) and Prentiss and Chatters (n.d., 2002) will give us an idea of how these models can be correlated to social change, however for now they are included in this discussion to be mainly compared to the forager to collector transition in the Interior.

Climatic-Change

This model looks at the development of new economic systems as compulsory response to environmental change as a consequence of newly or heightened resource availability. This model views the change in socioeconomic systems as neither too fast or too slow which allows Richerson et al (2001) to explain cultural system anomalies that share traits with later cultural systems that exist and decline before the onset of the full scale stable system (i.e. the Natufian in the Near East). This recent theoretical hypothesis of Richerson et al (2001), which has not been applied in Plateau contexts, examines the productivity and advantage of one system over another. Once a more productive subsistence system is possible, it will, over the long run, replace the less-productive subsistence system that preceded it (Richerson et al 2001). The reason is simple: all else being equal, any group that can use a tract of land more efficiently will be able to evict the residences that use it less efficiently (Boserup 1981; Sahlins and Service 1960). More productive recourses support higher population densities, or accumulation of more wealth per capita, or both (Richerson et al. 2001). A more productive system will extend throughout the landscape acquiring productive resource locales at the expense of the group utilizing the less productive system. The collector may offer an attractive alternative to the forager on how to survive at a lesser cost than their present economic system with a dismal choice of submission or eviction. The collector is most likely to also target opportunistically high-ranked resources essential to the dietarily broad spectrum forager forcing them to join the new system or be forced out to utilize lower ranked more marginal resources. Therefore, subsistence improvement generates a *competitive ratchet* as successively more land-efficient subsistence systems lead to population growth and labor intensification (Richerson et al. 2001: 395). Based on the growing populations, labor organization, and the generation of more wealth per capita the opportunity for elite individual(s) and sociocomplexity comes about as another element to the competitive ratchet.

Taxic Macroevolution

Prentiss and Chatters (n.d., 2002) argue that socioeconomic systems change in a very rapid or punctuated manner. Under times of climatic stress and resource unpredictability there are low change rates or periods of "stasis". Conversely, optimal climatic conditions and resource predictability offers times of opportunity and experimentation due to lower risk facilitating the change of socioeconomic systems virtually "overnight" (Prentiss and Chatters n.d.). During optimal conditions the collector system may emerge within a larger diversification process due to experimentation. After the collector system is evident, stresses due to population increase, climate change, or both bring competitive conditions where the more fit variants are selected for and succeed. The competitive conditions around resource access points favor aggregation and intensification of particular highly abundant resources.

If this model is true, then the archaeological record should indicate that changes in economic systems come about during times of climatic stability favoring resource predictability in high frequencies. There should be abrupt changes in the record indicating that the transition from forager to collector economies was a very rapid movement taking place during times of optimal climatic conditions.

The Evolution of Socioeconomic Systems in the Interior Northwest

Above I have presented theoretical models that have been entertained by researchers to explain the advent of collector systems and the emergence of complex social organization. The next section is dedicated to exploring transitions in socioeconomic systems with corresponding paleoenvironmental evidence in the Interior Northwest. The calibrated evidence and subsequent adaptation and population proxy models for the Interior are then evaluated under the hypotheses reviewed above. The past chapter provided evidence that the collector system developed in the Middle Holocene as a large scale phenomenon between 3,800 and 3,500 cal BP in the Interior Northwest. Similarly, I believe that complex social organization existed as a wide spread adaptation during the Late Holocene between 1,600 and 800/600 cal BP, concurrently with the aggregated complex collector adaptation.

High Mobility Forager to Semi-Sedentary Forager

Low density forager group populations have been documented in this study for the Upper Columbia and in the Columbia and Canadian Plateaus preceding 5,000 cal BP. It is thought that lower group populations make it economically successful for foragers to be residentially mobile to ensure that everyone is fed on an immediate-return basis (Binford 1980). Low population densities are documented by proxy measurements by Chatters (1995) for the early forager-type adaptations preceding 5,000 cal BP in the Columbia Plateau and in this study preceding 4,200 cal BP in the Upper Columbia with a rise in populations after this time (Figure 6-1). Preceding ca 5,000 cal BP there was 30-40% less precipitation than modern levels (Chatters 1995; Thoms 1989) (Figure 6-1).

The preferred environment for camas root growth is in topographically level areas with high precipitation that has been characterized as a wet meadow micro-environment (Thoms 1989). The low precipitation climate prior to 5,000 cal BP may have resulted in a limited productivity of camas grounds (Thoms 1989). Temperatures were also cooler having negative effects on camas however, not depleting them to the level of extinction; climatic pressures just limited it as a subsistence resource for hunter-gatherers in the southern Interior. This climate expanded anadromous fish runs and they have been documented in archaeological assemblages on a limited basis. After 5,000 cal BP there is a slight increase in precipitation, temperature, and flooding in the southern Plateau allowing higher productivity in camas grounds (Chatters 1986). Temperatures remained conducive for anadromous fish and this resource seems to be used more frequently than in the previous high mobility adaptation (30% of faunal assemblages Chatters 1995). Mass exploitation of salmon did not occur during this time because of technological limitations, which were overcome in later transitions. The shift from high mobility to semi-sedentism between ca. 5,000 and 3,800 cal BP can be linked to a slightly higher productivity rate in resource availability (camas, and stable anadromous fish migrations) allowing foragers to utilize less landscape to make a living however, still utilizing a broad spectrum of resources (Figure 6-1). Concurrently, populations rise in accord with the shift from high mobility to semi-sedentism in a less cost/higher productivity environment. This environment also allowed increased populations of high mobility foragers throughout the region. Under these conditions semi-sedentary year-round residential occupations would have been an attractive alternative to moving residential locales every couple of weeks. The landscape positioning of Pithouse I sites indicate that the semi-sedentary foragers were choosing residential site locales where there was access to multiple microenvironments and resources including large game, fresh water mussels, or edible roots (Chatters 1995). These new tactical variations that link to post 5,000 cal BP are considered to be a continuation and more sedentary version of a "mapping on" adaptation from the earlier highly mobile foragers with a more intensified focus on locally available resources (Chatters 1995). However, with considerably low population densities in the Interior Northwest, I believe that this adaptation did not diffuse throughout the region and remained as a localized event in the Columbia Plateau and at the Baker site in the Canadian Plateau. Moreover, I believe that this adaptation was unlikely to develop into a larger scale aggregated collector adaptation.

