Chapter 9

Site Formation Processes at Keatley Creek: The Paleoethnobotanical Evidence

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Introduction

A rich ethnobotanical record documents the significance of plants for food, technology, medicine, and ritual, among the First Nations of the Northern and Southern Interior Plateaux (Palmer 1975; Turner 1997; Turner et al. 1990). Despite this, few archaeological studies have attempted to independently evaluate the role of plants in the pre-contact era with archaeobotanical evidence. In the Northern Plateau, the Keatley Creek project was the first major research project to actively incorporate paleoethnobotanical analyses into its research design. Paleoethnobotany has been used throughout the 12 years of the project to answer a variety of research questions about life at the village of Keatley Creek.

The objectives of the paleoethnobotanical analysis at Keatley Creek were designed to address the larger goals of the project, specifically: 1) to gain an understanding of the formation processes of the Keatley Creek housepit deposits; and 2) to construct a model of prehistoric, economic, and social life at Keatley Creek. Both of the project goals are addressed in this paper, with particular focus on the former. Elsewhere, I present a more detailed analysis of the prehistoric socioeconomy at Keatley Creek as reflected in the archaeobotanical remains (Vol. II, Chap. 4; Lepofsky et al. 1996).

Given time constraints and the complexity of the deposits at Keatley Creek, we decided to focus the site formation component of the paleoethnobotanical analysis only on the largest of the three housepits investigated (HP 7). Specifically, we were interested in understanding the formation processes of the roof, rim, and floor deposits in that housepit. This involved determining how individual taxa entered the record, as well as how the remains came to be preserved. These data, combined with analyses of the density and diversity of archaeobotanical remains within and between deposits, provided insights into how the Keatley Creek deposits were formed. Such a detailed understanding of site formation processes was a necessary first step to deciphering the social and economic history of the Keatley Creek village.

In this chapter, I present an inventory of the plant remains recovered from HP's 7, 3, and 12. This is followed by an analysis of the site formation history of HP 7. Portions of this analysis are also reported in Lepofsky (in press). Finally, based on the foregoing, I present a model of prehistoric plant use at the village of Keatley Creek.

Methods

A total of 151 flotation samples were examined from the three housepits (HP 7, N=97; HP 3, N=38; HP 12, N=16). The bulk of the samples came from the floor of the three houses. The remaining samples came from the rim (N=18) and roof (N=10) of HP 7. In hindsight, the rim and roof deposits from all HP's should have been sampled far more extensively. Given the limited sampling of roof and rim deposits, some questions about site formation processes could not be dealt with in detail.

Samples collected from all deposits were generally "bulk samples" (Lennstrom and Hastorf 1992; Pearsall 1988). Those originating from the floors were collected from designated 50 × 50 cm sampling subsquares within a 2 m^2 excavation unit. Approximately 15% of the floor of HP's 7 and 3, and 12% of HP 12, were examined. Roof and rim samples from HP 7 were collected from judgementally selected excavation units or lenses, respectively. All samples were measured to a standardised volume of one liter and then floated using the "garbage can" technique (Watson 1976); most samples were floated in the field. The bucket mesh was 1.0 mm, and the scoop mesh was 0.45 mm The heavy fraction provided the material for the microfaunal and microdebitage analyses (Vol. II, Chaps. 7 and 9). The light fraction provided the material for the paleoethnobotanical analysis reported herein.

Generally, little sinking of floral remains was observed, and the recovery seems to be adequate. However, in some samples, considerable charred remains were observed in the heavy fraction. No effort was made to quantify this material, and as a result some bias has been introduced into the analysis.

Samples from the rim samples required special processing. Because the rim matrix is hydrophobic, almost the entire contents of some rim samples remained buoyant and could not be effectively floated. These samples were dry screened directly as described below for previously floated light fractions.

In the lab, I passed the dried light fraction remains through four geological sieve fractions (4.0, 2.0, 1.0, and 0.5 mm) to facilitate sorting. With the aid of a dissecting microscope (6–40×), I divided the 4.0 and 2.0 mm mesh fractions in all samples entirely into their constituent parts. To considerably reduce sorting time, sub-samples of the 1.0 and 0.5 mm meshes were taken from the samples with an abundance of small remains. This subsampling includes all the rim samples, and some of the samples from the roof deposits.

I determined the size of a subsample two different ways in the course of the analysis. The first method involved increasing the sub-sample size until redundancy for the percent of each species percents was reached. A sample was first divided randomly into several equal sub-samples. Floral remains in each sub-sample were tallied until the total percent of each species did not change more than 1.0% when a new sub-sample tally was added to the total. This defines "redundancy." In most cases, the samples were 35.5% of the original one liter sample. However, even when redundancy is reached, rare species may not show up in samples of such a small size.

