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Catherine Alison Dietz

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STRUCTURE, FUNCTION, AND DATING
OF EXTERNAL COOKING FEATURES AT
THE BRIDGE RIVER SITE

by
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B.Sc. Middle Tennessee University, 2001
presented in partial fulfillment of the requirements
for the degree of
Master of Arts
The University of Montana
May 2005

Approved by:

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Date
The Bridge River site is a large housepit village in British Columbia with a significant number of cooking features or earth ovens scattered throughout the site. One of the purposes of the Bridge River project is to determine the structure, function, and date ranges of the cooking features. In order to better interpret the structure and possible use life of the features, modern era root roasting pits used by the native people in the area were excavated. The results of that excavation are compared to the prehistoric cooking features in the village in order to better interpret the formation processes and possible use life of the feature as well as to look for correlations between the prehistoric and modern cooking features. Investigations focusing on the earth ovens at the Bridge River site have the potential to answer questions about subsistence strategies, social organization within the village while it was occupied and seasonal use of the village during occupation and after abandonment. The research will also begin to create a working chronology of the use of earth ovens at the Bridge River site. These objectives will be achieved by building a frame of reference from ethnographic and ethnoarchaeological research, and by using specific archaeological indicators to recognize evidence of past cooking strategies and "recipes" employed in those strategies. The use of earth ovens for the purpose of processing large amounts of plant foods for winter consumption has been documented both ethnographically and archaeologically in terms of in the upland root processing locations. It is possible that earth ovens encountered in the villages may be indicative of another pattern of use altogether. The purpose of this research is to determine if the patterns established in the upland earth ovens carry over into the earth ovens located in the villages. If the earth ovens at the Bridge River site are similar in morphology, contents, and date ranges to those of the uplands, then a previously unidentified pattern of intense food production for storage in the villages will be established and confirmed. If the earth ovens at the Bridge River site do not share the same patterning to those of the upland ovens, then a new model would be necessary.
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CHAPTER 1
INTRODUCTION

The Bridge River site is a prehistoric pithouse village in the Mid-Fraser Canyon that contains approximately 80 housepits and more than 150 earth oven features scattered among the housepits (Figure 1). The site is located 3.1 km (1.9 mi) northwest of the confluence of the Fraser and Bridge Rivers, near Lillooet, British Columbia. The purpose of my project is to determine the structure, function, and date range of a sample of the pit features from the Bridge River site. In order to better determine the potential purposes of the pits, I have elected to look at previous investigations of cooking pits, both in upland root food acquisition locations and in lowland village locations, and to compare them to the Bridge River pits to see if they are comparable in size, shape, and interior deposits. In addition to this research, I also conducted a two year ethnoarchaeological project which consisted of excavating modern era cooking pits that the native people in this area use even to this day. The goal of this analysis of the morphology, contents, and formation processes of sixteen prehistoric earth ovens at the Bridge River Site and four modern era earth ovens in and around Lillooet, British Columbia, is to infer function and variability in style of the aforementioned pits. Examination of the data from the ethnographies, archaeological sites, and my ethnoarchaeological project allow me to more fully recognize and understand the formation processes, use life, and post use abandonment processes that created the pit features in their current state at the Bridge River site.
This research is one of the first attempts to investigate the possible uses of earth ovens found in housepit villages. This is an important avenue of investigation for several reasons. Earth ovens are indicative of direct evidence of resource processing, either for immediate consumption or for processing for storage. Like hearths, earth ovens can be examined to learn about cooking processes, food choices, quantity and variety of foods being processed. The contents of earth ovens can be examined for plant and animal remains in order to determine seasonality, to observe changes in subsistence strategies, and shifts in intensity of resource production. These are all topics which have been addressed in reference to earth ovens located in the uplands, where root processing locations have been documented. However, in the housepit villages in the lowlands, little research beyond initial documentation has been executed.

Earth ovens are unique in that they represent a large amount of work that requires a number of people to help with construction. Many people were needed to produce enough foods for storage in the winter months. While this is a fact which has been documented both ethnographically and archaeologically in terms of earth ovens used in the uplands root processing locations, it is possible that earth ovens encountered in the villages may be indicative of another pattern of use altogether. The purpose of this research is to determine if the patterns observed in the upland earth ovens are repeated into the earth ovens located in the villages. If the earth ovens at the Bridge River site are similar in morphology, contents, and date ranges to those of the uplands, then a previously unidentified pattern of intense food production for storage in the villages will be established and confirmed. If the earth ovens at the Bridge River site do not share the same patterning to those of the upland ovens, then a new model would be necessary. The
earth ovens in the village could be indicative of evidence of feasting activities, single family use of one oven per housepit, or corporate group (e.g. Hayden and Cannon 1982) meal preparation in ovens being used by a number of related housepits. Another topic which has not been explored is evidence of use of the housepit villages post abandonment. Some of the earth ovens in the village show evidence of use after the village was abandoned. This research will be able to explore questions about use of the village post abandonment. Finally, the idea that the villages were only occupied during the winter months has gone largely unchallenged. The ethnographies state that the very old often stayed behind in the villages while the rest of the people were out procuring food for the winter months. It is very possible that summer lodges are also located in the village proper or on the periphery. If so, earth ovens would be a very convenient way to roast plant foods and any meat or fish found in the area. Finally, some resources, like berries, were often found on river terraces, river valleys, and river canyons. These locations are also traditionally where housepit villages were found. It is possible that people were utilizing areas around or even within the Bridge River village.

Investigations focusing on the earth ovens at the Bridge River site have the potential to answer questions about subsistence strategies, social organization within the village while it was occupied and seasonal use of the village during occupation and after abandonment. The research will also begin to create a working chronology of the use of earth ovens at the Bridge River site. These objectives will be achieved by building a frame of reference from ethnographic and ethnoarchaeological research, and by using specific archaeological indicators to recognize evidence of past cooking strategies and "recipes" employed in those strategies.
A Brief Outline of the Thesis

Chapter one consists of a short introduction to the thesis topic. A description of the Bridge River site is included, as is the ethnoarchaeological research. A discussion of the importance of the research and the intended goals follows.

Chapter two describes the Canadian Plateau and the culture history of the area. A short introduction to the kinds of resources cooked in earth ovens follows. A brief overview of earth oven chronology post 3000 BP is discussed next, followed by the history of the research of the Bridge River site, the upland earth ovens, and those found in the housepit villages. The importance of earth ovens to Interior Plateau people is discussed, with special attention placed on why they would use them. Chapter two also explores what kinds of information can be learned from studying earth ovens. Finally, the research questions I will be addressing are introduced in this chapter.

Chapter three introduces and explains my research design and my methodology for the research. I explain how I created a frame of reference and how I came to utilize ethnoarchaeology in the research. A frame of reference is instrumental to my research in that it allows me to compare the better known area of knowledge, the ethnographies, to the lesser known information of earth ovens from the Bridge River site and the modern earth ovens. Projecting the existing data against the frame of reference created by the archaeological and ethnoarchaeological data will generate a model which will show an observable patterned distribution relative to the frame of reference. The implications of these findings will be discussed later in the text. The theoretical constructs I chose to employ are discussed with principles of ethnographic analogy and middle range theory being briefly outlined. The ethnographies I use are identified and ethnographical
descriptions of earth ovens are examined. In addition to descriptions of traditional earth ovens, I also outline the methods of construction for the modern earth ovens in my research. I meticulously describe the excavation and analytical methods used for both the ethnoarchaeological ovens and the modern ones. The final topic covered in chapter three is the statistical analysis. The method of analysis and the goals of the analysis are discussed.

Chapter four presents the results from the ethnoarchaeological earth oven research. Each one is discussed individually and the results are broken down into four categories. The categories are: burning patterns, fill matrix, faunal remains, and botanicals. A discussion of the conclusions on each topic follows.

Chapter five presents the results from the analysis of the Bridge River earth ovens. As in chapter four, the results of the analysis are broken down into four categories: burning patterns, fill matrix, faunal remains, and botanicals. Possible explanations of oven functions are broken down into broad categories. Further identification of more specific oven function are attempted when possible. Finally, in chapter five, the results of the statistical analysis are presented.

Chapter six discusses the similarities and differences between the Bridge River ovens, the upland ovens, and the ethnoarchaeological ovens. Seasonality is interpreted using macrobotanical remains as seasonal indicators. Formation processes are interpreted by looking at surface and subsurface morphology. Ovens are examined in order to determine which ones would have been used for immediate consumption and which ones would have been used for processing for storage. Change in pit size through time is investigated and the implications are discussed.
Chapter seven discusses recommendations for future research. Finally, in chapter seven, concluding remarks are explored.
CHAPTER 2
BACKGROUND

Chapter two provides a brief introduction into the Canadian Plateau culture area. Subsistence resources that were most likely cooked in earth ovens are presented. The culture history of the area is presented, with a focus on housepits and the exterior pit features found in close proximity to them, as well as their ubiquity on the landscape in housepit villages. The history of research is discussed with a review of previous research on the site, in the uplands, and in housepit villages. The significance of studies on earth ovens to archaeologists is examined, as is the importance of earth ovens to the Interior Plateau peoples. Finally, the research questions are reviewed.

The Canadian Plateau

The Canadian Plateau culture area is in British Columbia with the Fraser River to the north, the Rocky Mountain range to the east, the Coast Mountain Range to the west, and the border of the United States to the south. This area is known for its dramatic topography with the Fraser River winding its way through the Coast Mountains. The topography is extreme with dizzying cliffs and deep gorges. The summers are dry and hot and the winters are wet and cold. In some places, the rapids of the Fraser river pound unmercifully into the rock, causing occasional rock slides. The Bridge River site is in the Mid-Fraser River Canyon area (Figure 1). The site sits on a terrace of the Bridge River
and is several kilometers upstream from the confluence of the Fraser River (Richards and Rousseau 1987). The Bridge River site is a large housepit village containing over 80 housepit depressions and over 150 external pit features, tentatively identified as either earth ovens or cache pits. It is assumed this village is a winter pithouse village. Villages were almost exclusively located on river terraces due to the fact that there is shelter from cold winds and they are close to water and fuel.

**Culture History**

This section consists of a review of the culture history on the Canadian Plateau in the southern part of British Columbia from between 3,500-250 BP. The information from this culture history is drawn from Richards and Rousseau (1987).

The Shuswap horizon (3500-2400 BP)

The Shuswap horizon (3500-2400 BP) corresponds to the first foremost distribution of pithouse villages in this region. The pithouses from this time are on average 10.7 meters in diameter. This shape is circular to oval, the walls are steep, and the bottoms of the pithouses are flat (Richards and Rousseau 1987). Large postholes have been recorded, which is suggestive a large wooden superstructure, which was most likely covered with soil, as recorded in the ethnoarchaeological period (Boas 1890; Dawson 1891; Hayden 1997, 2000; Richards and Rousseau 1987). Side entrances, hearths in the central portion of the house, internal storage pits, and internal storage pits are common (Richards and Rousseau 1987). External cooking pits and storage pits, both located on the outside of the pithouse appear during the last 500 years of the Shuswap horizon.
Lithic assemblages in the Shuswap horizon consisted of projectile point which were most likely used for atlatl or spear tips. Other lithic items include key-shaped and unformed unifaces and bifaces, microblades, and cores. Lithic technology appears to be expedient in nature (Richards and Rousseau 1987).

Subsistence strategies were logistically organized (see Binford 1980) with the main focus appearing to be on terrestrial animals, some salmon, trout, freshwater mussels, and some water birds (Richards and Rousseau 1987). Salmon procurement appears to have become more important than in previous horizons, but it is not the main focus (Richards and Rousseau 1987). There is evidence of some trade in the form of coastal dentalium shells (Richards and Rousseau 1987).

The Plateau horizon (2400-1200 BP)

The Plateau horizon takes place in a time when there is a climatic shift from cooler, wetter conditions to warmer, drier conditions (Chatters 1995). While housepit sizes were generally larger during the previous Shuswap horizon (3500-2400 BP), by the end of the Plateau horizon, there is a trending up towards larger housepits again (Richards and Rousseau 1987). The housepits tend to follow a similar design strategy with a large central hearth, evidence of smaller storage, cooking, and trash pits scattered throughout. There is evidence of both side and roof entrances and benches line the walls inside (Alexander 1992, 2001; Hayden 1997; Richards and Rousseau 1987). Excavations of small circular and oval depressions (2-4 meters in diameter) found in close association with housepits have recovered remains that are consistent with earth ovens, cache pits, and trash pits. Some of these pits were used only once while others were used multiple
times. Some pits were reused for different functions than the original intended function (Richards and Rousseau 1987).

Plateau horizon points are typically dart and arrow points. The dart points were used throughout the whole horizon while the arrow points do not show up in the record until after about 1,500 BP (Richards and Rousseau 1987; Stryd and Rousseau 1996). Bone tools become more common during this time but groundstone tools are still uncommon. In all, chipped stone tools make up about the most significant part of the lithic assemblage. Of the chipped stone tools, unifacial and bifacial tools are most prominent as well as key shaped scrapers (Richards and Rousseau 1987).

During the latter part of the Plateau horizon, we begin to see larger pithouse villages with all sizes of pithouses comprising the village. It is believed that this time period represents the height of social complexity with privately owned resources and access to resources, certain individuals co-opting non-kin labor, and status being ascribed rather than achieved (Arnold 1996; Hayden 1997).

The Kamloops horizon (1200 – 200 BP)

The Kamloops horizon, 1200 – 200 BP, shows an increase in the variability of size in housepits. Hearth, various storage and refuse pits and entrances follow the same patterns as they do in the Plateau horizon (Alexander 1992, 2001). Small (2 m diameter) round or oval depressions external to the housepits which have been excavated have been identified as cache pits or earth ovens (Richards and Rousseau 1987).

Bifaces increase in frequency as do the number of groundstone artifacts. Some of the groundstone artifacts take the form of anthropomorphic and zoomorphic figures. As
in the Plateau horizon, salmon appears to be the primary non-plant resource (Richards and Rousseau 1987).

**Resources Used for Subsistence in Earth Ovens**

The location of the Bridge River site is on a river terrace near the confluence of the Fraser and Bridge Rivers. The site itself is several kilometers from Fraser River Six Mile Rapids, a very well known fishery used by Interior peoples. The site location allows access to a wide array of plant and animal resources because the site is close to various different biotic zones. There is a short list of plants and animals which have been ethnographically purported to be hunted or processed for food in earth ovens. The ethnographies are vague as to which animals in particular were cooked in earth ovens, generally just stating “meat or fish” (Hill-Tout 1907:102; Teit 1909a:638; Turner et al. 1980:148). The Bridge River site is located relatively close to mountainous, forest, meadow, and riverine habitats. During certain times of the year, anadromous fish in the form of salmon (*Oncorhynchus* sp.) were plentiful in the Fraser River. Deer (*Odocoileus* sp.), bighorn sheep (*Ovis Canadensis*), mountain goat (*Oreamnos americanus*), black bear (*Ursus americanus*), grizzly bear (*Ursus arctos horribilis*), and elk (*Cervus elaphus*) would have been relatively common on the terraces, grasslands, and parklands at various times of the year. Hare (*Lepus americanus*), northern flying squirrel (*Glaucomys sabrinus*), red squirrel (*Tamiasciurus hudsonicus*), yellow-bellied marmot (*Marmota flaviventris avara*), and porcupine (*Erethizon dorsatum nigrescens*) were common small mammals used for food (Alexander 1992; Chatters 1998; Kusmer 2000). Aquatic animals like beaver (*Castor Canadensis*), and freshwater shellfish were reportedly common in
nearby Seton Lake (Alexander 1992; Kusmer 2000; Chatters 1998). Game birds are not mentioned, and neither are any fish other than salmon. However, other types of fish, like trout and sturgeon, were most likely also cooked in earth ovens. Exactly what kind of meats were pit cooked is vague, with only salmon, deer, and mountain goat being specifically mentioned (K’San 1980). It is possible to infer that any of the above animals would have been pit cooked.

Plant foods which were traditionally cooked in earth ovens are listed below. The root foods are: nodding onion (*Allium cernuum*), balsamroot (*Balsamorhiza sagittata*), mariposa lily (*Calochortus macrocarpus*), Blue camas (*Camassia quamash*), edible thistle (*Cirsium edule*), spring beauty (*Claytonia lanceolata*), yellow avalanche lily (*Erythronium grandiflorum*), Yellowbells (*Fritillaria pudica*), Chocolate lily (*Fritillaria lanceolates*), Waterleaf (*Hydrophyllum capitatum*), tiger lily (*Lilium columbianum*), chocolate tips (*Lomatium dissectum*), hog fennel (*Lomatium macrocarpum*), wild caraway (*Perideridia gairdneri*), silverweed (*Potentilla anserine*), wapato (*Sagittaria latifolia*), and water parsnip (*Sium suave*) and Black Lichen (Peacock 1998; Peacock and Lepofsky 2004; Teit 1900, 1906, 1909; Turner 1992, 1997; Turner et al. 1980, 1990). Berries were often added to earth ovens to flavor roots and meats (‘Ksan 1980; Peacock 1998; Peacock and Lepofsky 2004; Turner 1992, 1997; Turner et al. 1980, 1990). Many of these plant foods are found in areas higher in elevation than the village sites. As such, there is not much information to date on village ovens being used as initial processing areas for most root foods. There were most likely some roots and tuber which grew close to the village sites, but these would have been consumed rather quickly. Earth ovens were used to bake, or roast fresh roots, and to reconstitute dried roots for
consumption. The most commonly mentioned roots that were reconstituted in earth ovens were yellow avalanche lily (*Erythronium grandiflorum*) (Peacock 1998; Peacock and Lepofsky 2004; Teit 1900, 1906, 1909; Turner 1992, 1997; Turner et al. 1980, 1990).