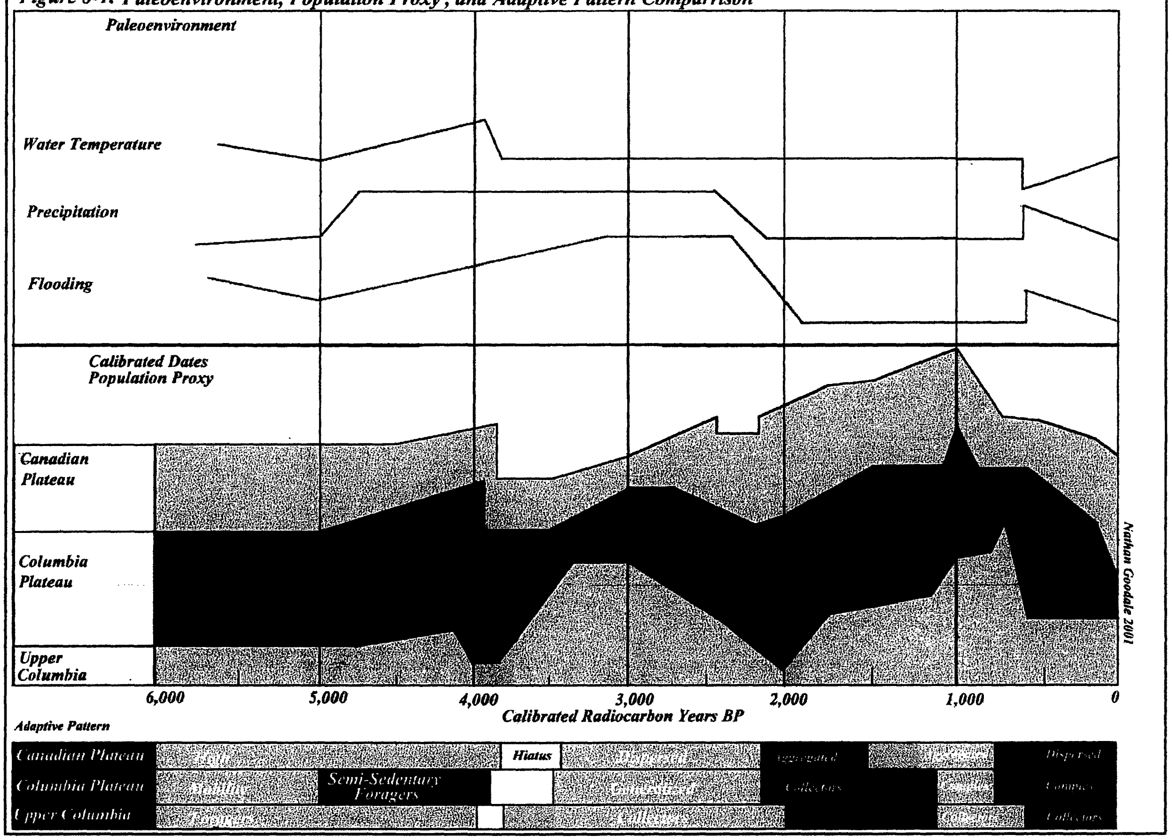
Semi-Sedentary Forager to Dispersed Generalized Collector

Following a 400-600 year hiatus in the prehistoric Interior Northwest record, there is an archaeologically abrupt shift in the way that hunter-gatherer groups organize themselves economically starting between 3,800 and 3,500 cal BP. This shift, as previously discussed, has been termed the transition from forager to collector. However, it is not clear if this archaeological record "hiatus" indicates an abandonment of the area and a subsequent large scale migration of new populations into the area or a declined use with residents ancestral to Pithouse I, the Nesikep tradition, or the Upper Columbia Forager forming what becomes the dispersed generalized collector adaptation. Because this hiatus is present at approximately the same time in the entirety of the Interior, I believe that the evidence indicates that highly mobile/semi-sedentary foragers were not ancestral to the dispersed collectors unless they moved to the coast and then migrated back to the Plateau between 3,800 and 3,500 cal BP. This transition is represented regionally in the Canadian and Columbia Plateaus as well as the Upper Columbia as a large-scale adaptive change (Figure 6-1). Environmentally, the start of the collector system corresponds to a fairly stable environment. After a rapid decrease in water temperature that corresponds to the demise of heightened populations during the semi-sedentary and high mobility foragers, water temperatures and precipitation stabilize with a long term slight increase of flooding events (Figure 6-1). These environmental conditions favored large anadromous salmon runs with cool water temperatures and highly productive camas fields with increased flooding events. Hence, the environmental stage was set for the development of the collector system in the Interior Northwest. On the Canadian Plateau, Chisholm (1986) documents 60% of dietary requirements were provided by salmon, while in the southern Plateau, camas processing abruptly increases at 3,800 cal BP. Populations start to rise during this time with the corresponding newly developed economic system and peak between 3,400 and 3,000 cal BP in the Upper Columbia, 3,000 and 2,800 cal BP in the Columbia Plateau, and 2,600- 2,400 in the Canadian Plateau (Figure 6-1). These data provide evidence for an increase in populations of the Upper Columbia and this may have facilitated the first large scale diffusion event of adaptive characteristics and consequently, the collector-type system spread rapidly throughout the Interior Northwest. It appears that the collector-type system may have been evident first in the Upper Columbia (storage features are evident by 3,700 cal BP Appendix A) and then diffuses west to the Columbia Plateau then north to the Canadian Plateau. Under competitive models, the collector system was a part of an advantage that out competed lower productivity systems by intensifying on highly productive resources in each area. The semi-sedentary adaptation was selected for and carried through to the collector-type system. These people then experimented with larger sized houses that most likely housed increased populations.

Dispersed Generalized Collector to Aggregated Collector

A large scale decline in dispersed collector populations occurs between 3,000 and 2,000 cal BP in the Upper Columbia, 2,600 and 2,200 cal BP in the Columbia Plateau, and 2,400-2,200 cal BP in the Canadian Plateau (Figure 6-1). Environmentally, there is a drop in precipitation and flooding events that takes place at ca. 2,400 cal BP (Figure 6-1). This environmental change correlates to the demise of dispersed collector populations reliant on camas root as an intensified food staple in the southerly Plateau represented as Pithouse II and the Upper Columbia Collector I. Archaeologically this is also apparent in the rapid decline of camas root roasting features (Figure 6-1). This environmental change and associated population decline appear to have had the least effect in the Canadian Plateau. Tentatively, this may be due to a higher reliance on salmon intensification in the Canadian Plateau (Figure 6-1). Paleoenvironmental evidence suggests that temperatures remained constant through this time and anadromous fish populations most likely remained high. At approximately 2,200 cal BP in the Canadian and Columbia Plateau and 2,000 cal BP in the Upper Columbia, populations again started to rise. Based on these data I suggest that hunter-gatherers immediately started to aggregate into communal living situations after 2,000 cal BP. However, I believe that they remained egalitarian until 1,600 cal BP based on housepit data that indicates mainly small and medium sized houses were occupied. The initial period of 2,000 to 1,600/1,200 cal BP may be viewed as a period where the first hints of building towards complexity come about (i.e. population packing in optimal resource gathering locales and the start concepts such as territorialism and ownership).

Figure 6-1. Paleoenvironment, Population Proxy, and Adaptive Pattern Comparrison



Aggregated Collector to Aggregated Complex Collector

The calibrated evidence indicates that as populations rise so do the aggregated villages and they reach peak levels between 1,600 and 800 cal BP in the Canadian Plateau, 1,200 and 800 cal BP in the Columbia Plateau, and 1,200-600 cal BP in the Upper Columbia (Figure 6-1). I believe that these peak time periods reflect the emergence of complex social systems in the Interior and they seem to be first evident in the Canadian Plateau. This is supported by the calibrated evidence indicating these are the only times when small, medium, and large houses were occupied at the same time indicating a possible inter-house village hierarchy. This may also be indicative of an inter-village hierarchy. Further investigation may indicate that the Upper Columbia and Columbia Plateau follow a timing and duration pattern closer to the Canadian Plateau, however for now these are the inferences that I can make based on the available data. During the rise of the aggregated villages, the environment is seemingly stable after ca. 1,800 cal BP (Figure 6-1). Stable water levels supported large anadromous fish runs allowing their intensification. The frequency of root processing abruptly increases at 1,800 cal BP, indicating that roots were intensified as a major food staple in the Upper Columbia. The aggregated collector period is characterized by increasing population sizes under packed conditions continuing until 1,000-800 cal BP, increasing resource specialization and probably the first hierarchically organized villages in the Interior by 1,600 cal BP.