In later analyses I determined the subsample size by first randomly dividing the sample into equal subsamples and then completely sorting one sub-sample of manageable size (approximately one petri dish-worth). I then sorted the entire remainder of the sample for remains which were not common in the subsample. "Common" species are charcoal and those seeds or needles represented by more than ten specimens. I determined the sample abundance of these common remains by multiplying their subsample count or weight by the proportion of the subsample of the whole sample. In contrast to the former subsampling method, the very rare species are always counted, but time is not spent enumerating the abundant species. All numbers presented in the report are either projected estimates based on subsamples or actual counts based on one full liter sample.

I identified charcoal with a reflected light microscope (with a maximum magnification of 450×), and used a transmitted light microscope (with a maximum magnification of 600×) for uncharred wood identification. Particularly rotted uncharred wood specimens were first charred in a furnace to facilitate identifications. Because neither the wood reference collection to which I had access nor the published reference material (Core et al. 1981; Friedman 1978; Panshin and deZueew 1980; Schweingruber 1982) adequately cover the flora of the Lillooet area, I was unable to identify a few specimens. I only identified charcoal from a portion of the flotation samples. After identifying several samples it became obvious that the results of the identifications were fairly redundant between samples, and no new information was gained by identifying additional specimens.

Seeds and other floral parts were identified with the aid of a dissecting microscope, my comparative collection, and published references (Delorit 1970, Montgomery 1977). Given the nature of the deposits at Keatley Creek, only charred floral remains from non-rim deposits were considered to be prehistoric (cf. Miksicek 1987). The rim deposits, however, with their highly hydrophobic matrix, preserved uncharred as well as charred archaeological floral remains. For this reason both charred and uncharred remains make up the archaeobotanical assemblage of the rim.

Plant Inventory

The following is an inventory of the plant taxa recovered from the flotation samples from the three housepits. The inventory is organised alphabetically by family. The discussion of each taxon includes a brief discussion of ethnobotanical uses, largely summarised from Turner (1992, 1997, 1998) and Turner et al. (1990). Habitat information comes from Hitchcock and Cronquist (1973), Hitchcock et al. (1984), Parish et al. (1996), and Turner (1992, 1997, 1998). For more detailed ethnobotanical and environmental descriptions refer especially to Turner (1992) and Parish et al. (1996).

The data comprising the archaeobotanical record at Keatley Creek are presented in Tables 1–10. Tables 1–5 present the raw data by species for all categories of remains except charcoal. Percent abundance of charred and uncharred wood taxa recovered from various contexts in the three housepits is presented separately in Tables 6–10.

For all remains except charcoal, raw counts/weights as well as ubiquity measures are presented. Ubiquity is a measure commonly used by paleoethnobotanists to minimize the effects of differential preservation and sampling (Dennell 1976; Hubbard 1975, 1976, 1980; Minnis 1981; Popper 1988; Wilcox 1974). In ubiquity measures, each taxon is enumerated by the number of times it is found at least once in each of the samples examined, expressed as a percent of the total number of samples analysed. The abundance of the taxon is not considered in ubiquity measures; a taxon represented by one seed in five of ten samples (50% ubiquity) has a higher ubiquity value than a taxon represented by 1,000 seeds in two of ten samples (20% ubiquity).

The appropriate method of quantification of the charred remains partly depends on the nature of the charring event. In the Keatley Creek samples, charred remains result from both accidental and purposeful burning during pithouse occupation, as well as during the final burning of the structure as a whole. Ubiquity measure is appropriate for remains from accidental burning because ubiquity considers frequency of occurrence rather than abundance, thus reducing preservation and sampling biases (Popper 1988). However, ubiquity measures are less appropriate for remains charred during the final burning of a housepit. In this case, because all remains have an equal chance of being preserved, using ubiquity measures may conceal cultural patterning (see Popper [1988] for additional drawbacks with this method of quantification). Both raw counts and ubiquity measures will be used throughout the discussion.

Gymnosperms

Cupressaceae (Cypress Family)

***Juniperus* sp. (Juniper).** The remains of juniper are rare in the assemblage in comparison to other woody species. This species is represented by only one piece of wood and a few stem fragments, all from HP 7. Both *Juniperus scopulorum* and *J. communis* are found at Keatley Creek today, in the Interior Douglas-fir Zone surrounding and at slightly higher elevation than the main part of the site. Both species likely grew in several biogeoclimatic zones in the general study area, with *J. communis* being far more ubiquitous. Ethnographically, boughs of both species were used for medicinal purposes and the wood of *J. scopulorum* was used for technological purposes. *J. scopulorum* berries were also casually eaten. *Juniperus* sp. could be harvested year-round as needed. Its relatively low abundance in the Keatley Creek assemblage indicates that it did not play a very important role at the site.

Pinaceae (Pine Family)

***Pinus* sp. (Hard Pines).** Unfortunately, based on minute anatomical wood characteristics, it is only possible to distinguish two general levels of pines—the hard and soft pines. Indeed, even this gross distinction is often difficult to make with archaeological specimens. The only soft pine in the study area is *P. albicaulis* (whitebark pine). The hard pines in the study area are *P. ponderosa* (ponderosa pine) and *P. contorta* (lodgepole pine).