**History of Research**

**Site**

In 1973, Stryd conducted limited testing at the Bridge river site. In the course of the investigation, housepit floors were sampled and the resulting dates ranged from 1000 to 2000 B.P. These dates fall within the same time frame as the housepit occupations at Keatley Creek (Hayden 2000; Prentiss et al. 2002, 2003). In the summer of 2003, a field school was conducted by Dr. William Prentiss and students from the University of Montana. During the course of the field school, a contour map of the site was produced, the initiation of a multi-year remote sensing study was established, and samples were systematically collected from both housepit floors and external pit features. Samples were collected from these two areas for the purpose of obtaining more dates, and for gathering information about house floor and outdoor activity areas. A variety of household activities took place on housepit floors, including cooking and processing of stone tools, hides, baskets, and countless other household goods. Traditionally, outside of the housepits, depressions purported to either be cache pits for storage of food during the winter months, or earth ovens, for the purpose of preparing foods by pit roasting (Kusmer 2000; Richards and Rousseau 1987). The external pit features are of particular interest to my research and will be the focus of this thesis. In subsequent chapters, the morphology of earth ovens will be described in great detail. A brief description of an earth oven...
consists of a hole excavated into the ground, lined with heated rocks, layered with vegetative insulation and meat or food plants or both, and covered with earth and allowed to bake for several hours.

**Previous Projects Examining Earth Ovens**

**Upland Root Acquisition Locations**

The majority of the research that has been performed on earth ovens on the Interior Plateau has been in upland valleys, which are generally located at elevations of 2,135,1,525 m (7004.6 – 5003.2 f) above mean sea level. The most well known research to date is in an upland valley located between the Fraser and Thompson Plateaus in southern British Columbia in the Hat Creek locality. Research undertaken by Pokotylo and Froese (1983) had the effect of not only identifying characteristics of upland valley root food acquisition locations, but also providing some guidelines to help identify and interpret these locales properly. They determined that upland locations were root processing base camps like those described in ethnographies and would consist of cultural depressions identified as earth ovens by the presence of fire altered rock, charcoal, burned vegetation, and rim material encircling the depression (Boas 1891; Bouchard and Kennedy 1977; Dawson 1891; Ray 1942; Teit 1900, 1906, 1909). They also determined that these sites would most likely be located close to a nearby stream, and near to locations where the vegetation contained a variety of edible root food species (Pokotylo and Froese 1983). There were some interesting distinctions from the ethnographies. There was intensive reuse in the form of superimposed rock lined basins.
There were also some ovens that had much larger dimensions than those described in the ethnographies. Pokotylo and Froese (1983) postulated that the large size of the earth ovens were indicative of processing much larger amounts of roots that were described in the ethnographies. It was also noted that the oldest pits (2250 B.P.) were also the largest ones with the evidence of reuse in the form of massive superimposed rock lined basins. The more recent pits were noted to be smaller with less evidence of reuse. Formulas were successfully tested for measuring exterior rim edge and interior rim edge to attempt to determine if there was reuse of pits without excavation. Rim crest measurements were also used to establish the size of the earth ovens. A formula was established for determining volume of food processed in the ovens. This was an important investigation in that it established what the ovens were, and what they were used for. It also provided a way for archaeologists analyzing earth ovens at other locations to begin to homogenize and synthesize data, with the use of formulas and standardized measurements.

Thoms (1989) conducted an extensive study of earth ovens in temperate regions of the world as well as on camas ovens in the Kalispell Valley in Washington. In the course of his research Thoms identified four different types of earth ovens with characteristics based on surface and subsurface morphologies. The first kind of oven identified was the basin shaped earth oven. This is the only type of earth oven I encountered in the course of my research at the Bridge River site. These ovens typically have well defined rim and basin shaped depressions with subsurface stone lined basins, evidence of burned vegetation and charcoal. The second type of oven identified by Thoms is the mound oven. This type of oven is created by building a fire directly on the
ground surface and cooking the food on top of the coals with a layer of soil on top of that. These ovens were built to a height of 35 to 60 centimeters and will have small depressions in the top or the side of the mounds (Dawson 1891). The third type of oven, the platform oven was also built on the ground surface, but with no distinctive mounding of soil. The final oven identified by Thoms (1989) was not described in the ethnographies. They are described as basin or platform ovens excavated into the slope of a terrace (Thoms 1989).

Peacock (1998) examined the emergence of wild plant food production during the Late Prehistoric period on the Canadian Plateau. She looked at root food processing locales and synthesized rim crest measurements and basin depths of dated earth ovens to provide a chronology for plant food production. Another very important part of her research was to conduct experimental reconstruction of earth ovens. She was able to determine that cooking balsamroot in an earth oven with in situ burning increased the energy value of the root by 200%.

A more recent publication by Lepofsky and Peacock (2004) more fully outlines a temporal model of root resource use on the Interior Plateau. The data from upland acquisition areas shows that root processing began sometime before 3300 B.P. By 2400 B.P., there is an apparent shift to a more intensive pattern of use. Upland resource locations show a consistent pattern of use and reuse through about 1500 BP. During this time, we see both large and medium sized ovens (3 to 4 m diameter) being used with the larger ovens (greater than 5 m diameter) being slightly more prevalent. From between 1500 to 800 bp, the frequency of upland ovens begins to decline but the size remains relatively the same. After 800 bp, the size of the upland pits declines significantly, with
an average diameter of less than 3.5 m. After 800 BP, while the size of the ovens decreases, the frequency of ovens increases. The increase oven frequency at this time is comparable to the frequency of earth ovens from 2400 – 1500 BP (Lepofsky and Peacock 2004).

Village Locations

Investigations of earth ovens have almost solely focused on ovens found in the uplands near known root food acquisition areas (Lepofsky and Peacock 2004; Peacock 1998; Pokotylo and Froese 1983; Thoms 1989). Ethnographies only identify earth ovens as having been used in the uplands also (Boas 1891; Bouchard and Kennedy 1977, Dawson 1891; Ray 1942; Teit 1900, 1906, 1909). Other housepit villages, like the Bell site and the Fountain site, have documented small numbers of earth ovens within the villages (Stryd 1973, 1980), but no research has been conducted on these ovens. Hayden and Cousins (2004) have conducted preliminary investigations at the Keatley Creek site. They identified 13 cultural depressions, 8 of which were tested and identified as earth ovens, used for the purposes of processing root foods. Although all 8 of the tested pits were identified as root roasting ovens, 2 had definitive evidence of root or tuber materials. One pit contained seeds of *Lomatium* sp., and remains of *Allium* sp. Another oven contained 4 root skin fragments, tentatively identified as *Lomatium* sp., but the identification was not definite. Two other pits contained remnants of unidentified tissues and bulbs. The pits were interpreted to be not only evidence of root processing in the village, but of feasting, either in the winter or summer months (Hayden and Cousins 2004). The placement of the earth ovens was interesting. All of the identified tested ovens
were located on terraces on the periphery of the village. Each oven was noted to be placed near housepit depressions that was believed to be structures potentially used for rituals, specialized activities, or possibly belonging to people with prestige (Hayden and Cousins 2004). Cultural depressions tested within the village proper were all identified as cache pits (Hayden and Cousins 2004).

**Importance of Earth Ovens to Archaeologists**

The most relevant questions to my research first and foremost are: why are these pits important, and what can they tell us? First of all, the roasting pits are unique in that they are easily visible and resilient objects on the landscape. They tend to have a distinctive mounded shape with a crater in the middle that makes a strong visual impact. Earth ovens also afford direct evidence of resource processing. The function of these pits was to provide enough long term heat to roast plant foods and in some cases, meat (Ksan 1980; Peacock 1989; Teit 1909; Thoms 1989; Turner 1992). While other evidence of root processing, such as digging sticks or baskets might be lost to taphonomic processes, the pits provide direct evidence of this activity. Finally, there are a large number of analyses which can be performed on a roasting pit. One can learn about cooking processes, food choices, quantity of foods processed, technologies used for cooking, material choices for food processing, and age of deposits. In addition, the larger questions of seasonality, settlement patterns, and subsistence strategies can begin to be addressed.
Importance of Earth Ovens to Interior Plateau People

The climate on the Canadian Plateau has been characterized by long, cold winters followed by short hot summers (Chatters 1998). Because of these long winters, periods of resource scarcity or food stress could be frequent and long. Ethnographies and archaeologists have often focused on salmon as the primary resource utilized by Interior people (Fladmark 1982; Hayden 1992; Kuijt 1989 Richards and Rousseau 1987). People in the Interior Plateau region relied on salmon as one source of a storable, protein-rich food. Salmon was a perfect food source in that it was available in large amounts at relatively predictable times annually (Hayden 1981). This allowed the people of the Interior Plateau to harvest and process large amounts of salmon, both for immediate consumption and in a storable form. New studies have recently emerged that contend that archaeologists focusing on salmon as the primary storable resource are ignoring a large part of the subsistence system of the people of the Interior Plateau. People on the Interior often encountered the problem of an excess of proteins and insufficient fats and carbohydrates. During the lean seasons of late winter and early spring, people subsisting on high protein, low fat meats were in danger of suffering severe malnutrition and even starvation unless either fat or carbohydrate rich food products were consumed (Bettinger 1991; Kelly 1995; Kuijt and Prentiss 2004, Speth and Spielmann 1983). In the case of the Interior Plateau peoples, carbohydrate rich foods in the form of roots were one of the resources used to supplement the lean meat diet that was common while overwintering in pithouses (Peacock 1998; Peacock and Lepofsky 2004; Teit 1900, 1906, 1909; Turner 1992, 1997; Turner et al. 1980, 1990). These root foods provided a valuable source of
vitamins, minerals, and highly concentrated carbohydrates in the form of starches or fructans (Peacock 1989).

Some commonly consumed roots were balsamroot, wapato, Indian potato, and nodding onion (Peacock 1998; Peacock and Lepofsky 2004; Teit 1900, 1906, 1909; Turner 1992, 1997; Turner et al. 1980, 1990). The most common method for processing these root foods were either roasting, steaming, boiling, or baking (‘Ksan 1980; Peacock 1998; Peacock and Lepofsky 2004; Turner 1992, 1997; Turner et al. 1980, 1990). All four of these cooking methods were performed in earth ovens, like the ones that dot the landscape at the Bridge River site. Pit cooking had two positive effects on the roots in that it improved the flavor of the roots and that it also converted the fructans to a form which were digestible to humans (Peacock 1998; Peacock and Lepofsky 2004; Thoms 1989). Without pit cooking, these roots in their raw forms would have been indigestible for human consumption (Peacock 1998; Wandsnider 1997). Earth ovens were also for cooking meat and fish (Teit 1900, 1906, 1930; Turner and Kennedy 1980). Pit cooking meat, particularly game, breaks down both the muscle protein and the connective tissues present in wild game. Breaking down the proteins and the tissues has dual beneficial effects of tenderizing the meat and making the meat more easily digestible (Wandsnider 1997).

**Research Questions**

Six questions were investigated in order to identify the function of the earth ovens at the Bridge River site. First, what was the function of each of the earth ovens at the Bridge River site? Second, is there variability in morphology, content, and context in the
pits at the Bridge River site? Third, are there any discernable differences between the
upland pits and the village pits? Fourth, what did I learn from the ethnoarchaeological
investigations and was the continuity between the prehistoric pits and the modern pits?
Fifth, how old are the Bridge River pits and do they fit into the existing chronology of
earth oven use on the Interior Plateau? Finally, can seasonality of pit use be determined
and if so, does it fit into the existing winter housepit model? In order to answer the
questions, I created a frame of reference using ethnographic analogy, ethnoarchaeology,
and data from other sites containing earth ovens.
CHAPTER 3
METHODS

In this chapter, data from ethnographies, previous archaeological excavations, and the ethnoarchaeological project are used to create a frame of reference which will be used to interpret possible functions and formation processes for the Bridge River earth ovens. In addition, the methods used to undertake the statistical analysis are described.

Creating a Frame of Reference

In the beginning stages of my research on earth ovens, I focused on previous archaeological research in the uplands and ethnographies. I quickly became aware of the fact that all of the materials available on the topic focused primarily on ovens used for processing large amounts of root foods in the upland meadows. When I compared the data from the upland ovens to those at Bridge River, it became apparent that the ovens in both locations shared some characteristics. There were some differences, however, that led me to come to the conclusion that the village ovens were not being used for the same purpose. This is the first project which addresses village earth ovens and while this in itself was exciting, I was unsure of how I was going to be able to interpret what was occurring at the village.

In the course of the 2003 field season at the Bridge River site, I had the chance to talk to members of the Bridge River Band and the Seton Portage Band. From these
people I learned that at times for special occasions earth ovens were still used to cook food. Rather than being used to process large amounts of plant material however, these ovens were used to roast meat to feed several people at one time. It was at this time that I decided to employ ethnographic analogy, ethnoarchaeology and principles of middle range theory to answer some of my questions. I elected to excavate some of the modern ovens used by members of the Bands and to compare them to the Bridge River ovens to see if perhaps the modern ovens could help to provide a link to past behaviors.

I decided that ethnographic analogy was crucial to explanation. No matter what theory they subscribe to, most archaeologist utilize ethnographic analogy in an attempt to put meaning and functionality into the material artifacts they study. Ethnographic analogy is used to compare archaeological evidence with observed ethnographic data for the purpose of explaining unobserved past human activity by using archaeological data (Ascher 1961; Stiles 1977). Hodder (1982) and Wylie (1985) describe “relational analogies” as a type of model which deems comparisons between analogy and archaeology to be relevant because the comparisons have the capability to identify processes that cause similarities between ethnographic information and archaeological data. Binford’s (1983) middle range theory is considered to be an example of relational analogy. This is so because of what he calls “actualistic studies,” which are defined as observations and empirical recording of ethnographic activities made by archaeologists at the present time (Binford 1983). Actualistic studies are significant tools for archaeologists. Being able to thoroughly observe and examine traditional behaviors can help archaeologists not only understand cause and effect in terms of behavior and the record, but also can help the archaeologist to see if the analogy itself is relevant. The
example that Binford (1983) used to explain this model was the elegant concept of the bear and the footprint. The archaeologist comes across a footprint in the forest and records its attributes. From the attributes recorded, the archaeologist can infer that a large heavy animal made the footprint but will not be able to get a clear picture of the nature of the animal. The same archaeologist sees a bear walking through the forest and sees the footprint it leaves behind. By having seen the actual bear making the footprint, the archaeologist can now say with greater certainty that the same kind of animal made the first print as made the second print (Binford 1983).

In researching the data from the Bridge River ovens, the ethnographies, and the upland ovens, I was left with a lot of descriptions, facts, and figures, and no way to synthesize it to garner some meaning. Therefore, I chose tenants of middle range theory under the supposition that the creation and use of earth ovens to specific standards were the result of those ovens being bounded and governed by physical and biological process which should manifest in very specific ways in the record. I propose that by observing the cultural and taphonomic processes involved with the use of an earth oven, certain propositions can be formulated about manifestations of use of fire, steam, content and morphology. These propositions could be considered to be elementary. However, I would argue that unless such steps are made to formally synthesize the information and to create explicit, testable statements, then the information will always remain in the realm of assumption and be untested (Binford 1967, 1980, 1983).

For the purposes of this study, ethnographies of both Interior and Coastal peoples were consulted in order to develop archaeological expectations for thermal pit features used for subsistence activities. An exhaustive review of the ethnographies provided
insight into not only the types of earth ovens most commonly used by people in both regions, but also the types of food most likely to be cooked in the ovens. Materials for constructing the earth ovens were also carefully noted. Generally, encountering and excavating an earth oven will only reveal the contents that remain in the oven after the food has been removed, with the remains of the food itself most likely making up a very small part of the feature fill being examined, whether in the form of dropped particles of food remains or food trash thrown back in the pit in a secondary context (Schiffer 1987). The majority of the macrobotanicals recovered are, in my opinion, most likely the remains of the insulating vegetative layer or the materials used for starting and maintaining the fire.

A second step in creating a frame of reference for this study was to undertake an ethnoarchaeological project in the same study area as the Bridge River site. The project consisted of the excavation of four modern era earth ovens after their use and abandonment in order to see the process from creation to abandonment. Burning signatures were examined and recorded. The process of excavation of the initial pit, filling the pit with all of the necessary items for cooking the food, re-excavating the pit to remove the food, and refilling the pit after the food was consumed was carefully monitored in order to better understand how the layers of organics were arranged and to consider how they might look when uncovered by the archaeologist. The fill matrixes, and organic remains of the modern earth ovens were then compared to those of the prehistoric Bridge River earth ovens.
In order to create a frame of reference I looked at the ethnographies on the subject of not only earth oven construction but also the kinds of foods which would be cooked in earth ovens. Archaeological indicators for thermal pit features used for subsistence activities were developed from ethnographies from the linguistic area of the Interior Salish of the Fraser River (Bouchard and Kennedy 1975a, Bouchard and Kennedy 1975b, Bouchard and Kennedy 1975c; Teit 1900, 1906, Turner et al 1990), the Chinook of the Columbia Plateau area (Gunther 1973; Ray 1938; Sapir and Spier 1930, Teit 1928; Turner et al 1980), the Nuu-chah-nulth of Vancouver Island, (Turner et al 1983), and Coast Salish ethnographies (Barnett 1955; Bouchard and Kennedy 1974, 1976a, 1976b, Bouchard and Turner 1976; Curtis 1913; Duff 1952; Gunther 1927; Haeberlin and Gunther 1930; Hill-Tout 1978a, 1978b). The information from all of the ethnographies examined was combined and synthesized to recognize four basic uses for earth ovens. The earth ovens were either constructed for the purpose of cooking meals for immediate consumption or feasting, processing large amounts of food for storage, or to extract bone marrow and grease from bones by boiling. Smaller earth ovens were used for steam cooking meat, fish, birds, roots, and other plant foods for immediate consumption, as well as for grease extraction (Barnett 1955, Gunther 1927; Bouchard and Kennedy 1974; Bouchard and Kennedy 1975b, 1975c; Bouchard and Kennedy 1976b; Sapir and Spier 1930; Ray 1938; Turner 1992, 1997). Larger earth ovens were used for slowly cooking one kind of food, most likely plant materials for storage or large quantities of meat for immediate consumption to feed a large group of people (Ray 1938; Bouchard and Kennedy 1976b; Bouchard and Turner 1976, Turner 1992, 1997).
Descriptions of Earth Ovens

The ethnographies of the Interior people by Teit (1900, 1906, 1909), Dawson (1891), Ray (1942), Bouchard and Kennedy (1977), and Boas (1891) describe similar methods for constructing roasting pits, as do those ethnographies from the Coast (Barnett 1955; Curtis 1913; Haeberlin and Gunther 1930) and the Columbia Plateau (Ray 1938; Thoms 1989). A circular hole is dug to a depth of anywhere from two and a half to four feet, depending on the types of food being processed as well as the amount. The diameters from the ethnographies vary, from three to six meters diameter in the Interior and the Coast (Dawson 1890; Haeberlin and Gunther 1930; Teit 1900, 1906), and seventy centimeters to two and a half meters in the Columbia Plateau (Malouf 1979; Thoms 1989; Thwaites 1959b). Medium to large river cobbles or volcanic rock are placed in the bottom of the pit. Dry wood is placed on top and set on fire. The wood is allowed to burn down to embers. An alternate version has the rocks heated in a separate fire and placed in the bottom of the pit once heated ('Ksan 1980). Damp earth is shoveled over the embers and red hot rocks in a thin layer. Branches of bushes or trees are laid on top of the earth (Teit 1900, 1906). Columbia Plateau ethnographies refer to the vegetative layers as being skunk cabbage leaves and mountain ash boughs (Malouf 1979; Thoms 1989). A layer of evergreen branches is laid on top of the previous layer. Next is a layer of fir needles and then more evergreen branches. Roots and in some cases meat were wrapped in more skunk cabbage leaves or birchbark packages (Teit 1900, 1906, Turner and Kennedy 1980) and placed on top of the branches and then more branches were placed on top of the roots and meat. A layer of soil comes next followed by a large fire being built on top.
of the soil or sand layer. The soil or sand layer on top was dependant on the size and quantity of food items to be cooked. A whole animal would warrant a thick insulating layer of soil while a smaller amount would warrant a thin layer of insulating soil (‘Ksan 1980). The fire is allowed to burn down to embers and allowed to sit for anywhere to two to 72 hours. After the desired amount of time, the unburned wood or embers are removed from the top and the food is dug out of the pit. The layers of vegetation were also pulled out and placed along the edges of the pit. In the ethnographies, the rock pavement that sat in the bottom was left in the bottom of the pit. In some cases, there is a large hollow stick that is placed in the pit and allowed to stick out the top after all of the layers have been put in place (Teit 1900, 1906). Water is poured through the hole in the stick that protrudes out the top onto the hot stones in the bottom of the pit to create steam.