During the aggregated complex collector adaptation at 1,000 cal BP in the Canadian and Columbia Plateaus and 800 cal BP in the Upper Columbia, peak demographic sizes had been reached, optimal settlement locations had been chosen, a full scale delayed return economy had developed, and most likely social hierarchies based on class distinctions of elite(s) versus commoners had been established. Population packing had occurred in these locales for two reasons 1) they were optimal for resource gathering and/or 2) they were optimal places to defend the resource. Then the question begs the asking: why do populations aggregate in optimal locales? The answer(s) may be simple: it is either to procure a resource and accumulate wealth in the form of highly valued subsistence; it is to defend the resource from neighboring groups; or it may be consequence of both. In all three of the regions examined in this study there is an abrupt and short lived peak during the aggregated collector adaptation (Figure 6-1). Environmentally, this peak occurs at the end of long term climatic stability with the peak occurring simultaneously in the Canadian and Columbia Plateaus while slightly later in the Upper Columbia. Population packing in villages occur in settings conducive for salmon and root procurement and is evident by pithouse village sites throughout the region that are located in optimal places to procure aquatic and terrestrial resources. This data set supports the assumption that while employing a delayed food economy, population packing events will occur in locales that are optimal for resource gathering and intensification, subsequently this facilitates the ability for social hierarchies to be established. It should be emphasized that I am not arguing for complexity among groups for the entire aggregated collector adaptation. Aggregated collectors are evident at 2,000 cal BP in most of the region however, variability in house size does not come about until 1,600/1,200 cal BP where I believe the start of complex hunter-gatherers is evident in the region. The initial period of 2,000 to 1,600/1,200 cal BP may be viewed as a building period where the first hints of building to complexity come about (i.e. population packing in optimal resource gathering locales and the beginnings of territorialism and ownership).

Aggregated Complex Collector to Dispersed Complex Collector

Declines in the large scale aggregated collector communities start immediately after 1,000 cal BP in the Canadian and Columbia Plateaus and after 800 cal BP in the Upper Columbia. The demise of the large-scale aggregated collector communities is evident by 800 cal BP in the Canadian and Columbia Plateaus and 600 cal BP in the Upper Columbia. I believe that the dispersed complex collector adaptation may reflect a larger overall population density apparent in a people to square mile ratio throughout the Interior landscape (based upon findings in Chapter Five). Therefore, the groups at this time retained an aggregated manner however, at a smaller scale, with an increase in the number of residential sites. These groups also exhibit semi-sedentary living situations and a collector economy. It is also possible that these groups retained forms of social complexity, however at a smaller scale. I offer this because 1) these traits are evident for the ethnographic groups in the Interior at contact 2) based on this data, I cannot say that the hunter-gatherers in the Interior reverted back to an egalitarian or more generalized social adaptation and 3) there is still variability in house size. After this time, declines continue associated with the effects of the Little Ice Age in the Canadian and Columbia Plateaus where groups intensified anadromous fish while the Upper Columbia populations decline significantly however, stabilize at 600 cal BP (Figure 6-1). This stabilization may be directly linked to their utilization of camas intensification and it's more stable availability under changing climatic conditions compared to a more susceptible anadromous fish resource. Groups retaining an aggregated nature probably also facilitated or aided the defense of highly productive locales. This is only tentatively offered at this time and is based off of the indication of probable defense walls at pithouse village sites in the Upper Columbia (Prentiss et al 2001, Mohs 1982).

Summary

The data presented in the last section indicates that the demise of economic systems occur during climatic changes. In opposition, the development of new and peaks in socioeconomic systems occur during stable climatic conditions. The development of the collector system in the Interior Northwest is associated with stable climatic conditions, enabling high anadromous salmon runs, with slight rises in flooding events that aided in camas production. Declines in dispersed collector populations is associated with abrupt declines in precipitation and flooding events in the Upper Columbia and Columbia Plateau while stable water temperatures minimized the decline in the Canadian Plateau where fish may have been intensified above other resources (Figure 6-1). The development, peak, and demise of the aggregated collector adaptation is associated with long-term climatic stability and its decline cannot be directly associated with a climatic change event. The next section will explore possibilities for this decline that are not directly related to climate change. I believe, based on these data, that complex social organization occurs from 1,600-800 cal BP in the Canadian Plateau, 1,200-800 cal BP in the Columbia Plateau, and 1,200-600 cal BP in the Upper Columbia associated with climatic stability throughout the region. After the break up of large aggregated communities the inhabitants of the Upper Columbia appear to have been more suited to the Little Ice Age where their populations dispersed yet remain stable compared to those of the Columbia and Canadian Plateaus which drop significantly during the climatic anomaly.

Calibrated Data and the Theoretical Implications in the Interior Northwest

Political Models

Prosperity under Competitive Action

Hayden (1995, 1997, 2001) argues that aggrandizers and "complex" hunter-gatherers should be evident by 2,500 BP and maybe as early as 3,500 BP. Hayden links Shuswap artifacts with the occupation of this 20+ meter diameter house, associated massive storage capacities per person for the house, and associated roasting pits possibly used in feasting activities as evidence that the house was occupied by a "corporate group" as early as 3,500-2,500 BP. Under this hypothesis, after elites are recognized a continued rise in village size occurs until the abandonment of the house and the demise of complex hunter-gatherers at approximately 1,000 BP. However, recent work of Prentiss et al (2000) and Lenert (2000) indicates that these culturally deposited items are most likely not associated with the Housepit 7 occupation; they are representative of earlier occupations small housepits that were occupied before and eventually buried by the construction of Housepit 7. Lenert's (2000) critical review of radiocarbon sampling and stratigraphic deposits of Housepit 7 revealed that the occupation of this large house was from the earliest 1580+/-60 BP and lasted until 1080+/-70 BP agreeing with the temporal model constructed for aggregated collectors occupying large housepits in this study and Lenert and Goodale (2001). Moreover, social complexity should be evident as soon as it is environmentally possible for aggrandizers to be recognized in the group context. If this were true one would expect to see the advent of complex social organization for the duration of the aggregated collector as well as the dispersed generalized collector adaptation. However, as aforementioned, I believe that the calibrated evidence supports the conclusion that the period from 2,000-1,600/1,200 was a building time where populations were beginning to pack into resource rich locales and social hierarchies did not come about until 1,600/1,200 cal BP when people started occupying pithouses that range greatly in their diameters.

Richards and Rousseau (1987) and Fladmark (1982) hypothesize that the Big Village Pattern, or the equivalent aggregated complex collector, existed between 2,000 and 1,000 years ago and then potentially peaked during the period of 1,500 and 1,000 years ago in the Mid-Fraser Region of the Canadian Plateau. This study supports this hypothesis and adds that the aggregated collectors utilizing complex social organization was a region wide development in the Interior Northwest during this time frame.