All pine specimens that I was able to identify with confidence fall into the hard pine category. It is possible that some of the wood specimens which were more difficult to identify belong to the soft pine category, but it seems unlikely, given that they should be no more difficult to identify than the hard pine category.

Within the hard pine category, the majority of specimens are likely ponderosa pine. I say this because all other pine parts which I was able to identify (see below) are ponderosa pine. *P. contorta* may be also represented in the Keatley Creek assemblage; indeed this would not be surprising given its ubiquitous distribution in the study area.

Pinus charcoal is abundant at the site, and is second in abundance in some contexts only to *Psuedotsuga menziesii* (Tables 6–10). Its wood was used structurally in all three houses (Table 10). Teit (1895) notes that it was easily cut with stone tools. Ethnographically, *P. contorta* was used more frequently than *P. ponderosa* in house construction. Given that ponderosa pine

Table 1. HP 7 Roof – Plant Inventory

	SEEDS (N)											NEEDLES (N)			STEM	MISC. PLANT				CHAR † (g)
Provenience (sq. - subsq.)	*A. alnifolia*	*A.uva-ursi*	*Chenopodium*	Compositae	Cyperaecae	Ericaceae	Poaceae	*Phacelia*	*Ribes*	Unidentified	TOTAL	*P. mensiesii*	*P. ponderosa*	TOTAL	Poaceae (N)	Conifer cone part (N)	Unidentified bud (N)	Betula bark (g)	Unidentified tissue (N)	
A - 7										1	1	2**	2						1	
C - 7											0	126		126						5
I - 5	1		27			21	7	1	1	6	64	544	156	700			2	2	4	18
J - 1		1	10	1		2	2	2		3	21	1,485	1,007	2,492		3		1	8	18
Y - 1			2			6		1		1	10	67	37	104				2	2	4
HH - 1		3									3	172	45	217	1		1	1	1	13
II - 3						1	1			1	3	57	10	67		1				4
II - 3*											0	8	7	15						Neg‡
GG - 9		2			1?					2	5	73	50	123			2		3	10
GG - 9*	1	1	3			1					6	156	70	226		5		1	2	Neg
TOTAL	2	7	42	1	1	31	10	4	1	14	113	2,562	1,382	4,072	1	9	5	7	20	73
UBIQUITY (%)	20	40	40	10	10	50	30	30	10	60	.	100	100	.	10	30	30	50	60	.

* Samples originate from a stratum designated "walking surface below roof fill."

** Needles not separated by species. These counts used in total needle count but not in total species count.

† CHAR = grams of charcoal

‡ Neg = negligable

would have been much more plentiful than lodgepole pine in the immediate vicinity of the Keatley Creek village, the ease of transport may have outweighed any structural benefits that lodgepole might have had.

***Pinus ponderosa* (Ponderosa Pine).** This species is represented at Keatley Creek by many of its anatomical parts. Needle (including bundle bases), cone, stem, and bark fragments are found in abundance in the samples. Uncharred specimens of *P. ponderosa* seed coats were recovered from HP 7 rim deposits.

Ponderosa pine is a primary species in the forest surrounding Keatley Creek today, in both the Interior Douglas-fir and Ponderosa Pine Biogeoclimatic Zones. Its abundance in the archaeological assemblage indicates that it was a preferred species for a variety of functions. As a wood it burns relatively hot, is a good self-pruner (i.e., dead branches are easily removed from the tree) and would have been readily available to the site's inhabitants. Ponderosa pine is generally recognized as an excellent fuel source by Interior Salish Indians, and *Pinus* sp. is found in abundance at Keatley Creek in most hearths examined (Table 9). Ponderosa pine wood had a variety of other technological uses, and the cambium was eaten by the Nlaka'pmx and Lil'wet'ul.

Ponderosa pine needles are found in abundance in many of the samples examined. Their high concentration, along with Douglas-fir needles, around the periphery of the pithouses suggests that they may have been used for bedding material (see discussion of floors below). Ethnographically, dried pine needles were used for insulating houses, for filling crevasses in roofs or even covering roofs, were interspersed between layers of stored food, and were used in pit cooking. The ubiquitous nature of pine needles in all pithouse contexts suggests that the needles may have been used prehistorically in much the same manner. Ponderosa pine seeds were eaten by the Nlaka'pmx, and the seeds recovered in the rim of HP 7 may indicate it was a food source in the past as well. Wood and needles of ponderosa pine could be gathered year-round.