There are some variations on this basic formula. In some cases, the stones in the bottom of the pit were heated in a fire outside of the pit and placed inside with tongs once the stones were glowing red hot. No additional fire was built in the bottom of the pit (‘Ksan 1980). Other accounts mention different kinds of vegetation matting for insulation. Other kinds of vegetation can include moss, fern, skunk cabbage leaves, thimbleberry leaves, rye grass, or burdock leaves (Dawson 1891; ‘Ksan 1980; Turner 1995, 1998; Turner et. al 1980).

Construction of large earth ovens would have been a very time consuming project. Dawson’s account (1892) of Thomson women constructing an earth oven for the purpose of processing root foods has the women taking many hours to gather the roots. Then it took them two to three days to gather the vegetation for the insulation. During this time, the men cut down an entire tree for fuel. Rocks were gathered, which also took
several hours. Add this to digging the pit, constructing the oven with the rocks and fire at the right temperature, and factor in the time it takes to cook some root foods, and the entire time could take several days.

Pit size was determined by the number of people that were using the pit, both the type and the quantity of food to be processed and prepared, and the compactness of the soil in which the pits were excavated (Alexander 1992). With all these factors in play, size becomes an issue very quickly. Alexander (1992) has stated that the minimum size for a successful earth oven would be 90 centimeters. Anything below this size simply could not hold the amount of rocks, vegetation, and food to be processed to make the entire endeavor worth all the time and trouble. However, there are smaller ovens, called steaming ovens, which were used frequently by Coastal peoples and some Interior groups (Barnett 1955; Bouchard and Kennedy 1974; Curtis 1913; Haeberlin and Gunther 1930; Ray 1938). These ovens were manufactured basically the same way as the larger ones, just on a smaller scale. In these ovens, rock was not always used in the heating element. Just a fire built on top of the earth layer could heat up the walls of the oven enough to cook fish and shellfish (Bouchard and Kennedy 1974, Bouchard and Kennedy 1975b). Because the smaller ovens were shallower, they took less time to cook. These ovens were most likely used for immediate consumption of meals for a small group of people, like a single family. There does not appear to be an upper limit to oven size. One of the Bridge River pits has a diameter of seven meters and one of the pits from my ethnoarchaeological project had a diameter of 7.5 meters.

The thickness of the stone pavement used as a heating element in the bottom of the pit play an important part in the ability of the pit to properly cook the food. In order to
cook balsamroot, a stone pavement thickness of 30 centimeters is required and the cooking time is at least 48 hours. With nodding onions and lilies, a thickness of between 15 and 20 centimeters should be used with a cooking time of 24 hours. Black lichen, with a thickness between 15 to 20 centimeters, takes about 12 hours to cook. With mountain potatoes, as little thickness as 10 centimeters can be used with a cooking time of two to five hours (Alexander 1992). Meat and fish have been briefly mentioned in the ethnographies as having also been cooked in earth ovens, (Teit 1900, 1906; Turner and Kennedy 1980) but not with much detail. Meat, fish and fowl could require anywhere from a few hours to a few days (‘Ksan 1980; Turner et al. 1980).

**Descriptions of Modern Earth Ovens**

The investigations on the modern earth ovens were conducted in two parts. The first part was in the fall of 2003 and the second part was in the spring of 2004. The project involved the excavation and subsequent analysis of the matrix and formation processes of four modern era earth ovens which were used by members of the Cayoosh and Seton Portage Band. Three of the pits were excavated months to years after the pits were used and abandoned while one pit was excavated, used, and closed while the author and another investigator, Sierra Mandelko, were present and taking part in the process.
The Fred Shields Pit

The Fred Shields Pit was excavated and studied over a period of three days, from October 4th, 2003 to October 6th, 2003. Fred Shields positioned his pit to the east of his house. He excavated a square pit with straight walls and a flat bottom. The dimensions were 1.35 meters north to south and 1.44 meters east to west. The maximum depth of the pit was 50 centimeters. As the pit was excavated, the back dirt was placed to the east of the pit. After fully excavating the pit, a thick layer of paper was placed along the bottom of the pit. On top of the paper was placed split kindling sized pieces of wood, identified as Ponderosa pine. Larger, chunky pieces of wood were placed on top of the split kindling. Big river cobbles had been collected beforehand, and a 30 centimeter thick layer of cobbles were placed on top of the chunky wood layer. It should be mentioned here that the cobbles had been used before for earth ovens and were saved and located in a small pile near the house when not in use. More large, chunky pieces of wood were placed on top of the rocks. This final layer of wood was placed all the way until it was level with the ground surface of the pit. This whole process with modern shovels took approximately 1.5 hours with one man doing the job. A fire was started in the pit with a propane torch at about 11:00 A.M on October 5th. Throughout the afternoon into late evening, more fuel was added to the fire until the rocks became glowing red. At 7:00 PM on the same day, a grill was placed over the hot rocks, which by this time had fallen somewhat due to the paper and kindling below them burning down. Deer meat wrapped in aluminum foil with garlic, potatoes, and carrots was placed on the grill over the red hot rocks. The backdirt which had been placed to the east of the pit was shoveled back into the pit until it was level with the ground surface. A second fire was built on top of the
newly filled pit to further speed the cooking process. The pit was opened again at 6:00 AM the following morning, October 6th, 2003. There were some large coals still on top of the pit from the fire built the night before. These coals along with some large pieces of wood charcoal were placed on the east side of the pit. The soil and ashes was again shoveled out and redeposited along the east side of the pit. The meat was removed and the grill was removed and placed along the west side of the pit. The river cobbles were left in the bottom so that they could cool. On October 10th, after excavating two other pits, the author and Mandelko returned to the Shields' residence to remove the river cobbles. This was done at the direction of Fred Shields who stated that he wanted to reuse the stones. The stones were placed to the east side of the pit. Photographs, maps, and soil samples were taken. The backdirt was once again pushed back into the pit and refilled until the pit fill was level with the ground surface.

The Seton Portage School Pit

The Seton Portage pit was constructed at the school for a class that taught traditional food preparation methods. This pit is the only one in the sample that was used twice. The pit is located on the east side of the ball field in the old long jump pit, which was filled with sand. The pit was originally excavated with a length of 1.20 meters, a width of .60 meters, and a depth of .60 meters. A fire was built on the west side of the pit to heat the rocks which would line the bottom of the pit. Another fire was built within the base of the pit to dry out the soil. The fire in the pit was allowed to burn down to coals and then the coals were spread out in an even layer along the bottom. The rocks, once they had become red hot, were moved to the bottom of the pit, on top of the coals. A
small plastic pipe, about three feet long, was placed in the corner of the pit. A thick layer of wet cedar boughs and pine needles was placed on top of the heated rocks. Deer meat with potatoes, onions and carrots in the chest cavity was placed on top of the cedar boughs and pine needles. Another layer of cedar boughs and pine needles, twice as thick as the one beneath the deer meat, was placed on top of the deer meat. A blanket was placed over the top of the final cedar layer. The sand from excavating the pit was used to refill the pit, making sure that the plastic pipe was sticking out the top of the sand. Four liters of water was poured down the pipe into the pit. The pipe was then pulled and the hole was sealed. The pit was allowed to sit for 24 hours. After the 24 hours had passed the pit was opened. The sand layer, the double thick layer of cedar boughs and pine needles was removed and placed to the side of the pit. The meat was removed and consumed. The bones were discarded somewhere else and the pit was refilled with the sand and vegetation layers until the fill was even with the surrounding ground surface. This whole process was executed a second time with the only varying detail being that on the second use of the pit, the blanket was not placed on top of the vegetative matting before the sand was shoveled back on top of the pit. As a result of this step being left out the second time the pit was used, the deer meat was very sandy and hard to eat.

Sierra Mandelko and I arrived at the school to excavate the pit on October 10th, 2003. It rained steadily the entire day and time was short. With the weather and the time factor taken into account, it was determined that at the time, the most important aspect of the project to focus on was the nature of the fill itself. As such, rather than excavating units, we decided to treat the pit as a feature and to bisect it. The west half of the pit was excavated. The soil was removed in ten centimeter increments in natural layers. No soil
was screened as this was a modern pit. Photos were taken with special attention being placed on fire reddening. Plan views and profiles were drawn. Soil samples were taken with the sizes of the sample varying. The soil samples were processed through a series of nested screens using manual bucket flotation at the lab at Simon Fraser University. Sediments were divided into light and heavy fraction and allowed to dry on drying racks. The dried light fraction samples were weighed and screened through a series of stacked sieves: 4.00 mm, 2.00mm, 1 00mm, 425 microns, 500 microns, and a catch pan at the bottom. All fractions were sorted for seeds, needles, buds, and cones.

The Tyax-Relay Pit

The Tyax-Relay pit is located at the confluence of the Tyax and Relay rivers. The pit was constructed by two elders, Kenny and Albert (K and A), for the purpose of cooking for and feeding several young Band members of the Seton Portage Band eight years ago. The pit was originally excavated to a depth of approximately three feet. The average diameter was approximately three and a half feet around. The pit was excavated to be basin shaped with a relatively flat bottom. The pit was placed close to the rivers according to K and A so that the moist sandy soil would add moisture to create steam. After the initial excavation, flat river cobbles, which had been heated in a fire along the edge of the pit until they were red hot, were placed along the bottom of the pit to reflect the heat. Thimbleberry leaves were placed in a thick layer along the top of the rocks and coals. Next, a whole deer with carrots, potatoes, and onions in a bag were placed on top of the thimbleberry leaves. A second layer of thimbleberry leaves was placed on top of the meat, followed by a wet blanket. The whole thing was covered with the soil dug out
of the pit until the soil was level with the ground surface. A large fire was built on top of the fill and allowed to burn for 24 hours. After 24 hours, the pit was excavated, the meat was removed and consumed, all the trash was thrown in the pit and the fill was yet again used to refill the pit.

Sierra and I arrived at the site, guided by K and A, on October 8th, 2003. It rained hard the entire time we were there. As we had focused on the nature of the fill at the Seton School pit, this pit we decided to focus more on the nature of the fill compared to the surrounding, undisturbed ground surface the pit is in. Because of this, we decided to dig this pit as part of a one meter by one meter unit. The western half of the pit was located in the southeastern corner of the unit. The soil was removed in ten centimeter increments in natural layers. No soil was screened as this was a modern pit. Photos were taken with special attention being placed on fire reddening. Plan views and profiles were drawn. Soil samples were taken with the sizes of the sample varying. The soil samples were processed through a series of nested screens using manual bucket flotation at the lab at Simon Fraser University. Sediments were divided into light and heavy fraction and allowed to dry on drying racks. The dried light fraction samples were weighed and screened through a series of stacked sieves: 4.00 mm, 2.00mm, 1.00mm, 425 microns, 500 microns, and a catch pan at the bottom. All fractions were sorted for seeds, needles, buds, and cones.

The Cayoose Pit

The Cayoosh pit was prepared for the purpose of feeding a large amount of people for the Cayoosh gathering. This was the largest pit we excavated. The original
dimensions were disputed by informants but from photos it appears to be approximately five feet long and three feet wide with a depth of two and a half feet. The process of the initial excavation and food preparation were as follows. The pit was excavated. A clay and sand layer was spread along the bottom of the pit. Vesicular basalt, a volcanic rock, had been gathered for weeks from the high country and the river bottoms by people in the Cayoosh Band. These rocks are highly prized because they hold heat longer and can be reused more times than river cobbles, which are much more prone to cracking and shattering. A large, thick layer of the volcanic rocks were placed along the base of the pit, on top of the sand and clay layer. A large, hot fire was built on top of the rocks and allowed to burn down to coals, with the fire being occasionally restoked. Once the rocks were glowing red hot, the fire was allowed to burn down to coals. Some of the rocks were removed and put aside. Damp burdock leaves and rye grass were placed on top of the glowing red rocks. Marie Barney (MB) stated that these particular plants were chosen for vegetative matting because neither would impart any sort of flavor to the meat. Deer meat was placed on top of the vegetative matting and then a second, thicker layer of burdock leaves and rye grass was placed on top of the deer meat. The heated volcanic rocks put to the side were placed on top of the second vegetative layer. Two blankets, one wool and one canvas, were placed on top of the second vegetative layer. MB stated that both of the blankets singed and a weird flavor was imparted to the meat. The whole thing was covered with the soil excavated from the pit until it was level with the ground surface and allowed to cook for six to seven hours. After this time, the soil and the second vegetative layer was removed. The meat closest to the heat was switched with the meat farthest from the heat, the subsequent layers were replaced, and the whole thing was allowed to cook
for six to seven more hours. The pit was then reopened and the meat was removed and consumed. Once the rocks cooled, the majority were removed and placed to the south of the pit, for the purpose of reusing them at some future date. The pit was then filled back in.

Sierra Mandelko, Jake Foss, and I arrived at the site of the pit on May 14th, 2004. The pit was 5 years old and we were having a hard time locating the pit as there was no real sign if a depression on the ground surface. However, since there was a large quantity of vesicular basalt (volcanic rock) located at the southeastern portion of the property line, we concluded that the volcanic rocks most likely marked the edge of the pit. Some of the rocks were quite large and heavy and we all agreed that the rocks would not have been hauled far from where they were removed. We excavated a shovel test pit in a spot a few meters north of the discarded rock so that we could locate the pit. We encountered a thin layer of volcanic rocks with chunks of charcoal beneath. We put a one by one meter unit in this spot, and later, another one by one meter pit along the north edge of the first test unit. We called the first unit A and the second one B. Both units were excavated in arbitrary ten centimeter levels in natural layers. No soil was screened as this was a modern pit. Photos were taken with special attention being placed on fire reddening. Plan views and profiles were drawn. Soil samples were taken with the sizes of the sample varying. The soil samples were processed through a series of nested screens using manual bucket flotation at the lab at Simon Fraser University. Sediments were divided into light and heavy fraction and allowed to dry on drying racks. The dried light fraction samples were weighed and screened through a series of stacked sieves: 4.00 mm, 2.00mm,
1.00mm, 425 microns, 500 microns, and a catch pan at the bottom. All fractions were sorted for seeds, needles, buds, and cones.

**Archaeological Indicators**

In order to postulate functions of the Bridge River pits, correlations (Binford 1967, 1983) between the characteristics observed in archaeological context and characteristics postulated from the ethnographies were sought. Although different foods were often cooked in earth ovens on the Coast or the Columbia Plateau than on the Interior, at the most basic level of construction, the methods were similar. As such, the signature they leave behind on the landscape, regardless of where they were used and what was used in them, should be easily observed. Earth ovens in general, whether large or small, follow similar patterns. The typical “classic” earth oven on the surface should resemble ovoid or circular depressions, from one to six meters in diameter, with a distinguishable rim encircling the depression. The depth of the basin within the depression should be anywhere from two and a half to four feet deep. Some quantities of charcoal and fire cracked rock may be present on the ground surface. Subsurface excavations should reveal basins which contain varied quantities of flat rocks, river cobbles, or volcanic rock to provide a heating element. Some pits will show evidence of *in situ* burning in the form of a discrete charcoal layer directly beneath the cobbles. Other pits will only have reddening or possibly small amounts of charcoal smears beneath the cobbles layer if the rocks were heated outside of the pit and put in after they had become glowing hot. An ashy layer may be present as well, as well as evidence of thermally altered soil in the form of reddened soil. In some pits, reddening may outline the basin all
the way to the top of the pit. Within the soil matrix, carbonized plant remains that are the remains of vegetative matting and fuel should be present. Birchbark was used to line pits for grease extraction, as well as for wrapping food and keeping it separate from other food items (K'San 1980; Teit 1900, 1909). Birchbark may be present in varying quantities. Other subsistence resources, such as fish or game may also be found in small quantities.