Punctuated Prosperity under Competitive Action

Ideally, to test this model explicitly, a finer-grained analysis is needed for the Interior than is presented herein. I believe that this model may have relevant contributions concerning the rise of complex hunter-gatherers. The calibrated and paleoenvironmental evidence indicates that there were climatic fluctuations right before the advent of aggregated communities. However, it is not clear if aggregations were facilitated/necessitated by these fluctuations or the stability that directly proceeded (Figure 6-1). I can confidently say that the demise in dispersed generalized collectors correlates with climate change and that the rise/peak in aggregated complex collectors corresponds to climatic stability throughout the Interior Northwest. If one were to test this model at a fine-grained level, the focus should be on the transition period between the demise of dispersed generalized collectors and the rise of aggregated complex collectors with an emphasis on individual community assemblage variability.

Functional Models

Climatic Stress and Population Stress

Both climatic and population stress models of culture change can be directly ruled out because there are no indicators of gradual environmental or population stress correlated with culture change. This study provides conclusive evidence that socioeconomic systems in the Interior were subject to dramatic and punctuated changes throughout the past 6,000 cal years BP. Moreover, the demise of systems, especially the high mobility/semi-sedentary foragers and dispersed generalized collectors, correlates strongly to environmental fluctuation. If this model was upheld by the calibrated data, then I would have expected to see the advent of new systems under time of constant duress, not the decimation due to punctuated environmental events that is obvious in Figure 6-1.

In the Interior Northwest populations grow from forager-type sizes to peak collector-type sizes very abruptly in 400-600 years. From the beginning of the archaeological record in the Interior Northwest at approximately 7,000 cal BP, populations remained low until 5,000 cal BP ending with a slight demographic increase associated with Pithouse I, the later Lochnore Phase, and Upper Columbia Forager. If population growth is a continuing and gradual process as Cohen (1977) indicates, then there was ample time (2,000 years) to build the population sizes associated with the collector-type system in the Interior. Moreover, in many cases in the Interior, the calibrated evidence indicates that intensified resource exploitation and the technology used to procure them was in play before peak population densities. For example, large scale intensification of roots in the Upper Columbia appears at the least 200 years before people move into semi-sedentary lifestyles indicated by semi-subterranean pithouses. I suggest based on these data that population increase is a consequence of changing economic systems.

Population Packing

This model appears to be supported by the calibrated evidence. It does appear that the collector system comes about during an environmental context that facilitated wider niche-variability. After the temperature downturn at 4,000-3,800 BP, the climate is seemingly stable providing more predictable aquatic resource availability and gradual increases in flooding events enabled higher camas productivity grounds. If we consider that in evolutionary terms there can be successes and failures in systems much like Richerson et al (2001) and Prentiss and Chatters (n.d. 2002), then it appears that populations start the packing process possibly as early as during Pithouse I in the Columbia Plateau. However, climatic changes decimated the system and the same pattern seems evident for the dispersed generalized collector adaptation with a subsequent rise, peak, and decline. It appears to me that the climatic stability correlates with the success of the aggregated complex collector adaptation. This appears to have facilitated populations to start the packing process once again. However, this time it is successful and aggregated communities appear in resource rich locales along the major river banks. Population packing may have enabled concepts of territorialism and ownership to come about however, this model is not accountable for these things. I will argue based on the calibrated evidence that, in Binford's (2001) terms, a "labor crunch" did come about between 1,600 and 800/600 cal BP in the large villages which added populations to the community labor effort and is representative of the peaks during this same time throughout the Interior. Binford's (2001) model also gives insight into the collapse of these aggregated communities. This may be correlated to a packing threshold or caring capacity of the resource which may not produce enough to feed the growing community. Subsequently, the large aggregated group breaks down into smaller group size aggregates filling environmental niches in a more even manner throughout the Interior. This is the only model that can account for this large-scale decline in aggregated communities which takes place without a link to environmental fluctuation. This model can also be used to explain the result of a higher site to year ratio for the Collector III rather than the Collector II adaptation provided in Chapter Five. Under Binford's model local group size declines while the overall population may increase. This corresponds to the Interior Northwest data which indicates an overall higher population density for the dispersed complex collector adaptation compared to the earlier adaptations in the Upper Columbia. Future research should provide us with an understanding about this pattern and it's validity for the entire Interior Northwest.

Evolutionary Models

Climate-Change

The evolutionary prospectus models were incorporated in this discussion mainly to gain a better understanding of the forager to collector transition in the Interior however, we are able to draw preliminary conclusions on the advent of social complexity. Under this model, the transitions from forager to collector, high mobility to semi-sedentism, and egalitarianism to complexity, are viewed as components of the competitive ratchet. Richerson et al (2001) would view these as tactics provided by selected traits enabling people the opportunity to utilize a more productive system which facilitates their take over of highly productive resource locales from people employing a less productive system. This competitive aspect may be apparent in the calibrated data which indicates that the advent of new systems comes about utilizing selected traits from the previous system. For example, this is evident by semi-sedentism starting during the Pithouse I adaptation and continuing throughout the Middle and Late Holocene in the Interior. Changes in organizational characteristics of socioeconomic systems make them more productive allowing them to compete, and succeed, in stable environmental conditions. However, in some instances, the system fails to adapt to climatic-change and subsequently, the system declines. This pattern is evident for all of the socioeconomic systems throughout the time period analyzed in this study (except the aggregated complex collector which may have decline for reasons discussed above).

Taxic Macroevolution

Opposed to the gradual functional models presented in this chapter, the calibrated evidence suggests that changes in the socioeconomic systems in the Interior Northwest follow a macro rather than a micro-evolutionary movement (per Prentiss and Chatters n.d., 2002). These systems change in an "archaeological time scale blink" and there is no evidence to suggest that previous system could have directly evolved into the next without the decline(s) and reorganization(s) reflected in all of the socioeconomic transitions that take place during the Middle to Late Holocene in the Interior. The calibrated evidence correlated with paleoenvironmental data agrees with this model's assumptions that stress and unpredictability in resources due to climate change causes the stasis and demise economic systems. It is also apparent that opportunity and resource predictability facilitates the advent of new systems under experimentation in a predictable resource climate. These factors, as also indicated in Binford's (2001) model, most likely facilitated the advent of the collector system in the Interior.

Summary

This chapter presented the calibrated data coupled with paleoenvironmental evidence to examine the transition from forager to collector and the emergence of complex communities in the Interior. These data were then utilized to test theoretical models explaining changes in socioeconomic systems. This has indicated that some models are not applicable to the examination of socioeconomic systems in the Interior, such as, prosperity under competitive action (Hayden 1994, 1995, 1997, 2000) and gradual climatic and population stress models (Cohen 1977, Schalk 1981, Croes and Hackenberger 1988, and Lohse and Sammons Lohse 1986). Arnold's (1993, 1996) hypothesis may hold validity however, this study cannot provide conclusive evidence to agree or disagree with this model. Models that these data can support to varying degrees include population packing (Binford 2001), climate-change (Richerson et al 2001) and taxic macroevolution (Prentiss and Chatters n.d., 2002). In fact, it may be a consequence of a combination of factors presented in the theoretical models put forth by Binford (2001), Richerson et al (2001) and Prentiss and Chatters (n.d., 2002) that first enables the transition from forager to collector and then causes the rise of complex villages in the Interior. Nevertheless, it appears to me that the collector system comes about with widened niche variability favoring intensification and storage. Population packing events occurred in optimal locales facilitating higher reliance on intensified resources around the aggregated community. Greater reliance on predictable resources necessitated defense of the locale and required a "labor crunch" which added people to the labor effort and caused peak aggregated population densities and a complex social system. When population densities exceeded the packing threshold, the aggregated communities dispersed and subsequently, smaller sized communities occupied the Interior landscape possibly retaining a complex social organization.