***Psuedotsuga menziesii* (Douglas-fir).** Douglas-fir is the single most ubiquitous and abundant wood species at Keatley Creek. Its charcoal, uncharred wood, and its needles are common in the deposits, and are generally much more abundant than the next most common species in these categories, *Pinus* sp. In a recent survey of cultural significance of plants among the Nlaka'pmx (Thompson) and Lil'wet'ul (Lillooet) conducted by Turner (1988a, 1988b, also 1992), Douglas-fir was rated

Table 2. HP 7 Rim – Plant Inventory*

	SEEDS (N)																						NEEDLES (N)			STEM		MISC. PLANT						WOOD (g)
Provenience (sq. - layer - sample)	*A. alnifolia*	*Amsinckia*	*A. uva-ursi*	Caprifoliaceae	*Carex*	*Chenopodium*	Collinsia	*Cornus*	Ericaceae	Poaceae (lg.)	Liliaceae	*Lithospermum*	*Opuntia*	*Phacelia*	*Pinus*	Polygonaceae	*Prunus*	*P. menziesii*	*Rosa*	*Sambucus*	Unidentified	TOTAL	*P.menziesii*	*P. ponderosa*	TOTAL	Poaceae (N)	*Juniperus* (N)	Conifer bud (N)	Conifer cone parts (N)	Unidentified bud (N)	Unidentified fruit (N)	Betula bark (g)	Unidentified tissue (N)	
D-a-24 charred					1				2		1?											4	2,800	1,200	4,000								4	23
uncharred	104		10			200			16			15	113		4		1	5				468	145	500	645							0.1	9	2
K-a-9 charred	36								3												3	42	3,434	961	4,395	100			2					12
uncharred	2	2				73			1													78	12	9	21									0
K-b-22 charred																						0	2,200	1,200	3,400			1	3				7	19
uncharred	778		6			19		2													1	806	1.530	3.100	4.630					2		0.8	1	9
K-b-28 charred																		3			9	12	1,180	2,710	3,890			1						20
uncharred	235		5			586							10								1	837	0	0	0									1
K-c-8 charred	1		1			1			12	1												16	5,000	1,600	6,600	12								9
uncharred	47	1	16			342							8									414	32.000	3.300	35.300		1	50				Neg ‡		5
K-c-10 charred						1				2											6	9	10,106	2,741	12,847				1				2	46
uncharred		1				311			9							1	1					323	5.764	5.843	11.607		7		2			0.3	2	42
K-c-11 charred	7																				2	9	4,658	1,193	5,851				2					23
uncharred	1.953	1	7			326						1										2,288	11.709	3.569	15.278			1	1	1		1.1		23
K-c-12 charred									10							1?						11	14,226	3,746	17,972	1,400		2					2	45
uncharred	134	2	12			1.200			2				2									1.352	4.080	4.642	8.722					1		Neg		4
K-c-13 charred									40										1		2	43	7,510	1,776	9,286	254		3					2	23
uncharred	72		235			1.296															1	1.604	2.138	1.310	3.448					6	1	0.6		4
K-c-26 charred													1								5	6	925	3,620	4,545				1					31
uncharred			39			102							6		1						1	149	1.100	2.800	3.900							4.5		18
L-a-28 charred	4		1	2			1		10	4											16	38	4,210	919	5,129	4	1	3	6	1			2	24
uncharred	2																					2	0	0	0									0
L-a-30 charred									1†												3	4	1175**		1,175								1	16
uncharred						16																16	2.600		2.600									0
L-a-23 charred			1						4					2						1		8	533	323	856								4	18
uncharred	4					40																44	0	1	1							1.8		0
M-c-60 charred	2																				1	3	3,875		3,875			1						26
uncharred						64																64	0	0	0									0
M-b-63 charred	5												1					1			2	9		1,840	1,840									12
uncharred						24																24	0	0	0									0
M-a-65 charred													1					5			3	9		1,165	1,165									12
uncharred						52															1	53	0	0	0									0
N-a-48 charred	9																					9	4,100	1,700	5,800									16
uncharred	34		16			140						13	128									331	90	210	300									8
N-d-66 charred																						0	330		330									13
uncharred	6					3																9	0	0	0									0
TOTAL	3,301	7	349	2	1	4,796	1	2	110	7	1	29	270	2	5	2	2	14	1	1	57	8,959	119,446	48,973	316,360	1,770	9	62	14	11	1	9.2	36	61
TOTAL (c)	64	0	3	2	1	2	1	0	82	7	1	0	3	2	0	1	0	9	1	1	54	231	52,658	23,689	92,356	1,770	2	11	11	0	0	0.0	19	53
TOTAL (uc)	3,237	7	352	0	0	4,794	0	2	28	0	0	29	267	0	5	1	2	5	0	0	4	8,728	66,788	25,284	224,004	0	7	51	3	11	1	9.2	3	8
Ubiquity (%)	50	14	33	3	3	53	3	3	23	8	3	8	25	3	6	6	6	11	3	3	44		81	83		13	8	22	17	14	3	25.0	31	
Ubiquity (%c)	39	0	17	6	6	11	6	0	44	17	6	0	17	6	0	6	0	17	6	6	61		100	100		27	11	33	33	6	0	0.0	44	
Ubiquity (%uc)	61	28	50	0	0	94	0	6	22	0	0	17	33	0	11	6	11	6	0	0	28		61	67		0	6	11	11	22	6	50.0	17	

* All rim samples are from an excavated trench.