**The Bridge River Pits**

At the Bridge River site, 16 external pit features (EPFs) were tested. Each pit was hand excavated in 50 cm by 50 cm squares. All soil was removed by hand with trowels, bamboo sticks, brushes and dustpans. All sediments were processed through a 1/8\textsuperscript{th} inch screen. All strata were excavated in natural layers in 10 cm increments. One liter soil samples were taken from each natural layer from each EPF. Detailed profile drawings were made from at least two walls in each excavated unit. The profile drawings detailed aspects such as gravels, cobbles, pebbles, charcoal, faunal and botanical remains. General stratigraphic zones were demarcated as well. Radiocarbon samples were collected from the EPFs whenever possible. Rim crest diameter measurements were taken to attempt to put the earth ovens into the pre-existing data base of rim crest diameters.

Faunal remains recovered from EPF sediments were examined for the purpose of taxon identification. Faunal identification research was conducted at Simon Fraser University at the zooarchaeological laboratory. Individual taxon identification was achieved, when possible, by using the comparative collection at the facility. Salmon was
identified by species using the Simon Fraser University Osteology Laboratory x-ray facility.

Botanical remains were analyzed at Simon Fraser University in the paleoethnobotanical laboratory at the direction of Dana Lepofsky. The soil samples taken from the EPF's were used for the botanical analysis. The soil samples were processed through a series of nested screens using manual bucket flotation at the lab at Simon Fraser University. Sediments were divided into light and heavy fraction and allowed to dry on drying racks. The dried light fraction samples were weighed and screened through a series of stacked sieves: 4.00 mm, 2.00mm, 1.00mm, 425 microns, 500 microns, and a catch pan at the bottom. All fractions were sorted for charcoal, burned seeds, needles, buds, plant tissues, and cones. Only a small sample of the plant remains was recovered from the samples, and there is not information for all of the Bridge River pits. All plant materials that were identified were only identified to a family level.

**Statistical Analysis**

The purpose of the statistical analysis is to test the ideas put forth in this study. I will be using principal component analysis with the factor scores being further used in hierarchical clustering to describe the variability within my assemblage. In the factor analysis, I will utilize the varimax rotated solution. I am considering any loadings greater that .4 and eigenvalues of .1 or greater to have a significant relationships.

Hierarchical clustering of the factor scores will in all probability sort the data from the earth ovens into broad functional categories. I am also interested to see whether the hierarchical cluster groups together ovens in the same patterns which I have placed
them in. I have further grouped the earth ovens into two main major groups and two subgroups within the main groups. The two major groups are cache pits and earth ovens. The two subgroups are earth ovens possibly used for meat roasting, and earth ovens for plant processing.

In the factor analysis, I am interested to see the correlations that the program presents. The variables I am using are: measurements of the ovens north to south, measurements of the ovens east to west, rim crest measurements, depth of feature, presence or absence of *in situ* burning, amount and location of oxidation, presence or absence of a stone pavement, thickness of the stone pavement, presence or absence of technological, food, or weed seeds, presence or absence of mammal, fish, or bird bone, and presence or absence of mussel shell.

**Summary**

Chapter three described my methods for creating a frame of reference. Detailed descriptions of earth ovens were discussed. Each oven in the ethnoarchaeological project was described in detail. Correlations between the characteristics in the archaeological context and the ethnographic record were enumerated. The methodology used for the Bridge River earth ovens was discussed. Finally, the methodology and goals for the statistical analysis was laid out
CHAPTER 4
RESULTS FROM ETHNOARCHAEOLOGICAL PITS

In this chapter, the results from the ovens excavated in the course of the ethnoarchaeological project are presented and discussed. Burning patterns, fill matrix, faunal remains, and botanicals are examined with the intent of understanding how these elements create the finished product that becomes an earth oven.

Results from Ethnoarchaeological Pits

The following is a review of the results of the ethnoarchaeological field research conducted during the fall of 2003 and the spring of 2004. Results are from both examinations of the pits themselves in situ in the field and from analysis that was conducted at Simon Fraser University in the spring of 2004.

Burning Patterns

Burning patterns were a point of interest for me because this characteristic of cooking features is not one that is generally closely examined in archaeological investigations, and not at all in the ethnographies. I was curious to see if the burning patterns observed in the ethnoarchaeological pits were similar to those I observed in the pits at Bridge River.
The Fred Shield's Pit

The Fred Shield's pit (Figure 22) had a total of two fires associated with it. There was one fire built to create the coals that the river cobbles were placed upon, and there was a fire built on top of the pit after the final soil layer had been put into place. Obvious visible manifestation of the burning from the fire on top of the pit could be observed on all sides of the pit in the form of reddened, thermally altered soil. This reddened soil was located along all four walls from ground surface to a depth of five centimeters below ground surface. Beneath the reddened layer was further evidence of burning in the form of a thick layer of charcoal, which was all that was left of the large amount of thick chunks of wood which had filled the pit all the way to the ground surface and was placed on top of the substantial river cobble and volcanic rock layer. The cobbles and volcanic rocks showed evidence of significant heat alteration. The rocks were blackened and in some cases cracked from the heat. Beneath the cobbles was a second thick layer of charcoal. This layer of charcoal was what was left of the second layer of thick chunky wood which was beneath the cobbles. Beneath the charcoal layer, the soil was reddened. This represents the coals being in direct contact with the ground surface. The burning patterns were not easily distinguishable until most of the river cobbles were pulled out of the pit and the wall profiles were closely examined.

The Seton Portage School Pit

The Seton Portage School pit was used twice before it was abandoned and, as a result, had four fires associated with it. During both incidences of use, there was a fire built to the east of the pit to heat the cobbles. Also during both incidences, there was a
second fire built in the bottom of the pit for dual purposes of drying the pit out and for creating a layer of coals extend the amount of time the sealed pit would remain hot. No fire was built on top of the sealed pit. Steam was used as third heating element in both instances. Thermal alteration of the soil was evident in the form of a red ring of soil which went from the ground surface all the way down the walls of the pit to the bottom. The stones at the bottom of the pit were blackened and charred and some of the stones were cracked. There was a thick layer of charcoal under the stones which was the remnants of the coal layer.

The Tyax/Relay Pit

The Tyax/Relay pit (Figure 23) had two fires associated with it. One fire was built on the outside of the pit to heat the flat river cobbles that were put into the bottom of the pit and used as a heating element. The second fire was built on top of the pit after it had been sealed closed with soil. Thermally altered soil was evident in the form of a reddened ring of soil along the outside edge of the pit that was visible from the top of the pit, down the walls, all the way to the bottom of the pit. There was more thermally altered soil beneath the stone heating element. There were also charcoal smears from the coals that were used to heat the rocks adhering to the bottom of the stones after they were lifted from the fire and put into the pit. Steam was also a heating element in this pit. The pit itself was excavated at a location about 20 feet from the confluence of the Relay and the Tyax creeks. One informant told us that this was because the soil so close to the water would have a lot of moisture in it and would create steam to further help prepare the deer meat.
The Cayoose Pit

The Cayoose pit (Figure 21) had one fire associated with it. After the substantial amount of volcanic rocks had been spread out on top of the sand layer at the bottom of the pit, a very large fire was built on top and allowed to burn down to coals until the rocks were red hot. Evidence of this fire and the subsequent high heat from the volcanic rocks is manifested in two ways. There is a ring of thermally altered soil in the form of reddening that is visible from halfway from the top of the pit all the way to the bottom of the pit. Under the volcanic rock layer there was also patchy fire reddening as well as large chunks of charcoal.

Fill Matrix

The fill matrix was closely examined. I was curious to see if I could see a dramatic difference in the different layers of pit fill and if there would be some distinct differences between the obviously disturbed layers and the undisturbed layers. The nature of the fill in these pits are unique in that they are excavated, refilled with vegetative and fuel fill, capped with a soil layer, re-excavated, and then the pit is either abandoned open or, in the case of the modern pits, refilled. These various activities leave a quite different feature from simple, shallow hearth features.

All of the ethnoarchaeological pits were different from the Bridge River pits in that they were refilled after use. Once they had been refilled, they were almost indistinguishable from the surrounding landscape. The only visible marker on the ground
was a small depression in the center of each pit where the sediments were sinking slightly.

The nature of the pit fill in all of the ethnoarchaeological pits was very similar. There were three distinct layers. The original, undisturbed ground surface layer surrounding the pits was designated as Stratum I, which in the Bridge River system is described as contemporary ground surface. The pit fill was composed of unconsolidated soil, pebbles, and gravel sized clasts, vegetative matting, unburned fuel, and, in the case of the Tyax/Relay pit, scattered faunal remains. This layer was designated as Stratum VII, Following the Bridge River system, which has designated pit fill as such. The stone pavements were beneath the pit fill and represented the first layer that was in primary context (Schiffer 1987). The stone pavement was either composed of volcanic rocks, river cobbles, or a combination of the two. The rocks showed evidence of burning in the form of reddening or blackening. In some cases, the rocks showed evidence of cracking or shattering. There was evidence of oxidation surrounding the stone pavement in one case as well as small pieces of charcoal. The stone pavement layers were designated as Stratum VII A. The area directly beneath the stone pavement layer was designated as Stratum VII B. This is the area where there was either evidence of in situ burning in the form of a dense charcoal layer and oxidation, or where rocks heated outside the pit were placed on the ground surface at the bottom of the pit. In the case of previously heated rocks, there was some patchy oxidation beneath the rocks and small charcoal smears from the coals that heated the rocks.
Faunal Remains

The only faunal remains encountered were in the Tyax/Relay pit. In this case, after eating the deer, the bones were thrown back into the pit before it was refilled. Both front forelegs were recovered. The preservation was excellent with hide and hair still attached in some places.

Conclusions

Burning Patterns

There were three major findings in terms of burning patterns. The first point I want to make is on soil reddening. Soil reddening occurred directly beneath the fire whether the fire was in the top of the oven, the bottom, or both. The Fred Shields pit had a fire in the bottom of the pit and a fire built on top after it had been covered with the soil layer. The result was reddening on the top of the edges of the pit that extended down to five centimeters and a uniform solid reddening along the bottom of the pit. The soil texture in the reddened areas was slightly more compact and was baked slightly compared to the surrounding soil. The Cayoose and the Seton School pits had fires built in the bottom of the pits. As a result, the bottom of both pits were solid uniform red with baked, hardened surfaces. The reddening extended no more than five centimeters up the side walls of either pit. The Tyax/Relay pit had fire on top and there was reddening along the edges that extended to five centimeters below the surface. The bottom of the Tyax/Relay pit did not have a fire built in the bottom. Stones had been heated on the outside of the pit and placed in the bottom. There was a small amount of reddening in the bottom of the pit. It was mottled with uneven patches of baked soil. These findings led
me to come up with my first proposition, which states that oxidation will occur directly beneath where the heat source came in contact with the ground surface.

Moisture also appeared to have had an effect on the reddening. The Tyax/ Relay and the Seton school pits both had soil reddening in a thick uniform layer all the way from the top edges of the pit down the walls to the base of the basins. The oxidation was not only thick but it was also a very bright red. Both of the pits had a high percentage of moisture in the pits while they were cooking the meat. The Seton school pit had 4 liters of water poured down a tube into the pit before it was sealed up to create steam. The steam from the Tyax/ Relay pit occurred naturally. I was told by one of my informants that the location for the pit was chosen specifically to be in close contact with the Tyax and Relay creeks. The pit was about 30 feet from the water. The informant told me they put the pit there because the sandy soil would have a high percentage of moisture that would create a large amount of steam once the pit was filled. The effect on the soil was very dramatic and led me to come up with the second proposition which states that the use of steam in an earth oven will cause visibly increased oxidation in the soil which will manifest dramatically in the form of brighter color reddening and a greater portion of the basin being oxidized.

The Seton school pit was used twice. As a result, this pit was exposed to more heat. The oxidation was by far the most dramatic in this pit and there was more evidence of baking on the walls and the floors of the pit than the others. Therefore, I propose that the more use a pit receives, the more oxidation of the walls and the floor will manifest. This finding has been noted in another replicative experiment as well (Armstrong 1993).
Soil texture may also have an effect on oxidation. The Tyax/Relay and the Seton school pits had the highest sand content in the matrix, and they had the most pronounced oxidation. Both the Cayoose and the Fred Shields pits had sand in the matrix, but in a much lower percentage.

Another proposition is that stones which were heated outside of the pit and then placed inside after becoming red hot will be hot enough to cause soil oxidation, but on a smaller scale than oxidation from an in situ fire. Also, an in situ fire in primary context (Schiffer 1987) will have a charcoal layer with reddening below the charcoal layer. In terms of activity areas, fires which were used to heat rocks outside of the pit will be located very close to the pit. In some cases with the modern pits, stones, particularly volcanic ones, will be removed from the pit for future reuse. I predict that the rocks pulled out for this purpose will be tossed in an area out of normal foot traffic but still close enough for convenient retrieval.

Conclusions on Fill Matrix

The ethnoarchaeological pits were unique in that each one of the pits was filled back in after it was used. The upland and Bridge River pits were all left open after the last use. No doubt this was in preparation for the next use. The excavation of the basin of the oven in the initial creation would have been a lot of work and it would not have been practical to fill the pits back in and then re-excavate if they are to be used again. The stratigraphy designations were assigned as extensions of the stratigraphy designations assigned at the Keatley Creek site and the Bridge River site. Stratum VII is unconsolidated pit fill. The fill consists of a large number of chunks of FCR in various sizes, remnants of vegetative
matting, and chunks of charcoal in varying sizes. This layer made up the majority of the fill in the modern pits. The layer beneath Stratum VII was designated as Stratum VII A. This is the stone pavement layer. In some cases, there might be remnants of the bottom layer of the vegetative matting. This may show up in prehistoric pits in the form of a thin, dark, organic soil layer directly above the stone pavement layer. It is my contention that if there is a stone pavement layer intact in the pit with a thin organic layer directly above that can be easily distinguished from the ground surface, this organic layer is most likely in primary context (Schiffer 1987). The stone pavement may be anywhere from five to 30 centimeters. There may be pieces of charcoal directly above and among the stone pavement layer. As discussed above, if \textit{in situ} was used and the fill is in primary context, then there will be a charcoal layer beneath the stone pavement with reddening beneath the charcoal layer. The reddened soil will be charred, baked, burned, or a combination of these. If there was no \textit{in situ} burning, there will be reddening, but on a smaller scale. In some cases, like the Cayoose pit (Figure 21), the stone pavement was removed so the stones could be used again. Even with the stones removed, there was enough oxidation and charcoal in the shape of a basin which would make it evident that the feature encountered was an earth oven. In the case of the Tyax/Relay pit (Figure 23) where there was no \textit{in situ} fire, there was still enough reddening in the bottom of the pit which made the basin shape evident.

The stone pavement provided me with some insights on cooking times for meat, something which is not covered in the ethnographies. One deer in an earth oven with average diameter of 1.4 meters, an average depth of 60 centimeters, and an average stone pavement thickness of 12 centimeters will take about 24 hours to cook. One deer in an
earth oven with an average diameter of 1.8 meters, an average depth of 50 centimeters and stone pavement depth of 30 centimeters will take approximately 11 hours to cook. A pit with an average diameter of 4.5 meters, an average depth of 50 centimeters and a stone pavement depth of 30 centimeters will cook two deer in approximately 13 hours.

Conclusions on Faunal Remains

The only faunal remains recovered from the modern pits were from the Tyax/Relay pit (Figure 23). Both left and right metacarpals of the deer were recovered from the fill. This is a big difference from the prehistoric pits. Generally, the bones found in features on the Interior are heavily fragmented from grease extraction (Kusmer 2000). Modern people in this area don’t break up the bones to extract grease, as they can get it from other sources.

Conclusions on Botanicals

The botanicals are identified in detail in the next chapter. In this section, I will be discussing the context of the botanicals. Analysis of botanicals is confusing in that it is often difficult to determine which food or technological plants, or which were weedy intrusives. One of the benefits of doing ethnoarchaeology is that before analyzing or even excavating these pits, I knew every intentional plant for food or technology that went into the pit. Therefore, anything else was incidental.

I elected to take soil samples from both the fill layer (VII) and the stone pavement/charcoal layers (VII A/ VII B). Stratums VII A and VII B were grouped together for purposes of time. I was interested to see which seeds would be charred (in
context) and which would be uncharred (incidental). I hypothesized that the majority of the uncharred seeds would be in the unconsolidated fill, Stratum VII. I also hypothesized that the majority of the charred seeds would be found in Stratum VII A and VII B. Another issue I wanted to address was the problem with *Chenopodium* sp. seeds. *Chenopodium* sp. has always been something of a mystery in botanical assemblages on the Interior. It generally makes up a very high percentage of the seed assemblages. The seeds are found in every context, whether it's rim, floor, roof, or cooking features. In historic times, it was boiled and eaten as a green (Turner 1997). It is also thought to be a weedy intrusive.

There are a few scenarios for introduction of *Chenopodium* sp. seeds. The seeds could be introduced by seed rain (Pearsall 2001). The *Chenopodium* sp. plants could be growing naturally in abundance around the perimeter of the pit or structure. Another scenario is that the seeds could be introduced accidentally with grasses. In the case of the earth ovens, grasses are listed as one of the plants used for vegetative matting (Dawson 1891; Teit 1900; Turner 1997). Lepofsky (2000) noted that her editor had gathered grasses from his garden and had seen literally hundreds of *Chenopodium* sp. seeds among the grasses.

As Table 1 shows, the modern pits had the majority of the uncharred seeds in the Stratum VII layer. The majority of the charred seeds were located in the VII A/B layer. There was a small percentage of charred seeds in the Stratum VII and a small percentage of uncharred seeds in the Stratum VII A/B layers. As these pits were excavated, filled, re-excavated, and refilled, there was bound to be some mixing. There are periods of time when the fill is on the outside of the pit, and there are periods of time when the pit is also
left open to the elements. Either instance could result in incidentals finding their way into the context.