CHAPTER SEVEN:
Research Conclusions

Upper Columbia Regional Implications

This thesis sought to illuminate trends in the evolution of hunter-gatherer socioeconomic systems of the previously poorly understood Upper Columbia. The calibrated radiocarbon data suggests that the adaptive pattern for the past 6,000 years BP in this region is emphasized by four main periods of occupation including the Upper Columbia: Forager, Collector I, Collector II, and Collector III. These periods have been identified under a rigorous methodology plotting calibrated radiocarbon dates in respect to their temporal and cultural feature association. These data were then combined to determine the characteristics associated with each adaptation and a proxy measurement on population densities for each interval. By providing a methodology that has effectively used the two-sigma 95% confidence interval to determine statistical events in the radiocarbon database, this thesis has the ability to impact the way researchers analyze adaptive models constructed by calibrated radiocarbon dates. This method of testing the adaptive model derived for the Upper Columbia, changed the way that I viewed the sequence and should be a methodology that researchers consider in the future. Along with the main periods of occupation derived through the testing stage, there remain associated periods of transition or archaeological hiatuses. This study has not been able to conclusively determine their significance and subsequently, remain gaps that exist in our knowledge of the prehistory.

Interior Northwest Inter-Regional Implications

This study has provided evidence to conclude that there were major socioeconomic system changes throughout the Interior during the past 6,000 cal years BP. Data from all sub-regions examined in this study reveal that the prehistoric inhabitants exhibited the same transitions in socioeconomic systems at approximately the same time.

This thesis has demonstrated a strong link between the calibrated data and paleoenvironmental evidence. The correlates of climate flux and the demise of the high mobility/semi-sedentary foragers and dispersed generalized collectors as well as climatic stability that correlates to the success of all of the adaptations for the past 6,000 cal years BP is very apparent in the data examined herein. However, one anomaly exists in the apparent down-fall of aggregated complex collectors with no indicated climatic variation. I have suggested that this is due to factors related to high population densities and the packing threshold of intensified resources.

Theoretical Implications

This thesis has tested theoretical models that concentrate on explaining changes in economic systems and the emergence of social inequality. I have argued that some theoretical models do not correlate with the calibrated evidence. Based on this data I cannot endorse Hayden's (1994, 1995, 1997) model of emerging complexity. My opposed view with Hayden's model is based off four conclusions in this study. First, complexity, or any signs of emerging complexity, do not appear by 3,500-2,500 BP, they appear at 1,600 cal BP. Second, there is not an abandonment of the area after 1,000 BP, and in fact the Keatley Creek site contains multiple lines of evidence that the site was occupied after this time (Lenert and Goodale 2001). Third, the calibrated evidence indicates that the rise to complexity did not appear concurrently with environmental opportunity, instead there was a building stage while populations aggregated and then later increases in packed population densities provided the opportunity for social hierarchies. Lastly, the calibrated evidence suggests that the emergence of complexity is much more multifaceted than can be entirely linked to genetically inherent personality traits. The calibrated evidence can just as easily disprove functional models. In this region there are no indicators of gradual climatic or population stress that correlates to socioeconomic system change.

This study has provided conclusive evidence to support theoretical explanations for the transition to forager to collector of Prentiss and Chatters (n.d., 2002), Richerson et al (2001) and Binford (2001) and the emergence of social inequality explanation of Binford (2001). The calibrated and paleoenvironmental evidence indicates that the collector system comes about with widened niche variability favoring intensification and storage. Population packing events occurred in optimal locales facilitating higher reliance on intensified resources around the aggregated community. Higher reliance on predictable resources necessitates defensive tactics and required a "labor crunch" which added people to the labor effort and caused peak aggregated population densities and an increase in the ratio of elite(s) to disenfranchised people, hence a complex social system. When population densities exceeded the packing threshold, aggregated communities dispersed and subsequently, lower population density aggregates occupied the Interior landscape possibly retaining a complex social organization.

Future Research

Based on this study, there may be some relevance to the consideration of a region-wide adaptive model for the Interior Northwest. With the exception of the seemingly localized event of the semi-sedentary forager (Pithouse I and the Baker site) there are large scale and uniform transitions that take place throughout the past 6,000 cal years in the Interior. The terminology used in this study, I feel, effectively expresses the characteristics of each adaptive interval including: high mobility forager, semi-sedentary forager, dispersed generalized collector, aggregated collector, aggregated complex collector, and dispersed complex collector. However, to support a regional adaptive sequence, future research should incorporate a complete calibrated radiocarbon database for the Canadian and Columbia Plateaus that are subject to the same analysis and tested under the same methodology that the Upper Columbia data has been in this study. I believe that a region-wide model may be appropriate for the Interior and based on future research we should be able to examine the advent of the collector economy and emergence of social inequality in a more comprehensive and detailed manner.

This thesis also provides the opportunity to examine inter/intra-site artifact assemblage variability under the guidelines of a comprehensive adaptive model. I hope that Plateau archaeologists can now attempt to associate stylistic variances in artifacts at the site level under this comprehensive adaptive sequence that plots cultural feature change through time. Moreover, I believe that this is necessary for further interpretations into the transition from forager to collector and, most importantly, the emergence of social inequality. I hope that this will help archaeologists to easily integrate site occupation models into the larger picture yet, at the same time, exploring more detailed conclusions on variability during the intervals of the adaptive model presented herein.

Conclusion

Perhaps the most significant contribution of this study is that we now have an understanding of the adaptive patterns in the Upper Columbia. With the rapid destruction of the archaeology in the area we may not have the ability to extensively study this region much longer. I hope that this thesis will aid future researchers to explore and further explain the evolution of hunter-gatherer socioeconomic systems in the Upper Columbia; even if all of the archaeology is under water.

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Appendix A
Raw Data Set

Table 6-1. The Upper Columbia Region Housepit Data

Site No.	Site Name	Location	HP Number	HP Size	Reference	Lab No.	C14 Date in BP	Calibrated Age BP
DkQi 1	Slocan Narrows	Slocan River Valley--Lemon Creek	1	Large	Prentiss et. al. 2001	ISGS-4632	2650+/-70	2945-2491
DkQi 1	Slocan Narrows	Slocan River Valley--Lemon Creek	1	Large	Prentiss et. al. 2001	ISGS-4631	710+/-70	760-546
DkQi 1	Slocan Narrows	Slocan River Valley--Lemon Creek	5	Medium	Prentiss et. al. 2001	ISGS-4630	830+/-70	912-663
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	6	Medium	Mohs 1982	SFU-198	2210+/-180	2724-1823
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	14	Small	Mohs 1982	SFU-193	700+/-100	887-516
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	14	Small	Mohs 1982	SFU-186	980+/-250	1343-522
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	14	Small	Mohs 1982	SFU-190	1860+/-150	2146-1420
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	15	Medium	Mohs 1982	SFU-184	790+/-150	975-519
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	20	Small	Mohs 1982	SFU-188	700+/-100	885-518
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	20	Small	Mohs 1982	SFU-189	1020+/-150	1236-676

DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	26	Medium	Mohs 1982	SFU-183	860+/-400	1521-0
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	26	Medium	Mohs 1982	SFU-179	480+/-200	761-0
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	26	Medium	Mohs 1982	SFU-181	1780+/-80	1876-1528
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	30	Medium	Mohs 1982	SFU-180	1040+/-110	1224-728
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	31	Medium	Mohs 1982	SFU-185	220+/-100	458-3
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	31	Medium	Mohs 1982	SFU-182	1170+/-260	1588-572
DiQm 4	Deer Park Site	Lower Arrow Lakes	12	Medium	Turnbull 1977	Gak-2898	2530+/-220	3159-2058
DkQm 5	Inonoaklin Site	Lower Arrow Lakes	2	Small	Turnbull 1977	Gak-2895	3090+/-200	3701-2782
DiQm 1	Cayuse Creek Site	Lower Arrow Lakes	2	Medium	Turnbull 1977	Gak-2896	3150+/-170	3816-2884
DiQm 1	Cayuse Creek Site	Lower Arrow Lakes	4	Small	Turnbull 1977	GX-1197	3215+/-120	3712-3080
45-FE-46	The Ilthkoyape Site	Columbia River Valley/Kettle Falls	1	Medium	Chance and Chance 1982	WSU-1501	370+/-70 floor D	518-301
45-FE-46	The Ilthkoyape Site	Columbia River Valley/Kettle Falls	1	Medium	Chance and Chance 1982	Gak-6419	770+/-90 floor C	911-556

45-FE-46	The Ilthkoyape Site	Columbia River Valley/Kettle Falls	1	Medium	Chance and Chance 1982	WSU-1659	1190+/-70 floor E	1260-970

Table 6-2. The Upper Columbia Root Processing Oven Data

Site No.	Site Name	Location	Feature #	Feature Type	Reference	Lab No.	C14 Date in BP	Calibrated Age BP
45PO137		Calispell Valley of Upper Columbia Region	O-25	Root Processing Oven	Andrefskyet.al 2000	WSU3669	590+/-120	758-320
45PO137		Calispell Valley of Upper Columbia Region	O-25	Root Processing Oven	Andrefskyet.al 2000	WSU3747	610+/-90	726-499
45PO137		Calispell Valley of Upper Columbia Region	O-3 1	Root Processing Oven	Thomas 1989 and Peacock	WSU 3670	820+/-70	911-658
45PO139		Calispell Valley of Upper Columbia Region	O-1.11	Root Processing Oven	Andrefskyet.al 2000	WSU3138	4150+/-95	4856-4422
45PO139		Calispell Valley of Upper Columbia Region	O-1.11	Root Processing Oven	Andrefskyet.al 2000	Beta13297	4000+/-80	4812-4187
45PO139		Calispell Valley of Upper Columbia Region	O-2.0	Root Processing Oven	Andrefskyet.al 2000	Beta13300	1730+/-90	1863-1417
45PO139		Calispell Valley of Upper Columbia Region	P-4.1	Root Processing Oven	Andrefskyet.al 2000	Beta13302	2150+/-150	2705-1737

45PO139		Calispell Valley of Upper Columbia Region	O-4.21	Root Processing Oven	Andrefskyet.al 2000	WSU3402	1120+/-65	1222-926
45PO139		Calispell Valley of Upper Columbia Region	O-4.9	Root Processing Oven	Andrefskyet.al 2000	WSU3334	1040+/-70	1168-770
45PO139		Calispell Valley of Upper Columbia Region	O-5.41	Root Processing Oven	Andrefskyet.al 2000	WSU3329	3050+/-60	3387-3074
45PO139		Calispell Valley of Upper Columbia Region	O-5.61	Root Processing Oven	Andrefskyet.al 2000	WSU3300	300+/-60	504-4
45PO139		Calispell Valley of Upper Columbia Region	O-5.61	Root Processing Oven	Andrefskyet.al 2000	WSU3400	3310+/-60	3687-3396
45PO139		Calispell Valley of Upper Columbia Region	O-5 61	Root Processing Oven	Andrefskyet.al 2000	WSU3401	1580+/-130	1815-1267
45PO139		Calispell Valley of Upper Columbia Region	O-8.31	Root Processing Oven	Andrefskyet.al 2000	WSU3331	1520+/-60	1525-1307
45PO139		Calispell Valley of Upper Columbia Region	O-8.41	Root Processing Oven	Andrefskyet.al 2000	WSU3337	3460+/-70	3896-3484
45PO139		Calispell Valley of Upper Columbia Region	O-8.51	Root Processing Oven	Andrefskyet.al 2000	WSU3332	3160+/-80	3626-3083
45PO139		Calispell Valley of Upper Columbia Region	O-16.1	Root Processing Oven	Andrefskyet.al 2000	WSU3674	2980+/-110	3434-2856

45PO139		Calispell Valley of Upper Columbia Region	O-20.0	Root Processing Oven	Andrefskyet.al 2000	WSU3675	3040+/-105	3468-2947
45PO139		Calispell Valley of Upper Columbia Region	O-27.0	Root Processing Oven	Andrefskyet.al 2000	WSU3750	2680+/-100	3074-2469
45PO139		Calispell Valley of Upper Columbia Region	O-27.0	Root Processing Oven	Andrefskyet.al 2000	WSU3751	5510+/-130	6617-5951
45PO139		Calispell Valley of Upper Columbia Region	O-5.31	Root Processing Oven	Andrefskyet.al 2000	WSU3752	3790+/-540	5580-2878
45PO139		Calispell Valley of Upper Columbia Region	O-6.1	Root Processing Oven	Andrefskyet.al 2000	WSU3753	990+/-70	1052-740
45PO139		Calispell Valley of Upper Columbia Region	O-7.5	Root Processing Oven	Andrefskyet.al 2000	WSU3754	3360+/-540	5210-2217
45PO139		Calispell Valley of Upper Columbia Region	O-5.7	Root Processing Oven	Andrefskyet.al 2000	WSU3755	4660+/-230	5908-4736
45PO139		Calispell Valley of Upper Columbia Region	O-4.3	Root Processing Oven	Andrefskyet.al 2000	WSU3756	3360+/-135	3969-3269
45PO140		Calispell Valley of Upper Columbia Region	O-3.0	Root Processing Oven	Andrefskyet.al 2000	WSU3328	3110+/-110	3564-2996
45PO140		Calispell Valley of Upper Columbia Region	O-7.0	Root Processing Oven	Andrefskyet.al 2000	WSU3340	2400+/-130	2753-2149
45PO140		Calispell Valley of Upper Columbia Region	O-14.1	Root Processing Oven	Andrefskyet.al 2000	WSU3711	2870+/-70	3209-2800