** Needles were not counted separately. These counts are used in total needle count but not in total species count.

† = whole fruit with several joined seeds.

‡ Neg = negligable

Table 3. HP 7 Floor – Plant Inventory

	SEEDS (N)																NEEDLES (N)			STEM	MISC. PLANT					CHAR^t (g)
Provenience (sq. - subsq.)	*A. alnifolia*	*A.uva-ursi*	?Boraginaceae	*Chenopodium*	*Cornus*	Ericaceae	Poaceae (lg.)	Poaceae (sm.)	*Opuntia*	*Phacelia*	*Prunus*	*Rosa*	*S. stellata*	*Scirpus*	Unidentified	TOTAL	*P. menziesii*	*P. ponderosa*	TOTAL	Poaceae (n)	Conifer buds (N)	Conifer cone parts (N)	Fruit pedicel (N)	Betula bark (g)	Unidentified Tissue (N)	
A - 1															1	1	10**		10							0
A - 7						3										3	8	0	8							1
A - 9															1	1	1		1							1
B - 1															1	1	17		17						1	1
B - 7															1	1	30		30							2
B - 9															1	1	6		6							1
B - 15	1					1									2	4	31		31							8
C - 1															2	2	81		81							1
C - 13																0	271		271							3
C - 15	1														1	2	15		15							0
E -1										1						1	220	50	270							4
E - 7																0	23		23							1
E - 9																0	70	15	85							1
F - 7																0	36		36							1
F - 9				6											1	7	146	156	302						2	4
F - 15																0	50		50							1
F - 16															1	1	0		0							0
G - 7	1			5		2	1									9	144	27	171			2				5
G - 15						1									3	4	3	34	37							3
H - 1															3	3	20	160	180							4
H - 2		1			1	1			1			5	1		4	14	92	10	102							5
I - 9																0	120	13	133							1
I - 16*							1									1	111	466	577							6
J - 1	6															6	839	5,800	6,639			5				20
J - 9						3	1									4	617	250	667							8
P - 7															1	1	68		68							8
Q - 7*	1					3									5	9	17		17							20
Q - 15						1									10	11	44		44							4
R - 15						2									6	8	41		41						1	22
U - 9	1	1?				2	2								1	7	604	54	658	2		1	1			5
U - 15	12	1?		5		6	12	1				3			7	47	1,184	112	1,296	2		8			11	6
W - 11															1	1	160	160	160						5	
X - 8																0	2	0	2							1
X - 9						1			1						2	4	124		124						2	5
X - 16																0	80	21	101						1	3

	SEEDS (N)																NEEDLES (N)			STEM	MISC. PLANT					CHAR[t] (g)
Provenience (sq. - subsq.)	*A. alnifolia*	*A.uva-ursi*	?Boraginaceae	*Chenopodium*	*Cornus*	Ericaceae	Poaceae (lg.)	Poaceae (sm.)	*Opuntia*	*Phacelia*	*Prunus*	*Rosa*	*S. stellata*	*Scirpus*	Unidentified	TOTAL	*P. menziesii*	*P. ponderosa*	TOTAL	Poaceae (n)	Conifer buds (N)	Conifer cone parts (N)	Fruit pedicel (N)	Betula bark (g)	Unidentified Tissue (N)	
Y - 7	1														3	4	179		179						3	6
Y - 15		2		16	2		1								1	22	269	91	360	3	1			2	1	4
Z - 6															2	2	40		40						1	7
BB - 1	2														5	7	6	39	45						4	12
BB - 7						3					2					5	40	8	48							8
BB - 15						1										1	27	8	35							1
JJ - 7	2			5		2	2	1		11					3	26	124	59	183	5	1					6
JJ -8*						7				5					6	18	not counted		.	3						9
JJ - 9						1	2			1						4	183	51	234					2		4
JJ - 15						1									1	2	37	7	42							1
KK - 9				3		2	1	2								8	339	88	427	2						8
LL - 1	1					1					1					3	44	12	56			1				4
LL - 15							1									1	310	15	325			2				3
MM - 1	1			1		1										3	83	41	124							4
MM - 9																0	98	24	122							2
NN - 7																0	115	23	138						1	3
NN - 10														1		1	94	10	104						1	2
NN - 13*	1															1	36	17	53		1				1	5
OO - 1	1			2		1	1	1								6	282	102	384	1					1	5
OO - 9																0	342	158	500	2					2	3
PP - 7	2			3		2										7	357	180	527	1						3
PP - 7.2	1			26		2	2	1							2	34	1,446	208	1,654	32					2	6
QQ - 1				20												20	1,186	488	1,574	6						4
QQ - 7.2				8												8	2,000	98	2,098	6						4
RR - 1											1				1	2	140	17	157							4
RR - 7	1			3		1	1	1								7	280	56	336	4						6
RR - 15	1	1		1		1	1								1	6	160	32	192	2		1				5
SS - 15	1	1		5		1	1						1		1	11	197	43	231	5	1			1		4
SS - 2				1			1	2							7	11	374	25	399						2	2
SS - 9		1				1	13					1			1	17	304	69	373	3	1					6
TT - 7							20									20	1,350	393	1,743	25	1					6
UU - 14	2		1	16		2									3	24	2,870	402	3,272	41	1					8
VV - 7																9	524	46	970	5					2	3
VV - 15		1		18		4		1		2					2	28	252	109	361	6	2				5	4
TOTAL	40	9	1	148	3	62	64	13	2	20	4	9	2	1	94	472	18,129	10,078	29,549	79	9	20	1	7	44	323
Ubiquity (%)	29	11	1	26	3	45	25	13	3	7	4	4	3	1	52	.	99	97	.	28	11	10	1	6	28	.