The *Chenopodium* sp. seeds showed up, both charred and uncharred, in all fill layers in all pits. I know without a doubt that *Chenopodium* sp. was not used as a food item, nor was it used as a technological plant. Yet it made up a large percentage of the seed assemblage. I believe that the fact that these seeds do show up in such numbers in all of the pits tested goes a long way in furthering the theory that the ubiquity of *Chenopodium* sp. in all contexts in the record is most likely the result of an intrusive presence rather than evidence of processing this plant for food.

**Summary**

The ethnoarchaeological results were enormously informative. Investigations on the burning patterns, fill matrix, faunal, and botanical remains all provided enough data to extrapolate a number of propositions. The investigations into the burning patterns has facilitated in uncovering relationships between soil texture and moisture content, stone choices for stone pavements, and oxidation patterns. The investigation on the fill matrixes has allowed me to further identify separate layers of stratigraphy in the earth oven fill which has been previously unidentified. The faunal remains were scarcer in the modern ovens than the prehistoric ovens. I was able to determine that this was due in part to different discard methods being practiced in the modern era. The bones recovered from the modern oven were intact with no evidence of heavy fracturing or breakage. This is due to the fact that modern peoples are not practicing traditional grease extraction methods to the same extent that their ancestors were. The botanical analysis was
particularly rewarding in that I was able to ascertain exactly what plant remains recovered were used for food, for technology, and which plant remains were incidental. One question in particular I was anxious to address was whether or not *Chenopodium sp.* would show up in the matrix in the ethnoarchaeological ovens. I was able to determine that the ubiquity of the seeds in all of the samples recovered from the ethnoarchaeological ovens could be explained as weedy intrusives.

Finally, the combination of all of these factors has provided me with a template that can be used, with great accuracy, to determine that processes incorporated into the construction, use, and abandonment of an earth oven. The results of the ethnoarchaeological study are exciting and have proved that ethnoarchaeology and replicative experimentation are valuable tools for the study and interpretation of prehistoric activities.
CHAPTER 5
RESULTS FROM BRIDGE RIVER PITS

In this chapter, results from the analysis of the Bridge River earth ovens are presented. As in the previous chapter, burning patterns, fill matrix, faunal remains, and botanicals are examined and discussed. The possible functions of the ovens are discussed. The results of the statistical analysis are presented in this chapter as well. This project continued the excavation units used at both the Keatley Creek site and the Bridge River site. The excavation units consisted of 2x2 squares. Each square was excavated in 50 x 50 centimeter subsquares, numbered 1-16.

**EPF 1 (Square A Subsquare 9)**

Subsquare 9 was located in the south central portion of the EPF. The Subsquare was excavated in three natural strata to a maximum depth of 46 cm below datum. The measurement from rim crest to rim crest is 4.5 meters. EPF 1 has an uncorrected date of 152+/- 34 BP, and a calibrated mean date of AD 1750.

**Fill Matrix and Burning Patterns**

EPF 1 (Figures 4 and 5) contained a Stratum I (surface) layer, a Stratum VIIA (stone pavement) layer, and a Stratum VIIB (charcoal) layer. The stone pavement (Stratum VIIA) was 10 cm thick. The charcoal layer under the rocks is indicative of
situ burning. Directly beneath the rocks is a thin ashy lense, which is indicative of a hot fire. There was oxidation below VIIB, which extended along the bottom of the basin, 26 cm up the southern edge of the pit, which might be suggestive a possible fire built on top as well.

Faunal Remains

Two small pieces of mussel shell were recovered from the basin of the pit as well as six pieces of mammal bones. The two shell fragments were calcined, as was one of the pieces of bone, which is indicative of a hot fire. The other five pieces of bone showed evidence of weathering but no burning.

EPF 2 (Square A Subsquare 8)

Subsquare 8 was located in the center of the EPF. The subsquare was excavated in four natural strata to a maximum depth of 54 cm. The measurement from rim crest to rim crest is 2.4 meters. EPF 2 has an uncorrected date of 310 +/- 40 BP, and a calibrated mean date of AD 1568.

Fill Matrix and Burning Patterns

EPF 2 (Figure 6) contained a Stratum I, a Stratum VIIA, a Stratum VIIB, and a Stratum III. EPF 2 is located within the rim of Housepit 14. The stone pavement layer was less than 10 centimeters thick not easily defined, which may be indicative of scavenging the pavement after use. There was a large amount of charcoal, which is suggestive of in situ burning. Oxidation is evident beneath the charcoal layer.
Faunal Remains

Two small pieces of calcined mammal bones were found within the basin of the EPF.

**EPF 3 (Square A Subsquare 9)**

Subsquare 9 was located in the western portion of the rim of the EPF. It was excavated in two natural strata to a maximum depth of 42 centimeters and extended into the rim of nearby Housepit 20. The rim crest measurement is 3.6 meters. EPF 3 has an uncalibrated date of 260 +/- 40 BP, and a calibrated mean date of AD 1645.

**Fill Matrix and Burning Patterns**

EPF 3 (Figure 7) contained a Stratum VII, a Stratum VIIA, and a Stratum VIIB, which is described as a charcoal layer. The stone pavement layer was less than 10 centimeters. Birchbark pieces were found scattered in the stone pavement layer. There was a thin layer of charcoal beneath the stone pavement, which is indicative of *in situ* burning. There was a large amount of oxidation beneath the charcoal layer.

Faunal Remains

There were five small pieces of calcined mammal bones within the basin of the EPF.

**EPF 4 (Square A Subsquare 9)**

Subsquare 9 was located in the south central portion of the EPF. It was excavated in four natural strata to a maximum depth of 60 centimeters and extended into the rim of
a nearby housepit. The rim crest measurement is 3.4 meters. The date for EPF 4 is uncalibrated 1219 +/-38 BP, and calibrated at a mean date of AD 792.

Fill Matrix and Burning Patterns

EPF 4 (Figure 8) contained a Stratum VI, a very ephemeral Stratum VIIA, a thin Stratum VIIB, and a Stratum III. Stratum III represents the rim of a nearby Housepit. The stone pavement layer was less than 10 centimeters. There was a thin layer of charcoal beneath the stone pavement, which is indicative of in situ burning. No oxidation was noted below the stone pavement or charcoal layer.

Faunal Remains

There were ten pieces of calcined mammal bones found in the basin of the EPF. Calcined bones are indicative of high heat.

EPF 5 (Square A Subsquare 4)

Subsquare 4 was located in the central portion of the EPF. It was excavated in two natural strata to a maximum depth of 45 centimeters that extended into the rim of Housepit 20. The rim crest measurement is 2.5 meters. No date is available for EPF 5 because there was no charcoal layer.

Fill Matrix and Burning Patterns

EPF 5 (Figure 9) contained a Stratum I, and a Stratum III, which is Housepit 20’s rim layer. Fire cracked rock was scattered throughout both layers, but not in any
discernable pattern. Flecks of charcoal were also noted throughout both layers, but again, not in any discernable pattern. There was no evidence of fire reddening.

Faunal Remains

No faunal remains were located within the basin of the pit.

EPF 6 (Square A Subsquare 13)

Subsquare 6 was located in the central portion of the EPF. It was excavated in two natural strata to a maximum depth 45 centimeters that extended into the rim sediments of nearby Housepit 59. The rim crest measurement is 3.25 meters. No date is available for the pit as there was no charcoal layer for sampling.

Fill Matrix and Burning Patterns

EPF 6 (Figure 10) contained a Stratum I, and a Stratum III, which Housepit 59’s rim layer. Fire cracked rock was scattered throughout both layers, but not in any discernable pattern. Flecks of charcoal were also noted throughout both layers, but again, not in any discernable pattern. There was no evidence of fire reddening.

Faunal Remains

No faunal remains were located within the basin of the pit.
EPF 7 (Square A Subsquares 8 & 9)

Subsquares 8 and 9 were located in the central portion of the EPF. They were excavated in four natural strata to a maximum depth of 30 centimeters that extended into the rim of Housepit 61. The rim crest measurement is 4.1 meters. The date for EPF 7 is uncalibrated 360 +/- 45 BP, and calibrated at a mean date of AD 1543.

Fill Matrix and Burning Patterns

The EPF (Figure 11) contained a Stratum VII, a very well defined Stratum VIIA, a distinct Stratum VIIB, and a Stratum III, which is a rim layer from nearby Housepit 61. The stone pavement was 14 centimeters thick. There was a large amount of charcoal beneath the stone pavement, indicative of in situ burning. There was evidence of soil oxidation directly beneath the stone pavement layer. Three pieces of metal were found on top of the stone pavement layer.

Faunal Remains

Two pieces of mammal bones were found in this pit, both slightly charred, were recovered from the top of the stone pavement layer.

EPF 8 (Square A Subsquare 2)

Subsquare 2 was located in the central portion of the EPF. It was excavated in three natural strata to a maximum depth of 26 centimeters below datum that extended into the rim of one of three nearby housepits. The rim crest measurement is 3.8 meters. The date for EPF 8 is uncalibrated 220 +/- 35 BP, and calibrated at a mean date of AD 1770.
Fill Matrix and Burning Patterns

The EPF (Figure 12) contained a Stratum I, distinctive Stratum VIIA, a thin Stratum VIIB, and a Stratum III. The stone pavement layer was 10 centimeters thick. There was a slim charcoal layer beneath the stone pavement with evidence of oxidation beneath the charcoal layer.

Faunal Remains

There were no faunal remains recovered from this EPF.

EPF 9 (Square A Subsquare 14)

Subsquare 14 was located in the central portion of the EPF. It was excavated in two natural strata to a maximum depth of 40 centimeters below datum. The rim crest measurement is 3.0 meters. The date for EPF 9 is uncalibrated 1194 +/- 36 BP and calibrated at a mean date of AD 834.

Fill Matrix and Burning Patterns

EPF 9 (Figure 13) contained The EPF contained a Stratum I, an ephemeral Stratum VIIA, and a thin Stratum VIIB. The stone pavement was less than 10 centimeters and the stones were reddened. The charcoal beneath the cobbles was thin and there was fire reddening around the stone pavement and beneath the charcoal layer.

Faunal Remains

Three pieces of calcined mammal bones were located in the basin of the EPF.
EPF 10 (Square A Subsquare 16)

Subsquare 16 was excavated in three natural strata to a maximum depth of 44 cm below datum. The rim crest measurement is 4.1 meters. The date for EPF 10 is uncalibrated 206 +/- 33 BP, and calibrated at a mean date of AD 1770.

Fill Matrix and Burning Patterns

The EPF (Figure 14) contained a Stratum I, a distinctive Stratum VIIA, a thin Stratum VIIB, and a Stratum III, which is the rim layer of nearby Housepit 55. The stone pavement is 10 centimeters thick. The stone pavement layer was placed on top of Stratum III. There is a thin layer of charcoal beneath the stone pavement. No fire reddening was noted beneath the charcoal layer.

Faunal Remains

There were 10 pieces of burned mammal bones recovered from the basin of the EPF.

EPF 11 (Square A Subsquare 7)

Subsquare 7 was excavated in two natural strata to a maximum depth of 45 cm below datum. The rim crest measurement is 2.3 meters. No date is available for EPF 11 due to the fact that there was no discrete charcoal layer to collect a sample from.
Fill Matrix and Burning Patterns

The EPF (Figure 15) contained a Stratum I, and a Stratum III, which is a rim layer, most likely from Housepit 59. Pieces of FCR were scattered throughout both layers but there was no stone pavement. Although charcoal was noted as being scattered throughout the layers, there was no discrete charcoal layer. There was no evidence of oxidation of the soil.

Faunal Remains

Two pieces of calcined mammal bones were located within the basin of the pit.

**EPF 12 (Square A Subsquare 4)**

The Subsquare was excavated in three natural strata to a maximum depth of 45 cm below datum. The rim crest measurement is 3.3 meters. The date for EPF 12 is uncalibrated 1221 +/- 48 BP, and calibrated at a mean date of AD 792.

Fill Matrix and Burning Patterns

The EPF (Figure 16) contained a Stratum I, a distinctive Stratum VII, and a Stratum III, which is a rim layer from nearby Housepit 59. There is no distinctive stone pavement layer (Stratum VIIA), and neither is there a distinctive charcoal layer (Stratum VIIB). The basin of the pit is clearly demarcated from the surrounding fill as it is much darker and charcoal stained. There is no evidence of in situ burning or oxidation of the soil.
Faunal Remains

There were six mammal bones, slightly charred, that were recovered from the basin of the pit. 2

EPF 13 (Square A Subsquare 7)

The Subsquare was excavated in five natural strata to a maximum depth of 50 cm below datum. The rim crest measurement is 5.1 meters. The date for EPF 13 is uncalibrated 93 +/- 93 BP, and calibrated at a mean date of AD 1870.

Fill Matrix and Burning Patterns

The EPF (Figure 17) contained a Stratum I, two separate layers of Stratum VII, and a cleaned out Stratum VII A layer, filled with dark, charcoal stained soil with evidence of reddening beneath the basin. There is evidence of a possible second basin beneath the first with a large amount of fire reddening and charcoal. A third layer of Stratum VII was located directly beneath the second possible basin. There was a layer of Stratum III located beneath the final Stratum VII layer.

Faunal Remains

EPF 13 had by far the largest amount of faunal remains associated with it. The remains have been identified as two year old *Oncorhynchus gorbuscha* (pink salmon), three year old *Oncorhynchus kisutch* or *keta* (coho or chum salmon), a large amount of unidentified mammal bones, and a distal end and shaft of an Aves coracoid with evidence of cut marks.
Subsquare 10 was excavated in three natural strata to a maximum depth of 45 cm below datum. The rim crest measurement is 3.3 meters. No date is available for this EPF due to the fact that there was no discrete charcoal layer to collect a sample from.

**Fill Matrix and Burning Patterns**

The EPF (Figure 18) contained a Stratum I, a Stratum VII, a thin stone pavement layer, an extremely ephemeral Stratum VIIB, and a Stratum III, which is described as a rim layer from nearby Housepit 69. There is no definable stone pavement layer. At the very base of Stratum VII, and the very top of Stratum III, there is an ephemeral basin with evidence of a very thin charcoal layer with a scant amount of oxidation underneath the charcoal.

**Faunal Remains**

There was one weathered mammal bone recovered from the basin.

Subsquare 15 was excavated in four natural strata to a maximum depth of 32 cm below datum with the bottom of the basin of the EPF extending into the rim sediment of nearby Housepit 28. The rim crest measurement is 6.3 meters. The date for EPF 15 is uncalibrated 196 +/- 31 BP, and calibrated at a mean date of AD 1770.
Fill Matrix and Burning Patterns

The EPF (Figure 19) contained a Stratum I, a distinctive Stratum VIIA, a thin Stratum VIIB, and a Stratum III, which is the rim layer of nearby Housepit 55. The stone pavement layer was 10 centimeters thick. Stratum VIIB consisted of a very thin layer of charcoal. There was a large amount of soil reddening under the charcoal layer which extended into the topmost level of Stratum III. The reddened portion was described as “baked”.

Faunal Remains

There were two mammal bone fragments found in the basin of the EPF. One bone was weathered and one was burned.

EPF 16 (Square A Subsquare 15)

The Subsquare was excavated in four natural strata to a maximum depth of 67 cm below datum with the EPF extending into the rim sediments of nearby Housepit 29. The rim crest measurement is 7.3 meters. The date for EPF 16 is uncalibrated 128 +/- 31 BP, and calibrated at a mean date of AD 1848.

Fill Matrix and Burning Patterns

The EPF (Figure 20) contained a Stratum I, distinctive Stratum VIIA, a thin Stratum VIIB, and a Stratum III, which is the rim layer of nearby Housepit 55. The stone pavement layer was 10 centimeters thick. There was a significant amount of charcoal,
both directly above the stone pavement layer and below it. There was a large amount of
ash below the charcoal layer as well as a large amount of fire reddening.

Faunal Remains

There were three burned mammal bones and six weathered mammal bones found
in the basin of the EPF.

Botanicals

The following is an inventory of the plant remains recovered from the samples in
the prehistoric earth ovens at Bridge River (Table 1) and the modern earth ovens from the
ethnoarchaeology project. A total of 12 plant families represented in the form of needles,
tissues, seeds, buds, and additional plant parts. The inventory is organized by family, and
when possible, genus and species. All categories of the macrobotanicals are described in
terms of ubiquity, number present, seasonality, range, and ethnobotanical uses, when
possible.

Conifers

Pinaceae (Pine Family)

Picea (Spruce) Both Interior and Coastal peoples used Spruce wood for fishing
implements, and constructing weaponry. The roots of the spruce were used to make
seams and rims of birch bark and other types of baskets. Large sheets of spruce were
formed and sew into water tight cooking baskets. Trays for gathering and processing
berries were made from spruce bark, as were summer lodges, and roofs. Branches were
sometimes used for bedding. Spruce needles were boiled and used for medicinal purposes (Turner 1988, 1998). *Picea* needles were recovered from EPF 12.

*Pinus ponderosa* (Ponderosa pine)

Pine needles were recovered in abundance in the Seton Portage School pit. Traditionally, Ponderosa pine needles were used to like cooking pits and cache pits. Ponderosa pine needles were also used as floor coverings, for bedding, and for tinder (Turner 1988, 1998).

*Pseudotsunga menzieii* (Douglas-fir)

Douglas fir was used for fuel in the Cayoosh pit. People of the Interior used the Douglas fir in numerous ways. The wood burned very hot and had little smoke. All manner of fishing implements were made with the wood. The branches were used to make bedding, covering for floors, and as mats for processing meats and berries (Turner 1988, 1998).

**Conifer bud**

Charred conifer buds were recovered from the Seton Portage School pit. They most likely belong to *Thuja plicata*, or Western Red-cedar. This particular earth oven had cedar boughs for vegetative matting.