45PO140		Calispell Valley of Upper Columbia Region	O-15.1	Root Processing Oven	Andrefskyet.al 2000	WSU3721	2120+/-80	2320-1928
45PO140		Calispell Valley of Upper Columbia Region	O-13.0	Root Processing Oven	Andrefskyet.al 2000	WSU3713	2500+/-80	2741-2363
45PO141		Calispell Valley of Upper Columbia Region	O-3.0	Root Processing Oven	Andrefskyet.al 2000	WSU3349	5340+/-390	7146-5074
45PO141		Calispell Valley of Upper Columbia Region	O-11.0	Root Processing Oven	Andrefskyet.al 2000	WSU3717	2460+/-100	2751-2336
45PO141		Calispell Valley of Upper Columbia Region	O-13.0	Root Processing Oven	Andrefskyet.al 2000	WSU3718	3060+/-130	3555-2882
45PO141		Calispell Valley of Upper Columbia Region	O-14.1	Root Processing Oven	Andrefskyet.al 2000	WSU3719	3410+/-185	4210-3214
45PO141		Calispell Valley of Upper Columbia Region	O-16.1	Root Processing Oven	Andrefskyet.al 2000	WSU3720	2595+/-70	2850-2372
45PO141		Calispell Valley of Upper Columbia Region	O-16.0	Root Processing Oven	Andrefskyet.al 2000	WSU3721	2690+/-70	2958-2715
45PO141		Calispell Valley of Upper Columbia Region	O-17 1	Root Processing Oven	Andrefskyet.al 2000	WSU37722	2860+/-130	3326-2755
45PO141		Calispell Valley of Upper Columbia Region	O-15.0	Root Processing Oven	Andrefskyet.al 2000	WSU3723	3015+/-180	3577-2773
45PO141		Calispell Valley of Upper Columbia Region	O-9.0	Root Processing Oven	Andrefskyet.al 2000	WSU3724	1020+/-90	1164-734

45PO141		Calispell Valley of Upper Columbia Region	O-8.1	Root Processing Oven	Andrefskyet.al 2000	WSU3725	1480+/-60	1512-1293
45PO141		Calispell Valley of Upper Columbia Region	O-3.0	Root Processing Oven	Andrefskyet.al 2000	WSU3726	2740+/-70	2994-2744
45PO141		Calispell Valley of Upper Columbia Region	O-11.0	Root Processing Oven	Andrefskyet.al 2000	WSU3727	1800+/-100	1963-1514
45PO141		Calispell Valley of Upper Columbia Region	O-10.0	Root Processing Oven	Andrefskyet.al 2000	WSU3758	2970+/-110	3381-2857
45PO144		Calispell Valley of Upper Columbia Region	O-2.0	Root Processing Oven	Andrefskyet.al 2000	Beta13398	3190+/-90	3633-3175
45PO144		Calispell Valley of Upper Columbia Region	O-24.0	Root Processing Oven	Andrefskyet.al 2000	WSU3339	2640+/-60	2876-2496
45PO144		Calispell Valley of Upper Columbia Region	O-11.0	Root Processing Oven	Andrefskyet.al 2000	WSU3658	770+/-70	906-560
45PO144		Calispell Valley of Upper Columbia Region	O-1.1	Root Processing Oven	Andrefskyet.al 2000	WSU3659	1210+/-80	1274-973
45PO144		Calispell Valley of Upper Columbia Region	O-5.0	Root Processing Oven	Andrefskyet.al 2000	WSU3660	2970+/-80	3350-2928
45PO144		Calispell Valley of Upper Columbia Region	O-15.0	Root Processing Oven	Andrefskyet.al 2000	WSU3677	3180+/-135	3695-3002
45PO144		Calispell Valley of Upper Columbia Region	O-19.0	Root Processing Oven	Andrefskyet.al 2000	WSU3759	1780+/-190	2121-1307

45PO144		Calispell Valley of Upper Columbia Region	O-4.0	Root Processing Oven	Andrefskyet.al 2000	WSU3760	2450+/-100	2753-2213
45PO144		Calispell Valley of Upper Columbia Region	O-7.0	Root Processing Oven	Andrefskyet.al 2000	WSU3761	1800+/-120	1990-1420
45PO144		Calispell Valley of Upper Columbia Region	O-3.1	Root Processing Oven	Andrefskyet.al 2000	WSU3762	2610+/-130	2968-2348
45PO144		Calispell Valley of Upper Columbia Region	O-11.0	Root Processing Oven	Andrefskyet.al 2000	WSU3763	915+/-110	1052-661
45PO144		Calispell Valley of Upper Columbia Region	O-11.0	Root Processing Oven	Andrefskyet.al 2000	WSU3764	1250+/-60	1290-1012
CVAP-23		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3345	2250+/-100	2706-1990
CVAP-45		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3346	2930+/-100	3348-2849
CVAP-8		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3347	60+/-62	281-0
CVAP-39		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3348	750+/-70	881-554
CVAP-6		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3350	490+/-45	626-466
CVAP-9		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3715	690+/-50	698-552

CVAP-46		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3716	1410+/-60	1416-1181
45PO149		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3701	75+/-80	283-1
45PO150		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3702	1240+/-100	1305-962
45PO?		Calispell Valley of Upper Columbia Region	0	Root Processing Oven	Andrefskyet.al 2000	WSU3704	1700+/-80	1814-1416

Table 6-3. The Upper Columbia Storage Pit Data

Site No.	Site Name	Location	Feature Number	Storage Pit	Reference	Lab #	C14 Date in BP	Calibrated Age BP
DiQm 4	Deer Park Site	Lower Arrow Lakes	C-1	Storage Pit	Turnbull 1977	Gak-2897	2870+/-100	3312-2778
DiQj 5	Slocan Junction Site	Kootenay River Valley	0	Storage Pit	Turnbull 1977	Gak-2899	1120+/-100	1267-795
DiQj 5	Slocan Junction Site	Kootenay River Valley	0	Storage Pit	Turnbull 1977	Gak-1197	1660+/-120	1822-1316
45PO139		Calispell Valley	P-7.9	Storage Pit	Andrefsky et al.	WSU3336	3360+/-130	3960-3272
45PO139		Calispell Valley	P-8.1	Storage Pit	Andrefsky et al.	WSU3333	1310+/-55	1309-1079

Table 6-4. The Upper Columbia Cultural Earthworks Data

Site No.	Site Name	Location	Earthwork	Reference	Lab No.	C14 Date in BP	Calibrated Age BP
DkQi 2	Slocan Narrows	Slocan River Valley--Lemon Creek	Large Earthwork	Prentiss et al. 2001	ISGS-4636	260+/-70	496-1
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	P-1	Mohs 1982	SFU-191	750+/-90	905-550
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	P-2	Mohs 1982	SFU-192	110+/-80	292-4
DjQj 1	Vallican Site terrace B	Slocan River Valley-Vallican Locality	P-2	Mohs 1982	SFU-194	760+/-140	937-522

Table 6-5. The Upper Columbia Region Non-Residential Site Data

Site No.	Site Name	Location	Feature #	Feature Type	Reference	Lab No.	C14 Date in BP	Calibrated Age BP
45-ST-94	The Fishery Site	Columbia River Valley/Kettle Falls	Feature 1	Hearth	Chance and Chance 1982	?	1410+/-90	1523-1145
45--FE-45A		Columbia River Valley/Kettle Falls	0	Hearth	Chance and Chance 1982	TX-3496	2890+/-340	3856-2160