* feature

** Needles not separated by species. These counts used in total needle count but not in total species count.

Table 4. HP 3 Floor – Plant Inventory

	SEEDS (N)															NEEDLES (N)					STEM	MISC. PLANT				CHAR' (g)
Provenience (sq. - subsq.)	*A. alnifolia*	*A. uva - ursi*	*Carex Sp.*	*Chenopodium sp.*	Ericaceae	Poaceae (lg)	Lilliaceae	*Opuntia sp.*	*Phacelia*	*P. menziesii*	*Rosa cf. woodsii*	*Scirpus*	*Silene sp.*	unidentified	TOTAL	*P. menziesii*	*P. ponderosa*	*A. tridentata*	Deciduous	TOTAL	Poaceae (N)	Coniferbuds (N)	Fruitpedicel (N)	Betula bark (g	Unidentified Tissue (N)	
A - 7								1							1	0	1			1						Neg
A - 9	1														1	3	1			4						2
B - 6					1	1				2					4	45	20			65						4
E - 7														1	1	2	1			3					1	1
E - 15									1				1		2	4	3			7			1		2	1
F - 3*					1										1	66	48			114						1
F - 9										1				1	2	7	1			8						4
F - 15					4				1	1				6	12	11	6		1	18						3
G - 6			1					1						1	3	1,180	35			1,215		1			2	9
G - 9	2	1			6										9	383	67			450						5
G - 16*	4								1						5	53	4			57						20
I - 1	1														1	20	11		1	32	1				1	4
I - 15	1				1										2	18	3			21						1
J - 1	1														1	276	70			356						5
J - 15					3										3	3	1			4						1
M - 1					2										2	132	18			150			1			2
M - 15				1											1	13	4			17						3
N - 1	1	1													2	42	1			43	1					2
N - 9	1	1			6										8	22	1			23						2
O - 10	1	1		5	2	1									10	1,564	254			1,818	24			2	1	6
O - 15	2			4		2									8	1,766	194			1,910	54	1			1	5
Q - 7						1									1	276	44			320		1			2	3
U - 1				4	1	1									6	87	9			96						3
U - 7	3			14			2?		2		1			1	23	600	6			606	13				5	3
V - 6					1			2							3	306	4			310	5				6	1
V - 9					1										1	73	2			75	2				1	Neg
W - 9	2	1?		1?											4	22	5			27					1	Neg
X - 13				2	1	1								2	6	51	6	1		50	3				3	3
AA - 1	1									1					2	4				4						3
EE - 1	1														1	6				6						1
EE - 15															0	28	1			29						2
II - I		1							2					2	5	36		1		37	2			1	1	1
II - 15		1		4	1										6	100	1	5		106	3	7			1	3
MM - 1															0	95	6			101					2	2
MM - 9	1			4	8			8							18	48	19			67	2				6	4
UU - 1	4	2				2						1			9	247	18			265	4					7
VV - 3	1				5									1	7	163	12			175	1					1
WW - 1		2												1	3	45	9			54						4
TOTAL	27	11	1	36	44	9	2	12	7	5	1	1	1	16	172	7,521	835	7	2	8,644	115	11	2	3	36	122
Ubiquity(%)	45	24	3	24	42	18	3	11	13	11	3	3	3	24	.	97	92	11	5	.	34	11	5	5	42	.