**Unidentified needles**

There were unidentified needles in the Cayoosh pit, the Tyax/ Relay pit, and EPF 3. Needles were used for floor coverings and for lining cooking pits, as noted above. They were also used in cache pits to keep away rodents and insects (Romanoff 1992).
Monocots

Poaceae (Grass family)

Charred, unidentified grass seeds were recovered from EPF's 2, 3, 4, the Seton Portage school pit, and the Cayoosh pit. Interior peoples used grasses for a multitude of household tasks. In terms of food preparation, grasses were used to line earth ovens used for steaming pits, and as mats for drying cooked, mashed berries. Grasses were used to line cache pits. The grass provided ventilation so the food would not mildew. Grasses were used to make baskets which held foods. The baskets could be made watertight and placed in a pit for the purpose of providing a vessel to boil foods for soups, stews, and for rendering fat from bones. Grasses were also used to tie roots and bulbs together for steaming (Bouchard and Kennedy 1975a; Turner et al. 1990; Turner 1998).

Dicots

Asteraceae (Aster family)

Artimesia

One charred Artemisia seed was recovered from the charcoal layer in EPF 3. Interior peoples used Sagebrush (Artemisia tridentate), Pasture Wormwood (Artemisia Frigida), Dragon Sagewort (Artemisia dracunculusi), and Western Mugwort (Artemisia ludoviciana). All of the Artemisia species were sought after because of the aromatic smell, as well as the ability of the plant to be an insect repellant. Smoke from burning the plant is an insect repellant. Whole branches placed under bedding could also repel insects. Branches with the leaves attached were used to make salmon spreaders for drying and storing salmon. The branches repelled flies from landing on the fish as it was drying and laying eggs and also kept insects out of cache pits. Artemisia was also considered to
be an important source of fuel because it burns easily and is plentiful on the landscape (Turner 1998).

*Taraxacum officinal* (Dandelion).

One uncharred Dandelion seed was found in the stone pavement layer in the Seton Portage School pit. This plant is an introduced species from Europe. During the historic period, the greens were boiled and eaten (Turner 1998). This seed has been interpreted as a weedy intrusive as there was no mention of Dandelion being used in any part of the creation and use of the pit.

**Brassicaceae (Mustard Family)**

Charred Brassicaceae seeds were recovered from the fill of EPF’s 10 and 13. Traditionally, Brassicaceae was valued as medicine for treatment of a variety of ailments (Turner et al. 1990).

**Caryophyllaceae (Pink family)**

*Silene*

Uncharred *Silene* seeds were recovered from EPF 8, and charred seeds were recovered from EPF 12. Traditionally, *Silene* was used as a good luck charm (Turner 1990). The uncharred seeds are likely a weedy intrusive.

**Chenopodiaceae (Goosefoot family)**

*Chenopodium album* and *Chenopodium* sp. (lamb’s quarters).

Chenopods are the most common seed recovered from the Bridge River site. The seeds are found, either charred or uncharred, in a large percentage of the samples. It is likely that the uncharred seeds are the introduced species, *Chenopodium album*, which is described as a weedy herbaceous annual (Lyons 2003; Parish and Lloyd 1996). The
charred seeds could represent the smaller native form of *Chenopodium*, which are described in the same way as the introduced species. The introduced species in historic times were boiled and eaten as greens by Interior people (Turner 1997). In two of the modern pits, *Chenopodium* seeds were found in both charred and uncharred forms. None of the informants who described the process of creation and use of the pits mentioned using *Chenopodium*. Therefore, it is my assertion that the *Chenopodium* seeds recovered from the modern pits are definitely intrusive, and that the *Chenopodium* seeds recovered from the prehistoric pits were most likely intrusive as well.

**Ericaceae (Heather family)**

Ericaceae seeds were recovered from EPF’s 1, 2, 3, 4, 7, 12, and 13. In two of the pits in particular, there are very high numbers of Ericaceae seeds. All of the seeds were identified to family, so I am only able to speculate on the species. The most likely species represented are *Arctostaphylos uva-ursi*, (kinnikinnick berries), or some species of *Vaccinium*, like blueberries (*Vaccinium alaskaense, V. caespitosum, V. membranaceum, V. ovalifolium*) or huckleberries (*V. ovatum, V. parvifolium*). I am considering these to be likely because both species are common and widely harvested and processed by Interior peoples. Kinnikinnick berries were too dry to be eaten alone, so Interior peoples employed various cooking methods to make the berries more palatable. The berries were fried in bear fat or salmon oil. People cooked them in soups, or boiled or baked them with deer, moose, or salmon meat. These berries were available throughout the winter (Turner 1997). *Vaccinium* berries were either eaten fresh in mid to late summer, boiled and mashed into cakes or spread over a slow fire to dry to be used for winter consumption (Turner 1997).
EPF 4 contained an extremely high number of charred seeds (n=586). The seeds are smashed and distorted by burning. The number and condition of the seeds is suggestive of either processing the berries in a method described above, or by reconstituting them for winter consumption (Lyons 2003). EPFs 2 contained 150 charred Ericaceae seeds, in the same smashed condition as those in EPF 4. EPF 1 contained 42 charred seeds, EPF 3 contained 26 charred seeds, EPF 7 contained 12 charred seeds, EPF 12 contains 18 charred seeds, and EPF 1 contained 1 charred seeds. As none of the other seeds had the broken pattern, it could be assumed that these berries were eaten singly and discarded or used in a different cooking method from smashing (Lyons 2003).

**Fabaceae (Pea family)**

*Medicago* (Clover)

One uncharred clover seed was recovered from the fill of the Seton Portage School pit. I consider this to be a weedy intrusive, due to the fact that the seed is uncharred, and that none of the informants mentioned using clover in the creation and use of the pit.

**Hydrophyllaceae (Waterleaf family)**

*Phacelia* sp.

Ten charred seeds were recovered from the fill of EPF 1, eight from EPF 2, seventy from EPF 4, and seven from EPF 13. There are quite a few species of *Phacelia* which grow on the Interior. *Phacelia* was traditionally used on the Interior for medicinal purposes (Turner et al. 1990).
Orobanchaceae (Broomrape family)

*Orobanche* sp.

One charred *Orobanche* seed was recovered from the charcoal layer of the Cayoosh pit. This plant is a parasitic plant that traditionally was believed to bring bad luck (Turner et al. 1990). I consider this to be a weedy intrusive, due to the fact that none of the informants mentioned using *Orobanche* in the creation and use of the pit.

Plantaginaceae (Plantain family)

*Plantago* sp.

Ninety five charred seeds were recovered from EPF 2, one charred seed was recovered from EPF 1, five seeds were recovered from EPF 4, two charred seeds were recovered from EPF 12, and one charred seed was recovered from the Tyax/Relay pit. Traditionally, *Plantago* was used for medicinal purposes (Turner et al. 1990). The seed recovered from the Tyax/Relay pit is an intrusive, due to the fact that none of the informants mentioned using *Plantago* in the creation and use of the pit.

Rosaceae (Rose family)

*Amelanchier alnifolia* (Saskatoon)

One charred Amelanchier *alnifolia* seed was recovered from EPF 1, two seeds were recovered from EPF 2, one charred seed was recovered from EPF 7, and one whole charred berry was recovered from EPF 16. Saskatoon berry bushes are common and have a widespread range. They are one of the most important berries to the Interior people. The berries can be spread out on mats in the sun to dry, shade dried, and boiled and mashed into cakes (Turner et al. 1990).
Prunus sp. (Cherry)

Two charred Prunus stones were recovered from the Seton Portage school pit. There was no information from the informants about cherries being used in the cooking process of this pit. However, the purpose of this pit was for feeding a large amount of people with a sizable quantity of food being cooked in the earth oven. From my own experiences at any feast or ritual I have attended, cherries, either canned or fresh, were always present and consumed by the people. The pits were always spit out in and around the fire.

Unidentified seeds

Seven charred, unidentified seeds were recovered from various contexts in EPF’s 1, 2, and 13.

Unidentified Plant Tissues

A large amount of charred, unidentified tissues were recovered from EPF 4. These could possibly be the remains of bulbs or root materials.

Conclusions

In this section, I postulate what the possible functions for the earth ovens may have been by looking at surface and subsurface morphology, fill matrix, burn patterns, and faunal and botanical remains.

EPF’s 5, 6, 11

The most likely function of these three EPF’s is that they were used as cache pits. There was no evidence of burning, a stone pavement, or soil oxidation. The rim crest diameters are smaller and the depths of the features are much less than any of the other
EPF's tested. The fact that all three of the EPF's have rim crests is evidence of some sort of excavation. Teit (1900, 1906, 1909) describes the use of cache pits in the villages in his ethnographies. These pits are described as being smaller than earth ovens. Two kinds of underground caches were described. On kind of underground pit was used to hold all of the surplus food not required during the winter months. The food in these pits was left until spring (Dawson 1891; Hill-Tout 1907; Teit 1900, 1906, 1909). The second kind of underground cache pit was constructed with much less care than the previously described pit. These pits were situated near the house and were described as shallower with a smaller diameter (Dawson 1891; Hill-Tout 1907; Teit 1900, 1906, 1909).

EPF's 1, 2, 3, 4, 7, 8, 9, 10, 12, 13, 14, 15, 16

The most likely functions for these EPF's is that they were earth ovens. All of them have rims, evidence of use of heat in the form of charcoal and/or soil oxidation, FCR, and in some cases, stone pavements. Seven of the pits sampled had intact stone pavements. An analysis of soil samples taken from the fill matrix has allowed for a closer look at some of the earth ovens and made it possible to identify the most likely function of selected EPF's.

Proposed Functions for Selected EPF's

EPF's 1, 2, 3, and 4

EPF’s 1, 2, 3, and 4 were most likely used for some sort of plant processing activity or earth oven activity. It is also possible that the pits were used for both. The dominant plant remains from all of the pits are berry food seeds. Ethnographies indicate
that berries were being dried whole on grass mats over open fires, mashed into cakes and
dried, or boiled in birchbark containers (Turner 1997). Because of the unusually high
number of berry seeds in the assemblages, open pit drying could be one of the inferred
activities. As mentioned above the seeds from EPF 4 were smashed and distorted from
burning and possibly from berry processing activities or from reconstitution activities.
There is also a presence of seeds in all of the pits which were used for medicinal
purposes. Generally, medicinal plants were also dried over an open pit fire (Turner 1997;
Turner et al. 1990). All of the EPF’s could have been used for pit cooking meat as well.
They all contain intact stone pavements. There were small amounts of mammal bones
recovered from each EPF. This could also explain the berry seeds as well. Ethnographies
state that berries were often used to flavor meat and fish (Dawson 1891; Hill-Tout 1907;
Teit 1900; 1906, 1909; Turner 1997; Turner et al. 1990). There were unidentified needles
and grass seeds, which could also been used for vegetative matting (Turner 1997; Turner
et al. 1990). The non-food seeds could also be indicative of weedy intrusives.

**EPF 7**

This EPF was most likely used as an earth oven. A stone pavement, mammal
bones and berry seeds could be indicative of meat cooking.

**EPF 8**

EPF 8 had an intact stone pavement, which would be indicative of an earth oven.
No faunal remains were found. Silene seeds were recovered from the fill. Silene was
ethnographically used as a medicinal plant (Turner 1997; Turner et al. 1990). Open
hearth drying could also be inferred from the Silene seeds, which was how the plants were prepared. The Silene seeds could have also been the result of weedy intrusives.

EPF 9

This EPF was most likely used as an earth oven. It had a thin stone pavement and a small amount of faunal remains found.

EPF 10

EPF 10 contained a stone pavement, mammal bones, and grass seeds. All of these things are indicative of pit cooking using an earth oven. Birchbark was found on top of the stone pavement layer. Birchbark could have been used to wrap food or to line a pit for grease extraction. Medicinal seeds were found in this pit, which could be indicative of open hearth drying, or weedy intrusives.

EPF 12

EPF 12 had no stone pavement, no evidence of in situ burning, or oxidation. The basin was filled with dark charcoal stained soil. Berry seeds and medicinal seeds could be indicative of open pit drying or weedy intrusives. Pine needles and mammal bones could indicate pit cooking with berries being used to flavor the meat.
EPF 13 contained a large amount of mammal and fish bones. One Aves bone was found as well. No real stone pavement was present. However, there was a large amount of charcoal stained soil and soil reddening. What appears to be two superimposed basins could be indicative of reuse. The varied amount of botanicals, meat and fish bones might represent evidence of a feasting oven.

EPF’s 14 and 15

EPF’s 14 and 15 were most likely both used earth ovens for the purpose of cooking meat. Both had stone pavements, Mammal bones, and evidence of burning indicative of a possible meat roasting pit.

EPF 16

This EPF was likely used as an earth oven for cooking meat. A stone pavement and mammal bones would point to the function of this pit. Saskatoon seeds could be indicative flavoring for meat in an earth oven or could be indicative of open pit drying.

Results from Statistical Analysis

The goal of the principal component analysis was to see what kinds of correlations among the variables were detected by the program. This was an important element in my research. The variables I chose covered aspects of the contents of the earth ovens and subsurface morphology. I was looking for correlations between these items so that I could better understand how the contents of the ovens interacted with the heating element employed. I was also interested in trying to determine how weedy intrusives
were introduced into the context of the oven. Finally, I was curious to see if certain kinds of seeds and faunal remains were commonly found in context together. The factor analysis program extracted two components (Table 5). The two components explained 56% of the variability. The rotated component matrix (Table 6) divided the two factors as follows. Factor one showed high positive loadings in all of the oven dimension measurements, placement of oxidation, *in situ* burning, and presence of a stone pavement. Factor two contained high positive loadings on presence of all seed types, presence of a stone pavement and *in situ* burning.

The correlation matrix (Table 4) showed that: measurements of the ovens north to south, east to west, rim crest measurements, depth of feature, presence or absence of *in situ* burning, amount and location of oxidation, presence or absence of a stone pavement, and thickness of the stone pavement all positively correlate. Also, there are positive correlations between the presence of technological plant seeds, weed seeds, presence of *in situ* burning, and presence of a stone pavement. Food plant seeds positively correlate with the other two categories of plant seeds, the depth of the earth oven, and the location of oxidation on the side of the pit, and presence of mammal bones.

The hierarchical clustering (Table 8) roughly sorted the ovens into four groups. The cache pits were put together, the earth ovens most likely used for plant processing were grouped together, and two kinds of pits most likely used for meat roasting were subdivided.
Implications

The first factor in the principal component analysis appears to represent the dimensions of the earth ovens, and the kind of heating element it contains. Factor two appears to represent that *in situ* burning and an intact stone pavement will allow for the recovery of a high percentage of charred seeds of all types. This correlates well with my contention that *in situ* burning coupled with an intact stone pavement will produce a large amount of plant seeds because the soil directly above and around the stone pavement is relatively undisturbed.

The correlation matrix shows basically the same thing with the plant remains and heating element. Also, food plant seeds positively correlate with presence of animal bones and oxidation on the side of the pit. I believe that the food plant seeds and the mammal bones most likely represent the use of berry juice to flavor meat. Also, reddening on the side of the pit in the ethnoarchaeological ovens were representative of a fire having been on top of the closed oven. Perhaps this factor positively correlating with berry seeds and mammal bones are also indicative of a closed pit with a fire on top being used to dry berries on a rack above the fire.
Chapter six discusses the results of the analysis on the earth ovens at the Bridge River site. Possible explanations for the differences and similarities are examined. Seasonality is again discussed, with the possible uses for the ovens being explored by using macrobotanicals recovered from the ovens. Cooking times, stone pavement thicknesses, and the possibility of determining oven function from looking at these two factors are discussed in this chapter. The implications of changes in earth oven size through time are also explored.

**Comparisons between Bridge River, Upland and Ethnoarchaeological Ovens**

In the initial stages of my research, I assumed that the Bridge River pits were used for processing roots, in the same manner as the upland pits. Upon comparing the Bridge River pits to the upland pits however, similarities and differences became apparent.

**Differences Between Upland and Bridge River Pits**

The most obvious difference between the two is that while the upland pits are located near root gathering grounds, the Bridge River pits are located in the village. A second observable difference is that while the subsurface basins of the upland pits were filled with an enormous amount of thick stone pavements, the Bridge River pits have
much smaller, thinner stone pavements. While exact measurements of the depth of the stone pavements at the Hat Creek site were not taken, a look at the photographs and the profile drawings show huge amounts of rock. The pits at Bridge River have nothing like the same amount of rock in the stone pavements as those at Hat Creek. A third obvious difference between the Bridge River pits and the upland pits is the botanicals recovered from the basins of both pits. The upland pits had remains of root foods in the basins. None of the Bridge River pits had any root food remains recovered, with the exception of EPF 4. This is not to say that there will not be remains of root foods recovered from Bridge River pits if more testing is done. However, I do think it is telling that 15 of the 16 pits tested contained no identifiable root remains. A fourth difference between the pits is the evidence of re-use. In the upland pits, some show evidence of re-use in the form of superimposed stone pavements. In the case of the Bridge River pits, re-use may be indicated by the size of the rim crest, in that the pits are too large to only have been used once. Also, some of the pits have superimposed layers of Stratum VII, designated as pit fill. The pit fill is full of pieces of FCR with basins beneath the layers of fill. A fifth difference between the two pit locations is the variety of pit surface morphology in the uplands, as opposed to the one type of surface morphology noted in the village. Thoms (1989) and Peacock (1998) both identify four types of pits, which are discussed above. All four of the pit types were identified at the upland locations. The Bridge River pits have only one kind of pit identified, that being the basin oven.
Similarities Between Upland and Bridge River Pits

For all of the differences between the uplands and the village pits, there were some similarities. All of the pits from all of the locations share the same basic morphologies of rim crest, basin, stone pavements or scattered FCR, oxidation, charcoal, vegetative matting, plants remains used for food or technology, and faunal remains. The rim size and the basin depths were comparable. The date ranges were similar. Finally, the large number of pits in the village were comparable to the numbers in the uplands. The basic method of creating an earth oven to establish the specific cooking environment was the same, regardless of where the pit was located.

Differences between Bridge River and Ethnoarchaeological Pits

One of the major differences between the two types of pits was the fact that in every case, the modern pits were refilled after they were used. There are obvious different discard procedures with no faunal remains in three of the modern pits. The amount of oxidation was dramatically different in the modern pits. I believe this is in part due to the soil type. The modern pits contained a very high percentage of sand, which showed dramatic oxidation in the form of reddening. The Bridge River pits contained a very high percentage of silt, which showed some evidence of oxidation in the form of reddening, but not as dramatically as in the sandy silts. There were no random pieces of FCR floating around in the fill of the modern pits. I believe this is due to the fact that three of the pits were only used once and one of the pits was used twice. I feel that the large
amount of scattered FCR in the Bridge River pit fill could be indicative of a combination of pit clean out and pit re-use.