45-FE-45B		Columbia River Valley/Kettle Falls	0	Hearth	Chance and Chance 1982	Gak-7873	4120+/-190	5275-4090
45-FE-45F		Columbia River Valley/Kettle Falls	0	Hearth	Chance and Chance 1982	Gak-7878	2280+/-140	2716-1956
45-ST-28A		Columbia River Valley/Kettle Falls	0	Hearth	Chance and Chance 1982	Gak-7874	3170+/-220	3891-2794
45-ST-65B3		Columbia River Valley/Kettle Falls	Feature 4	Hearth	Chance and Chance 1982	Gak-7709	2640+/-110	2956-2360
45-ST-65B5		Columbia River Valley/Kettle Falls	Feature 9	Hearth	Chance and Chance 1982	TX-3499	600+/-70	662-521
45PO137		Calispell Valley	H-10	Hearth	Andrefsky et.al 2000	WSU-3343	1215+/-50	1263-994
45PO137		Calispell Valley	H-11	Hearth	Andrefsky et.al 2000	WSU-3344	1615+/-90	1708-1314
45PO137		Calispell Valley	H-10	Hearth	Andrefsky et.al 2000	WSU-3397	1460+/-180	1730-973
45PO137		Calispell Valley	H-26	Hearth	Andrefsky et.al 2000	WSU-3398	1350+/-70	1405-1085
45PO137		Calispell Valley	H-46	Hearth	Andrefsky et.al 2000	WSU-3706	935+/-90	1047-675
45PO137		Calispell Valley	H-75	Hearth	Andrefsky et.al 2000	WSU-3707	930+/-75	960-694
45PO137		Calispell Valley	H-40	Hearth	Andrefsky et.al 2000	WSU-3708	2790+/-120	3318-2713

45PO137		Calispell Valley	H-55	Hearth	Andrefsky et.al 2000	WSU-3709	250+/-120	498-0
45PO137		Calispell Valley	H-89	Hearth	Andrefsky et.al 2000	WSU-3748	1620+/-130	1816-1295
45PO137		Calispell Valley	H-67	Hearth	Andrefsky et.al 2000	WSU-3750	2160+/-175	2709-1730
45PO150		Calispell Valley	0	Hearth	Andrefsky et.al 2000	WSU-3703	2870+/-190	3209-2800

Table 6-6. The Canadian Plateau Root Processing Data

Site No.	Site Name	Location	Feature #	Feature Type	Reference	Lab No.	C14 Date in BP	Calibrated Age BP
EeRb 8		Komkanetkwa Canadian Plateau	Feature 8	Root Processing Oven	Peacock 1998	Beta57436	70+/-70	275-0
EeRb 8		Komkanetkwa Canadian Plateau	Feature 9	Root Processing Oven	Peacock 1998	Beta57437	80+/-70	276-0
EeRb 15		Komkanetkwa Canadian Plateau	Feature 4	Root Processing Oven	Peacock 1998	Beta97955	1060+/-80	1170-791
EeRb 44		Komkanetkwa Canadian Plateau	F 1	Root Processing Oven	Peacock 1998	Beta57433	2360+/-150	2752-2042
EeRb 44		Komkanetkwa Canadian Plateau	F 1	Root Processing Oven	Peacock 1998	Beta57434	1660+/-90	1814-1351
EeRb 45		Komkanetkwa Canadian Plateau	F.2	Root Processing Oven	Peacock 1998	Beta57435	1300+/-50	1302-1085

EeRb 57		Komkanetkwa Canadian Plateau	F 1	Root Processing Oven	Peacock 1998	Beta97954	1780+/-80	1876-1528
EeRb 58		Komkanetkwa Canadian Plateau	F.2	Root Processing Oven	Peacock 1998	Beta97954	160+/-60	294-0
EeRb 89		Komkanetkwa Canadian Plateau	F.1	Root Processing Oven	Peacock 1998	Beta97957	1830+/-60	1916-1574
EeRb 91		Komkanetkwa Canadian Plateau	F 1	Root Processing Oven	Peacock 1998	Beta 57439	870+/-50	913-690
EeRj 1		Upper Hat Creek Valley Canadian Plateau	F.9	Root Processing Oven	Pokotylo and Froese 1983	S-1579	970+/-55	968-742
EeRj 1		Upper Hat Creek Valley Canadian Plateau	F.9	Root Processing Oven	Pokotylo and Froese 1983	S-1580	2030+/-45	2114-1884
EeRj 46		Upper Hat Creek Valley Canadian Plateau	F 1	Root Processing Oven	Pokotylo and Froese 1983	S-1454	1550+/-60	1546-1311
EeRj 55		Upper Hat Creek Valley Canadian Plateau	F 1	Root Processing Oven	Pokotylo and Froese 1983	S-1455	1220+/-70	1282-975
EeRj 55		Upper Hat Creek Valley Canadian Plateau	F.2	Root Processing Oven	Pokotylo and Froese 1983	S-1581	600+/-40	651-540
EeRj71		Upper Hat Creek Valley Canadian Plateau	F 1	Root Processing Oven	Pokotylo and Froese 1983	S-1453	2120+/-65	2309-1933
EeRj 71		Upper Hat Creek Valley Canadian Plateau	F.1	Root Processing Oven	Pokotylo and Froese 1983	S-1642	2245+/-50	2346-2131

EeRj 93		Upper Hat Creek Valley Canadian Plateau	F 1	Root Processing Oven	Pokotylo and Froese 1983	SFU 277	1270+/-140	1509-921
EeRj 101		Upper Hat Creek Valley Canadian Plateau	F 1	Root Processing Oven	Pokotylo and Froese 1983	S-1456	2090+/-65	2304-1896
EeRk 42		Upper Hat Creek Valley Canadian Plateau	F.1	Root Processing Oven	Pokotylo and Froese 1983	SFU 278	1940+/-100	2146-1615
EeRk 43		Upper Hat Creek Valley Canadian Plateau	F.1	Root Processing Oven	Pokotylo and Froese 1983	SFU381	2000+/-160	2336-1575
EeRk 53		Upper Hat Creek Valley Canadian Plateau	F 1	Root Processing Oven	Pokotylo and Froese 1983	SFU280	790+/-120	930-550
EeRk 53		Upper Hat Creek Valley Canadian Plateau	F.2	Root Processing Oven	Pokotylo and Froese 1983	SFU 365	700+/-100	887-516
EjSb 12		Potato Mountain Canadian Plateau	F 1	Root Processing Oven	Alexander and Matson 1987	WSU 3381	100+/-60	277-0
EjSb 12		Potato Mountain Canadian Plateau	F.2	Root Processing Oven	Alexander and Matson 1987	WSU3381	1910+/-50	1966-1715
EjSb 12		Potato Mountain Canadian Plateau	F.3	Root Processing Oven	Alexander and Matson 1987	WSU 372	1710+/-90	1856-1411
EjSb 26		Potato Mountain Canadian Plateau	F 1	Root Processing Oven	Alexander and Matson 1987	WSU 3376	450+/-70	623-313

EjSb 33		Potato Mountain Canadian Plateau	F.1	Root Processing Oven	Alexander and Matson 1987	WSU 3373	615+/-80	683-511
EjSb 39		Potato Mountain Canadian Plateau		Root Processing Oven	Alexander and Matson 1987	WSU 3380	1680+/-90	1817-1391
EeRl 7	Keatley Creek	Mid-Fraser Region of Canadian Plateau	EHPE 35	Root Processing Oven	Hayden n.d		1495+/- 35	1511-1306
EeRl 7	Keatley Creek	Mid-Fraser Region of Canadian Plateau	EHPE 36	Root Processing Oven	Hayden n.d		820+/-50	906-664