* feature

Table 5. HP 12 Floor – Plant Inventory

	SEEDS (N)					NEEDLES (N)			STEM	MISC. PLANT (N)			CHAR† (g)
Provenience (sq. - subsq.)	*A. alnifolia*	*Chenopodium sp.*	Ericaceae	unidentified	TOTAL	*P. menziesii*	*P. ponderosa*	TOTAL	Poaceae (N)	Coniferbuds	Deciduous buds	Unidentified Tissue	
A – 2					9	142	3	145				2	8
A – 11		2			2	326	1	327					2
B – 10		1			1	105	3	108					3
B – 15					0	60	5	65	1			1	Neg ‡
C – 15	1				1	101	2	103					1
D – 7					0	5	1	6					1
D – 15			1		1	3	1	4					1
E – 7		1	1		2	189	7	196				1	4
E – 11		1			1	912	2	914	1				7
G – 1		2			2	61	3	64	2	1			1
G – 10	1				1	60	3	63					1
I – 1		2		1	3	1	0	1					1
I – 9				1	1	2,041	72	2,113			3		8
I – 15		1			1	210	4	214				8	4
J – 1					0	34	1	35					Neg
J – 15					0	89	3	92					5
TOTAL	2	10	2	2	16	4,339	111	4,450	4	1	3	12	46
Ubiquity (%)	13	44	13	13	.	100	94	.	35	6	6	25	.

† CHAR = grams of charcoal ‡ Neg = negligable

Table 6. HP 7. Percent Wood and Charcoal Taxa from Select Rim Samples*

	Percent													
Sq.-samp #	**Pin**	**Pmen**	**Sam**	**Pop**	**Sal**	**Aln**	**Acr**	**Atri**	**?brk**	**?con**	**?dec**	**unid**	**tot dec****	**tot con****
Charcoal														
D-24	15	25	-	55	-	-	-	-	5	-	-	-	42	58
K-22	30	45	-	-	-	25	-	-	-	-	-	-	75	25
K-28	35	25	-	30	-	5	-	-	-	-	5	-	60	40
K-26	45	50	-	-	-	-	5	-	-	-	-	-	5	95
L-30	40	45	-	15	-	-	-	-	-	-	-	-	85	15
M-60	45	45	-	5	-	-	-	-	5	-	-	-	95	5
M-63	35	35	-	25	-	-	-	-	5	-	-	-	74	26
M-65	40	40	-	15	-	-	-	5	-	-	-	-	80	20
N-48	60	35	-	5	-	-	-	-	-	-	-	-	95	5
N-66	5	5	-	90	-	-	-	-	-	-	-	-	10	90
X ± sd	35 ± 16	35 ± 14	0	24 ± 29	0	3 ± 8	1 ± 2	0	2 ± 3	0	1 ± 2	0	62 ± 33	38 ± 33
Wood														
D-24	-	80	-	-	-	-	-	-	10	-	10	-	89	11
K-22	40	5	20	-	15	-	-	-	15	5	-	-	59	41
K-28***	35	20	-	-	-	-	-	-	-	5	30	10	61	39
K-26	65	10	-	10	-	-	-	-	5	5	-	5	89	11
N-48	65	5	-	-	-	15	-	-	5	-	5	5	78	22
X ± sd	41 ± 27	24 ± 32	4 ± 9	2 ± 5	3 ± 7	3 ± 7	0	0	7 ± 6	3 ± 3	9 ± 12	4 ± 4	75 ± 15	25 ± 15

* N=20 for all samples. Pin=Pinus sp.; Pmen=Psuedotsuga menziesii; Sam=Sambucus racemosa; Pop=Populus sp.; Sal=Salix sp.; Aln=Alnus sp.; Acr=Acer glabrum; Atri-Artemesia tridentata; ? brk=unidentified bark; ? dec=unidentified deciduous; ? con=unidentified conifer; ??=unidentifiable. Samples from Square M and N-66 contained charcoal, but no uncharred wood.

** Calculated using all specimens that could be placed in either the deciduous or coniferous categories.

*** Wood badly degraded and difficult to identify.

Table 7. HP 7. Percent Charcoal Species from Floor Flotation Samples

	Percent										
Sq.-subsq.	N	Pin	Pmen	Jun	Pop	Aln	Bet	?brk	?dec	tot con*	tot dec*
A-7	20	30	50	-	5	-	-	15	-	94	6
E-1	20	10	70	-	20	-	-	-	-	80	20
E-9	20	15	60	-	10	-	-	-	15	75	25
F-9	15	20	27	-	53	-	-	-	-	47	53
G-15	15	60	33	-	7	-	-	-	-	93	7
G-7	20	20	75	-	5	-	-	-	-	95	5
H-1	15	7	73	-	7	13	-	-	-	80	20
H-2	20	25	75	-	-	-	-	-	-	100	0
I-9	20	15	60	-	15	-	-	10	-	83	17
J-1	10	10	50	-	20	10	10	-	-	60	40
J-9	20	25	50	-	10	5	-	5	5	79	21
P-7	10	20	10	-	70	-	-	-	-	30	70
Q-15	10	10	80	-	-	-	-	-	10	90	10
R-15	10	-	80	-	20	-	-	-	-	80	20
V-7	10	10	60	10	10	10	-	-	-	80	20
W-11	10	10	90	-	-	-	-	-	-	100	0
X-9	10	40	50	-	10	-	-	-	-	90	10
X-8	20	30	55	-	-	-	-	-	15	85	15
Y-7	10	10	90	-	-	-	-	-	-	100	0
Z-6	10	-	40	-	60	-	-	-	-	40	60
BB-1	15	7	86	-	7	-	-	-	-	93	7
BB-15	20	30	70	-	-	-	-	-	-	100	0
BB-7	20	10	85	-	5	-	-	-	-	95	5
X ± sd	23	18 ± 14	63 ± 20	0.4 ± 2	15 ± 20	2 ± 4	0.4 ± 2	1 ± 4	2 ± 4	81 ± 19	19 ± 19

Ppon=Pinus ponderosa; Pmen=Psuedotsuga menziesii; Jun=Juniperus sp.; Pop=Populus sp.; Aln=Alnus sp.; ?brk=unidentified bark; ?dec=unidentified deciduous.