**Similarities between Bridge River and Ethnoarchaeological Pits**

Again, the major similarities between the modern pits and the Bridge River pits were the continuity in the overall formula used to create the pits to create and maintain a specific cooking environment for a special type of cooking. The size and depths of the pits are comparable. The thicknesses of the stone pavements were remarkably similar, much more so than that of the upland pits. I consider this to be very significant. All of the modern pits were used for the purpose of cooking meat. Perhaps the comparable morphologies of the modern and the Bridge River pits are indicative of similar foods being cooked in the village pits.

**Implications**

**Seasonality**

Seasonality for the Bridge River site was interpreted using botanical remains collected from a select number of the earth ovens. Clear seasonal indicators are rare. The problem is that plants which are only seasonally available, such as spring plant resources, tend to be eaten fresh and thus leave no remains in the archaeological record (Lepofsky 2000). Berries, which are seasonally available in the summer or fall (Turner 1997) commonly leave lasting remains in the record. The problem with berries is that these are the same kinds of plants which are both eaten fresh and processed for storage. Therefore, the seeds and berries which show up in the record may be the result of winter
reconstitution rather than fresh consumption or processing for storage and would not necessarily be an accurate indicator of seasonal use. Lastly, some species were available through the winter months, as well as spring, summer, and fall. Thus, further obscuring evidence of seasonality.

Summer use of earth ovens could be indicative of people returning to the village periodically to store supplies (Alexander 2000). Opportunistic hunting activities at the time would have provided fresh meat. If a number of people were present, an earth oven would have been a convenient way to prepare fresh meat for a group of people. Hunters were ethnographically documented as using birchbark lined food boiling ovens (Teit 1900, 1909, 1930). The ovens could also be indicative of late summer use as task groups returned from the uplands to begin the fishing season, as ethnographically documented (Alexander 2000; Teit 1900, 1906, 1909). Another explanation for summer earth oven use has been mentioned in the ethnographies (Teit 1900) but has not been investigated. It is reported that the very old remained in the villages year round. Once an earth oven was excavated and left open (as I believe they were) it would be a convenient way to cook and process foods. Berry bushes ripen in the summer and are generally found in large number in the same biotic zone as the housepit villages. It is possible that berry pickers were near or even in the village, in which case, the open pits would be convenient for cooking foods or drying berries. It is also apparent from some of the more recent dates from the EPF’s that people were returning to the Bridge River village in the post abandonment period. These later pits may have been used for hunting groups or berry pickers. The compilation of seasonal indicators (Table 2) suggests that the Bridge River ovens were constructed and used at the earliest from early to mid summer. EPF 10
had one charred Brassica seed, which could indicate an early summer use. However, the presence of Poceae seeds in the same oven could be indicative a late summer use. The rest of the EPF's point to a mid to late summer use. Although burned seeds do not necessarily indicate the subsistence activities taking place with that particular plant, it can indicate what season the earth ovens were open to the air with a fire burning in or around them. Therefore, although EPF's 1, 2, 3, and 4 do have a large number of charred, crushed berry seeds which could be indicative of winter reconstitution, the Plantago, Phacelia, and Poceae seeds present in the oven likely point to summer activity.

**Variability and Function in Earth Ovens**

**Variability**

Variability among the Bridge River pits was investigated by looking at the surface and subsurface morphology. As stated above, the surface morphology among the pits was the same. All had mounded rims with basins in the center. Three of the pits were identified as cache pits and thirteen of the pits were identified as earth ovens. All of the cache pits were shallow, small, and located on the outside of the housepits and shared similar subsurface morphology. The earth ovens all had similar surface morphology with some variation in size. There were differences noted in the subsurface in terms of stone pavements, burning signatures, faunal and botanical remains.

Some of the ethnographies address the variability among earth ovens by calling the different methods different recipes (K'San 1980) and up to the preferences of those constructing the pit (Alexander 1992). I would argue that some variability, like fuel type or vegetative matting, may be the result of an individual's preference. However, I contend that the basic formulas are age old practices which are specifically formulated to
produce explicit chemical reactions in the foods being cooked. As stated above, many factors can influence the nature of the earth oven. Factors which influence earth ovens are type and amount of food being prepared, number of people being fed, and whether the food is for immediate consumption or for storage.

On the Interior Plateau, processing for immediate consumption would most likely contain a variety of faunal and botanical remains. Pits used for processing for storage would most likely contain a large amount of one kind of food (Turner 1992; Turner et al. 1990). Typically, if there are no botanicals or faunal remains recovered, the pit is given the broad functional class of cooking feature or cache pit. In my research on earth ovens on the Interior, I came across some very specific instructions for cooking foods (Table 3). These have already been discussed above but I will list them again: In order to cook balsamroot, a stone pavement thickness of 30 centimeters is required and the cooking time is at least 48 hours. With nodding onions and lilies, a thickness of between 15 and 20 centimeters should be used with a cooking time of 24 hours. Black lichen, with a thickness between 15 to 20 centimeters, takes about 12 hours to cook. With mountain potatoes, as little a thickness as 10 centimeters can be used with a cooking time of two to five hours (Alexander 1992). My own research has allowed me to add to this: One deer in an earth oven with average diameter of 1.4 meters, an average depth of 60 centimeters, and an average stone pavement thickness of 12 centimeters with no in situ burning, a fire on top and steam used will take about 24 hours to cook. One deer in an earth oven with an average diameter of 1.8 meters, an average depth of 50 centimeters and stone pavement depth of 30 centimeters with an in situ fire and one on top will take approximately 11 hours to cook. A pit with an average diameter of 4.5 meters, an
average depth of 50 centimeters and a stone pavement depth of 30 centimeters with an *in situ* fire in the pit and no fire on top will cook two deer in approximately 13 hours.

Finally, a pit with an average diameter of 1.3 meters, an average depth of 68 centimeters, and a stone pavement thickness of 15 centimeters, an *in situ* fire and one on top of the pit will take 24 hours to cook.

I believe that presence or absence of a stone heating element and presence or absence of *in situ* burning can be used to roughly determine the type of food that may or may not have been prepared in the pit. Peacock’s (1998) experimental earth oven proves this point dramatically. She cooked balsamroot in two different earth ovens. One had the rocks heated outside of the pit and one had a fire in the pit with the rocks on top. The oven that had the stones heated outside of the pit didn’t get the oven hot enough nor did it maintain the heat long enough to cause the chemical reaction in the balsamroot necessary to make it fit for human digestion. *In situ* burning and stone pavements of a certain thickness are necessary to cook balsamroot and most of the known root foods utilized by Interior peoples, as evidence by the upland pits shows us. It is not necessary for cooking deer meat. This may be a crude method for inferring pit function but I believe that, if properly tested, it could prove to be a valuable method.

**Determining Function**

By examining the stone pavement thicknesses and determining if there was *in situ* burning in the Bridge River pits, I feel confident in stating that, with the exception of three EPF’s, most of the excavated pits were likely to have been used to cook balsamroot, lilies, nodding onion, or mountain potato. EPF’s 7, 16, and 4 could have potentially been
used to cook mountain potatoes, but any other root foods would have required more of a stone heating element. EPF 4 had unidentified tissues recovered. It was the only EPF with any recovered plant tissues.

Berry processing might have been the functions of EPF’s 1 – 4, except that they all have stone pavements. If the pits were used for berry drying, they would have been on a rack over a fire, and a stone pavement wouldn’t have been necessary. Another possibility examined to explain function of these pits was that they were used as boiling pits for soups, stews, or grease extraction. This wouldn’t have been considered a viable explanation for those pits with stone pavements because, again, they wouldn’t have been necessary. EPF’s 13 and 14 don’t have stone pavements and were considered for possible boiling pits. However, this idea was rejected for a few reasons. First of all, the ethnographies indicate that a birchbark basket was placed in a pit and hot stones were placed in until the liquid boils. Both of the EPF’s after close examination have evidence of in situ burning and oxidation. The hot liquid most likely would not have produced enough heat to cause dramatic reddening. Also, there would not have been a fire in the bottom of the pit if it was used for a boiling pit as it would have set the basket on fire. A final reason all of the pits were ruled out as boiling pits is that the dimensions mentioned, 45 centimeters diameter and 30 to 60 centimeters below surface (Teit 1900, 1906, 1909), are much smaller than the dimensions of the pits.

The pits without stone pavements were ruled out as the shallow steaming pits described above because again, the dimensions are much smaller than any of the Bridge River pits. The absence of stone pavements from some of the pits were most likely the result of people pulling the stones out to reuse them at a later time. In two of the modern
pits I excavated, this was done. Volcanic rocks in particular are valued because they can be reused so many times. There are volcanic rocks all over the site on the ground surface that I believe are evidence of re-use patterns. EPF 13 is an example of a pit with no stone pavement but enough reddening and charcoal to infer there was once a stone pavement. EPF 12 had no stone pavement, or reddening. There was charcoal in the pit fill however. This could be another example of a cleaned out pit.

In closing, variations in stone pavement thickness can be used, in concert with botanicals and faunal remains, as an indicator of type and amount of food prepared in the pit. A thick stone pavement will either point to a specific type of food or a large amount of food. Burning patterns can also be used to infer pit function if one has a good working knowledge of food preparation techniques. Conversely, pit contents can be used to indicate the absence of certain foods.

Certain cooking methods, like berry processing or stone boiling can be ruled out with the presence or absence of a stone pavement or in situ burning. Even, thick layers of solid reddening can be used to infer in situ burning with a stone pavement even if the stone pavement has been removed. The oxidized part is more likely to remain behind in the event of a clean out event because the reddened area becomes harder the longer it is heated or the more it is used (Armstrong 1993). Stone, heated outside of the pit, will leave oxidation behind, but it will be patchy and more ephemeral. This sort of oxidation could indicate food types or methods which do not require direct fire, like fish, soups, stews, and grease extraction. Reddening along the top edge of the pit can be indicative of a fire being placed on top of it. Charcoal chunks in the top few centimeters of soil along the edge of the pit can also point to fire on top. Finding evidence of fire on top of the pit
could be indicative of a large amount of food being prepared or root foods. The fire on top would help to keep the temperature in the pit at a higher temperature for a longer period of time. The use of steam can also create distinctive oxidation. Both of the modern pits that used steam had reddening from the top of the pit all the way down the sides to the bottom. Soil type probably has an effect on the amount and brightness of the soil reddening, so the effects of steam may manifest differently from pit to pit depending on the soil type (Armstrong 1993).

**Differences between upland and village pits**

As discussed above, while the surface and subsurface morphologies of the pits in the uplands were similar, there were some striking differences. The differences have been outlined above but the differences in stone pavement depths warrant further discussion. Different use and re-use patterns between the two site types have been surmised from the stone pavements. The uplands have massive stone pavements with evidence of re-use manifesting in the form of superimposed stone pavements. Re-use in the village manifests in the form of deep basins for cooking with no stone pavements, evidence for intense heating, and large amounts of FCR in the pit fill.

The differences in stone pavement thickness and the kinds of food remains between the upland pits and the Bridge River site pits is most likely the result of different patterns of use. All of the ovens in the uplands tested contained remains of root foods in them. Of the Bridge River pits, only EPF 4 had tissues. Obviously, the fact that all of the pits tested did not uncover root processing activities does not mean that every pit in the site will follow this same pattern. But the current data suggests that root processing was
not the primary activity for which the pits were used. The Keatley Creek site shows a somewhat different pattern from the Bridge River site. Investigations in a small sample of the earth ovens at Keatley Creek revealed some form of root or bulb remains in half of the pits tested. Hayden and Cousins (2004) have interpreted the pits with root food remains as evidence of feasting and evidence of large scale root processing. Of the thirteen pits identified at the Keatley Creek site, only eight were tested, and the most commonly identified root remains identified were nodding onion. These plants are identified as the most common root foods in the study area is reported to have a relatively short cooking time as compared to other root foods, and they are also the root food most commonly reported to have been cooked with meat (Turner 1997; Turner et al. 1990).

One remarkable difference between the pits in the two village locations is the location of the pits in each village. All of the tested pits at the Keatley Creek site are located along the periphery of the village proper. There are pits along the periphery of the Bridge River site, but the majority are located in the central portion of the village. In terms of numbers, the Bridge River pits (n=150+) vastly outnumber the number of pits (n-13?) at the Keatley Creek site.

This brief discussion has served to point out that, while there are definite differences between the upland pits and the Bridge River site pits, there are also very noticeable differences between the Bridge River site pits and the Keatley Creek site pits.

**Did Ethnoarchaeological Pits Compare?**

The ethnoarchaeological pits provided a large amount of information. All of the modern pits were refilled after use, but upon excavation, the pits were nearly identical to
the Bridge River pits. There were some differences though. The modern pits showed a lot more reddening that the prehistoric pits. I believe this is due to a combination of soil texture and type of heating elements used. I was fortunate that even though all of the pits were used to cook the same type of food, each person chose to employ a slightly different method of oven construction. The result was that each kind of earth oven described in the ethnographies was present in the ethnoarchaeological sample. I found that the surface and subsurface morphologies were remarkably similar to the Bridge River pits. One pit, the Fred Shields pit was what I called “over-constructed.” I say this because the stone pavement was very large and was certainly more than was necessary to cook one deer. The Tyax/Relay pit had a much smaller stone pavement and no in situ burning, yet it was still capable of cooking a deer. The benefit of the Fred Shields pit was that it took half the time to cook the meat. The fact that Fred Shields had modern conveniences and the materials on hand to construct the pit would contribute to the overconstruction. The Fred Shields pit was the modern correlate to the upland earth ovens. The depth, size, extreme heat in the form of in situ and top of pit burning, and thickness of the stone pavement was the same as the upland pits used to process large quantities of roots (Pokotylo and Froese 1983). The Tyax/Relay pit was the modern correlate to an oven with no in situ fire and steam used as a heating element as described by Teit (1900, 1906) and Dawson (1891). The Seton Portage pit is another example of an earth oven with steam used as a heating element plus a fire in the bottom of the pit, as described by Teit (1900, 1906) and Dawson (1891). The Cayoose pit is an example of an earth oven used to cook large amounts of food for a larger than average group of people.
Changes in Size through Time- Implications

In terms of age, there has been a tentative model of root resource use on the Interior Plateau. In short, the data from upland acquisition areas shows that root processing began sometime before 3300 BP. By 2400 BP, there is an apparent shift to a more intensive pattern of use (Lepofsky and Peacock 2004; Pokotylo and Froese1983). Upland resource locations show a consistent pattern of use and reuse through about 1500 BP. During this time, we see both large (greater than 5 meters diameter) and medium sized ovens (3 to 4 meters diameter) being used with the larger ovens being slightly more prevalent. From between 1500 to 800 BP, the frequency of upland ovens declines, but the size remains relatively the same (Lepofsky and Peacock 2004; Pokotylo and Froese1983). The two ovens from Bridge River site that fall within this time frame are both within this size range, one being 3.8 meters diameter and one being 3 meters diameter. Keatley Creek has a few large ovens from this time period. There are some very large ovens at Bridge River but they have not been dated yet. But the fact that roasting pits are showing up at all in the villages by this time suggests that there are some social or economic shifts taking place. After 800 BP, the size of the upland pits declines significantly, with an average diameter of less than 3.5 (Lepofsky and Peacock 2004; Pokotylo and Froese1983). In Bridge River, the small number of post 800 BP pits fall within the range of about 4 to 2.5 meters diameter. The pits at Keatley from this time fall within this range too. In the uplands, preliminary investigations show an increase in the frequency of small pits during this time. My small sample from Bridge River has a majority of the smaller pits being post 800 BP. For the final stage of my investigation on chronology, I used an average of the rim crests of my dated pits from the Bridge River
site and plotted them against pits from three upland resource areas and one lowland village area. The data from the lowland village area was of particular interest to me because there is a distinct lack of roasting pit data from housepit villages. I did find that my pits seemed to fit in the general trend of older pits being larger, smaller pits being younger, and smaller, younger pits being more frequent (Figure 3).
CHAPTER 7
CONCLUDING REMARKS

This chapter covers concluding remarks, with the final supposition being that the Bridge River ovens are different from the upland ovens and are indicative of far different activities going on in the villages than in the uplands. I suggest that a new model is needed to address the issues of earth ovens in housepit villages. The final discussion in this chapter is that of recommendations for future research at the Bridge River site and other earth ovens in housepit villages. Replicative experimentation is suggested as one new avenue for research.

At the onset of this research, I hoped that a comparison between prehistoric and modern pits would help to provide a template to use for interpreting the function of the external pit features at the Bridge River site. Drawing from Binford (1983), I wanted to attempt to link the past to the present and add more information to the growing knowledge on subsistence practices at the Bridge River site and on the Interior Plateau. Initially, I assumed that the EPF’s were representative of root food processing activities at the site. The more I researched and compared the upland, village, and modern ovens to each other, the more I began to consider that there was something different taking place at the Bridge River site, and possibly at housepit villages as a whole. Simply put, large scale root processing did not appear to have been the function of the Bridge River pits. I
believe the "recipes" I have collected through the course of my research I believe are representative of well known and well used cooking techniques employed by people on the Interior Plateau. From my findings on stone pavement thicknesses, burning patterns, and the botanicals from the EPF's, root foods could not have been cooked in the majority of the ovens tested. The food remains in the form of botanicals were, as usual in these investigations, difficult to interpret in terms of seasonality. The results could point to summer use or winter use. But the incidental seeds appeared to be pointing to an early to late summer use pattern. If this is the case, then the most likely scenarios, as discussed above, would be the following. The pits were used by people returning to the village to store supplies; the pits were being used by people returning to the valleys and terraces to begin fishing; or the pits were being used by people harvesting berries in or near the village. The pits could have been used by the elderly who were purported to have lived in the village year round. The final explanation which applies to the pits which were used after the village was supposedly abandoned is that people used those pits while hunting or passing through the area. I believe these more recent pits are examples of re-use of abandoned pits on the landscape.

A final comment on the pits with the large amount of berry seeds and intact stone pavements. In the course of my ethnoarchaeological work, an elder told me in passing that sometimes an earth oven with a fire on top could have a dual role of functioning as a drying oven, with a drying rack over top of the top fire. Meat or plant materials could be dried this way. Perhaps this could explain the earth ovens with intact stone pavements and a large amount of berry seeds.
Because it appears that the use patterns are different between the upland and the Bridge River pits, I believe that we as archaeologists might be remiss in using the upland processing as a model for village pits. A new model is needed to explain the activities that took place with the earth ovens at the Bridge River site. It has been stated that focusing on salmon as the most important source of food for Interior peoples is inaccurate and that root foods were just as important to the Interior people’s diet (Peacock 1998; Prentiss and Kuijt 2004). However, other arguments counter this assumption and say that the people who lived at the Bridge River site lived in an environment that was too wet to support the large upland meadows which thrived in a dry environment (Alexander 2000; Hayden 2000; Turner 2000). Another part of this same argument is that the uplands locations were too far away to bring large numbers of roots back to the village to process and that the focus on root foods may not have been very pronounced until the introduction of the horse (Alexander 2000; Hayden 2000; Turner 2000).

The fact that the Bridge River pits are not really constructed in the manner consistent with root processing activities and that no root remains were recovered from the tested pits may well prove the above argument to be true in the long run. However, I would argue that we do not really know if there were any root locales near the Bridge River site. The environment at the Bridge River site is a richer, more varied environment than the environment at and around the Keatley Creek site. Also, the Bridge River site is very close to Six Mile Rapids, which is one of the most famous salmon fishing locations. Surely people who lived this close to Six Mile Rapids would have some sort of control over the prime spots. This would put people in a position to have a lot of salmon available for trade. It is possible that even if a large amount of roots were not available
the people could trade for the roots. I believe that focusing on any one resource as "the most important resource" is too elementary of an explanation that does not consider the complex interplay between Interior peoples, the food they ate, and their nutritional needs.

**Recommendations for Future Research**

One of the exciting and frustrating aspects of this research is how much can and needs to be done. One of the first investigations that needs to be conducted is ethnobotanical research. Some of the legwork has already been done in that we have a good working knowledge on the plants used and their uses (Turner 1988, 1992, 1997, 1998; Turner et al. 1990). The problem I constantly ran into was not how the plants were used, but where they were coming from. I had to base my botanical findings on known plant use from a completely different area around the Keatley Creek site. All of the information currently being utilized in reference to known plant use and their gathering areas comes from the exhaustive ethnobotanical studies conducted in and around the Keatley Creek area. We do not know enough about the area around the Bridge River site to know if roots were an important resource, and if so, from where the roots were being gathered.

Another avenue for future research should be replicative experimentation. The replicative experimentation should focus on burning patterns, experimenting with stone pavement depths, and investigating the effects of *in situ* burning or top of pit burning. Reddening of the soil should be investigated. We need to understand how oxidation manifests in different types of soil. There needs to be some sort of a standardized system for interpreting oxidation and what it means. Armstrong (1993) suggests using Munsell
color chips to provide a standardized interpretation method. Like Peacock (1998) there should be a way to monitor and interpret the intensity of heat generated in a pit hearth with more experimentation on stone pavement heat capacities. We know that cooking times are lengthy in the case of root foods which require inulin hydrolysis in order to be made digestible for humans. We also know that meat takes less time to cook, even factoring in extra time for amount. By performing more replicative experimentation, I believe we can take our general ideas about pit function and streamline them into more specific and successful analysis. Understanding what was going on with the earth ovens in the village location at the Bridge River site will allow for a clearer understanding of the structure and function of earth ovens on the British Columbia Plateau. Also, understanding the function of the Bridge River earth ovens could provide a broader understanding of economics of the Mid-Fraser peoples, particularly in reference to geophyte harvesting and processing.
APPENDIX A: TABLES
<table>
<thead>
<tr>
<th>External Pit Feature</th>
<th>Catalogue Number</th>
<th>Provenience</th>
<th>Description</th>
<th>Date Cal/Uncial</th>
<th>Rim Crest</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>VII A lvl 1</td>
<td>1 Amelanchier seed, charred; 42 Ericaceae seeds, charred; 10 Phacelia seeds, charred; 1 Plantago seed, charred; 2 unknown seeds, charred</td>
<td>AD 1750/152 +/- BP</td>
<td>4.5m</td>
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<tr>
<td>2</td>
<td>1</td>
<td>VII B lvl 1</td>
<td>2 Amelanchier seeds, charred; 4 Chenopodium seeds, charred; 150 Ericaceae seeds, charred; 8 Phacelia seeds, charred; 95 Plantago seeds, charred; 2 Poceae seeds, charred; 3 unknown seeds, charred</td>
<td>AD 1568/310 +/- BP</td>
<td>2.4m</td>
</tr>
<tr>
<td>No.</td>
<td>Sample Code</td>
<td>Layer</td>
<td>Description</td>
<td>Date</td>
<td>Depth</td>
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<tr>
<td>3</td>
<td>VLL B lvl 1</td>
<td></td>
<td>1 Artemisia seed, charred; 1 Chenopodium seed, charred, 26 Ericaceae seeds, charred; 1 Poceae seed, charred; Uncounted needles</td>
<td>AD 1654</td>
<td>3.6m</td>
</tr>
<tr>
<td>4</td>
<td>VII B lvl 1</td>
<td></td>
<td>1 Chenopodium seed, charred; 1 Chenopodium seed, uncharred; 586 Ericaceae seeds, charred; 70 Phacelia seeds, charred; 5 Plantago seed, charred; 50 Poceae seeds, charred, Unidentified plant tissues (large amount)</td>
<td>AD 792</td>
<td>3.4m</td>
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<td>7</td>
<td>VII A lvl 1</td>
<td></td>
<td>1 Amelanchier seed, charred; 4 Chenopodium seed, charred; 12 Ericaceae seeds, charred</td>
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<td>8</td>
<td>14</td>
<td>VII B lvel 1</td>
<td>1 Chenopodium seed, uncharred; 5 Silene seeds, uncharred</td>
<td>AD 1770 220 +/- 35BP 3 8m</td>
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<td>10</td>
<td>17</td>
<td>VII B lvel 1</td>
<td>1 Brassica seed, charred; 6 Poceae seeds, charred</td>
<td>AD 1770 206 +/- 33BP 4 1m</td>
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<td>12</td>
<td>18</td>
<td>VII lvel 1</td>
<td>2 Chenopodium album sp. seed, charred; 18 Ericaceae seeds, charred; <em>Picea</em> needles; 2 Plantago seeds, charred; 2 Silene seeds, charred</td>
<td>AD 792 1221 +/- 48BP 3.3m</td>
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<td>13</td>
<td>23</td>
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<td>1 Brassica seed, charred; 5 Chenopodium seed, charred; 1 Ericaceae seeds, charred; 7 Phacelia seeds, charred; 2 unknown seeds, charred</td>
<td>AD 1870 93 +/- 93BP 5 1m</td>
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<td>Seton Portage School</td>
<td>10</td>
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<td>1 <em>Chenopodium</em> seed, uncharred; Uncounted cedar needles</td>
<td>7.3m</td>
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</tr>
<tr>
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<td>VII lvl 2</td>
<td>3 <em>Chenopodium</em> seed, uncharred</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>VII A/B lvl 1</td>
<td>1 <em>Medicago</em> seed, uncharred; 1 <em>Taraxacum</em> seed, uncharred; 1 <em>Chenopodium</em> seed, uncharred; Uncounted fungal spore balls; Uncounted conifer buds, charred; 3 Poaceae seeds, charred 6 <em>Chenopodium</em> seeds, charred 2 <em>Prunus</em> seeds, charred Uncounted unidentifiable plant remains</td>
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<td>Table 1 (Continued)</td>
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<td>---------------------</td>
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</tr>
<tr>
<td><strong>Cayoosh Pit</strong></td>
<td>29</td>
<td>VII lvl 1</td>
<td>1 Chenopodium seed, uncharred; Uncounted fungal spore balls; 1 Poceae seed, charred; 1 Poceae seed, uncharred</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>VII A/B lvl 1</td>
<td>1 Chenopodium seed, charred; 1 Orobanche seed, charred; 1 Poceae seed, charred; Uncounted needles</td>
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</tr>
<tr>
<td><strong>Tyax/ Relay Pit</strong></td>
<td>24</td>
<td>VII level 2</td>
<td>1 Taraxacum seed, uncharred Uncounted unidentifiable plant remains; 1 Plantago seed, charred; 1 Chenopodium seed, uncharred</td>
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</tr>
<tr>
<td></td>
<td>27</td>
<td>VII A/B lvl 1</td>
<td>1 Pseudotsunga menzieii cone, charred; 1 Taraxacum seed, uncharred; Unidentified fungal spores; Unidentified needles</td>
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Table 2. Seasonal Indicators from EPF’s at Bridge River

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<th>Winter</th>
<th>Spring</th>
<th>Early Summer</th>
<th>Mid Summer</th>
<th>Late Summer</th>
<th>Fall</th>
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<tr>
<td>Chenopodium</td>
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<tr>
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<td>•</td>
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<td>•</td>
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<td>Poceae</td>
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<td>•</td>
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<td>•³</td>
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<td>Silene</td>
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<td>•</td>
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* Indicates when fruits ripen
** If the Ericaceae berries are *Arctostaphylos uva-ursi* then they would have been available almost year round
¹ Indicates reported ethnographically to have been eaten fresh or dried for later use. Therefore not considered to be reliable for seasonality indicators
Table 3 Cooking Times for Foods

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<th>Food Type</th>
<th>Pavement Thickness/cm</th>
<th>Cook Time</th>
<th>Type of Heating Element</th>
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<td>30 cm</td>
<td>48 hours</td>
<td><em>in situ</em></td>
</tr>
<tr>
<td>Nodding Onion/Lilies</td>
<td>50-20 cm</td>
<td>24 hours</td>
<td><em>in situ</em></td>
</tr>
<tr>
<td>Black Lichen</td>
<td>15-20 cm</td>
<td>12 hours</td>
<td><em>in situ</em></td>
</tr>
<tr>
<td>Mountain Potatoes</td>
<td>10 cm or less</td>
<td>2-5 hours</td>
<td><em>in situ</em></td>
</tr>
<tr>
<td>Deer</td>
<td>12 cm</td>
<td>24 hours</td>
<td>fire on top</td>
</tr>
<tr>
<td>Deer</td>
<td>30 cm</td>
<td>11 hours</td>
<td>fire on top <em>in situ</em></td>
</tr>
<tr>
<td>Deer</td>
<td>30 cm</td>
<td>13</td>
<td><em>in situ</em></td>
</tr>
<tr>
<td>Deer</td>
<td>15 cm</td>
<td>24</td>
<td>fire on top <em>in situ</em></td>
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Table 4 Correlation Matrix

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<th>east west measurements</th>
<th>rim crest measurement</th>
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<td>.569</td>
<td>.591</td>
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<td>.421</td>
<td>.429</td>
</tr>
<tr>
<td>red below stones</td>
<td>.409</td>
<td>.419</td>
<td>.430</td>
</tr>
<tr>
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<td>.626</td>
<td>.618</td>
<td>.631</td>
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<tr>
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<td>.481</td>
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<td>.458</td>
<td>.476</td>
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<td>-103</td>
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<tr>
<td>weed/grass seed present</td>
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<td>-153</td>
<td>-153</td>
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<th>in situ burning</th>
<th>red below stones</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>421</td>
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Table 4. Correlation Matrix (Continued)

**Correlation Matrix**

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<td>.395</td>
<td>460</td>
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<tr>
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<td>.231</td>
<td>.713</td>
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<tr>
<td>red below stones</td>
<td>.372</td>
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<th>weed/grass seed present</th>
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Table 4 Correlation Matrix (Continued)

**Correlation Matrix**

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<tr>
<td>in situ burning</td>
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Table 5 Total Variance Explained

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<th>Cumulative %</th>
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Extraction Method: Principal Component Analysis.

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<th>Cumulative %</th>
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Extraction Method: Principal Component Analysis.
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Extraction Method: Principal Component Analysis.
Table 6. Rotated Component Analysis.

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a Rotation converged in 3 iterations.

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Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Component Scores.
Table 8 Hierarchical Cluster of Earth Ovens.

* * * * * H I E R A R C H I C A L C L U S T E R A N A L Y S I S * * * * *

Dendrogram using Average Linkage (Between Groups)

Rescaled Distance Cluster Combine

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CASE 15 +-----------------+-----------------+-----------------+-----------------+-----------------+-----------------+-----------------+
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2 2
4 4
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Table 9  Cases, Variables, and Factor Scores.

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Figure 1. Location of Bridge River Site in the Mid-Fraser Canyon area showing site location in reference to other housepit villages.
Figure 2. Illustration of the Bridge River Site showing the locations of housepits and excavated external pit features.
Figure 3. Scatter plot showing the relationship between the age of the earth ovens and the rim crest size. Bridge River and Keatley Creek are housepit villages in river valley locations. Potato Mountain, Komkanet, and Hat Creek are upland meadows with a large amount of root foods growing in the area.
Figure 4. EPF 1, subsquare 11, showing west and north walls.

Figure 5. EPF 1, subsquares 9, 10, and 11, showing east walls.
Figure 6. EPF 2, subsquare 8, showing north, south, east and west walls.

Figure 7. EPF 3, subsquare 9, showing north, south, east and west walls.
Figure 8. EPF 4, subsquare 9, showing north, south, east and west walls.

Figure 9. EPF 5, subsquare 4, showing north and east wall.
Figure 10. EPF 6, subsquare 13, west and north walls.

Figure 11. EPF 7, subsquare 8, east and south walls.
Figure 12. EPF 9, subsquare 14, showing west and north walls with plan views of Stratums I and VII.

Figure 13. EPF 8, subsquare 2, showing north and east wall with a planview identifying Stratums III and VII A/B.
Figure 14. EPF 10, subsquare 16, showing west and north walls with a plan view identifying Stratum III.

Figure 15. EPF 11, subsquare 7, showing north and east walls.
Figure 16. EPF 12, subsquare 4, showing west, north, and east walls with a plan view identifying Stratums III and VII A/B.

Figure 17. EPF 13, subsquare 7, showing west, south, and north walls.
Figure 18. EPF 14, subsquare 10, showing the west and north walls.

Figure 19. EPF 15, subsquare 1, showing west and north walls with a plan view identifying Stratum VII A/B.
Figure 20. EPF 16, subsquare 15, showing the west and north walls.

Figure 21. Cayoose earth oven, showing the north wall.
Figure 22. Fred Shield’s earth oven, showing the north wall.

Figure 23. Tyax / Relay earth oven, showing the west wall.
Figure 24. Seton Portage School earth oven, showing the east wall.
WORKS CITED

Alexander, D


Armstrong, S.

Arnold, J.

Ascher, R.

Barnett, H.

Bettinger, R.

Binford, L.


Boas, F.

Bouchard, R. and D. Kennedy
1974 *Utilization of Fish, Beach Foods, and Marine Animals by the Tl’U’hus Indian People of British Columbia*. British Columbia Indian Language Project, Victoria, B.C.

1975a *Utilization of Fishes by the Colville Okanagan Indian People*. British Columbia Indian Language Project, Victoria, B.C.

1975b *Utilization of Fish by the Chase Shuswap Indian People of British Columbia*. British Columbia Indian Language Project, Victoria, B.C.

1975c *Utilization of Fish by the Mount Currie Lilooet Indian People of British Columbia*. British Columbia Indian Language Project, Victoria, B.C.

1976a *Utilization of Fish, Beach Foods, and Marine Animals by the Squamish Indian People of British Columbia*. British Columbia Indian Language Project, Victoria, B.C.

1976b *Knowledge and Usage of Land Mammals, Birds, Insects, Reptiles, and Amphibians by the Squamish Indian People of British Columbia*. British Columbia Indian Language Project, Victoria, B.C.


Bouchard, R. and N.J. Turner
1976 *Ethnobotany of the Squamish Indian People of British Columbia*. British Columbia Indian Language Project, Victoria, B.C.

Chatters, J.C.


Curtis, E. S.
Dawson, G. M.

Duff, W.

Fladmark, K.

Gunther, E.


Haeberlin, H. and E. Gunther

Hayden, B.


1997 *The Pithouses of Keatley Creek*. Harcourt Brace, Fort Worth.

Hayden, B. (editor)


Hayden, B. and A. Cannon
Hayden, B. and S. Cousins

Hill-Tout, R. J.


Hodder, I.

Kelly, R.

Ksan, the People of

Kuijt, I.

Kuijt, I. and W. Prentiss

Kusmer, K.
Lepofsky, D.

Lepofsky, D. and S. Peacock

Lyons, N.

Malouf, Richard T.

Peacock, S.
1989 Putting Down the Roots: The Emergence of Wild Plant Food Production on the Canadian Plateau. Ph.D. dissertation, Department of Anthropology, University of Victoria, British Columbia.

Parish, R. and D. Lloyd

Pearsall, D.

Pokotylo, D. and P. Froese

Prentiss, W. et al.

Ray, V.F.


Richards, T., and M. Rousseau
1987 *Late Prehistoric Cultural Horizons on the Canadian Plateau*. Department of Archaeology, Publication No. 16, Simon Fraser University, Burnaby, B. C.

Romanoff, S.

Sapir, E. and L. Spier
1930 Wishram Ethnography *University of Washington Publications In Anthropology* 3 (3): 151-300.

Schiffer, M. B.
1987 *Formation Processes of the Archaeological Record* University of Utah Press, Salt Lake City.

Speth, J. and K. Spielmann

Stiles, D.

Stryd, A.


Stryd, A. and M. Rousseau
1996 The Early Prehistory of the Mid-Fraser-Thompson River Area. In *Early

Teit, J.


Thoms, A. V.


Turner, N. J.


Turner, N.J. et al
Turner, N. J., R. Bouchard and D. I. Kennedy


Wandsnider, L.

Wylie, A.