* Calculated using all specimens that could be placed in either the deciduous or coniferous categories.

as being the most important plant in the traditional culture of both groups; the Keatley Creek remains suggest that this was the case prehistorically as well.

Douglas-fir is found in a variety of contexts at Keatley Creek. It seems to have been the preferred wood for roof construction in HP 7 (Table 10), and was also a preferred construction wood in ethnographic times. Douglas-fir is an excellent fuel source for the same reasons as ponderosa pine, and is reported to be a preferred wood for pit-cooking, as well as puberty, illness, and death rituals. At Keatley Creek, it equals *Pinus* in abundance in hearth and rim samples in HP 7 (Tables 6 and 9), and exceeds pine in the floor contexts (Tables 7 and 8). The ethnographic literature documents the use of Douglas-fir boughs for bedding and floor coverings as well as in pit-cooking by the Interior Salish people. The distribution of Douglas-fir needles at Keatley Creek suggests that Douglas-fir boughs, like ponderosa pine, were placed on the floor on mats or on raised benches above floors of the pithouses.

Douglas-fir grows in the vicinity of Keatley Creek today as well as throughout the general study area. Indeed, it is the dominant tree species in the variety of biogeoclimatic zones in which in grows. Douglas-fir wood and boughs could be harvested year-round as needed.

Coniferous Buds. Several fragments of axillary buds (probably Douglas-fir) were recovered. Douglas-fir produce axillary buds in the fall; these remain on the branches all winter and then open in the spring (Allen and Owens 1972; USDA 1989). The buds in the samples are not opened, suggesting they may have been picked sometime in the fall or winter.

Monocotyledons

Cyperaceae (Sedge Family)

***Carex* sp. (Sedges).** This genus is represented by two seeds, one each from HP 7 and HP 3. Sedges grow in wet sites as well as dry, open forests within the study area. Ethnographically, only the Okanagan are reported to have used the leaves of a single *Carex* species (*C. concinnoides*) to layer between food in pit-cooking, as well as lining or covering berry baskets. The mature stems of *Carex* were harvested ethnographically in the late summer; the presence of *Carex* seeds in the archaeobotanical assemblage supports the notion of late summer or fall harvesting.

***Scirpus* sp. (Tule).** This genus is represented by one seed from the floor of HP 7, and one from HP 3. Two species of Scirpus, *S. lacustris* and *S. microcarpus* grow in the

Table 8. HP 3. Percent Charcoal Species from Selected Floor Flotation Samples

	Percent							
Sq.-subsq.	N	Pin	Pmen	Pop	Decid	Unid. bark	Unid. Conif*	Decid*
A-9	15		80	14	-	6	86	14
B-6	15	28	66	6	-	-	94	6
E-7	15	66	14	14	6	-	80	20
F-9	15	14	80	6	-	-	94	6
G-6	20	10	75	10	-	5	89	11
I-15	15	-	74	20	6	-	73	27
J-1	15	30	46	28	-	6	71	29
AA-1	15	6	74	14	-	-	80	20
EE-15	15	20	54	20	6	-	73	27
X ± sd	9	19 ± 21	63 ± 22	15 ± 7	3 ± 3	2 ± 3	82 ± 9	18 ± 9

Pin=*Pinus* sp.; Pmen=*Psuedotsuga menziesii*; Pop=*Populus*; Unid Dec=Unidentified deciduous; Unid Con=Unidentified conifer; Tot Conif = Total % Conifer; Tot Decid=Total % Deciduous

*Calculated using all specimens which could be placed in either the deciduous or coniferous category.

Table 9. Percent Charcoal Species from Hearth Flotation Samples from Three Housepits

	Percent							
Sq.-subsq.	N	Size	Pin	Pmen	Pop	Bet	Tot Con	Tot Dec
HP 7								
B-?	15	93	7	-	-	-	100	0
F-9	15	14	46	33	-	7	65	35
G-15	15	33	60	7	-	-	93	7
P-14	15	14	33	53	-	-	47	53
Q-7	10	100	-	-	-	-	100	0
Q-7	15	7	60	20	13	-	67	33
Z-9	15	20	46	34	-	-	66	34
BB-13	15	33	60	7	-	-	93	7
X ± sd	8	39 ± 36	39 ± 24	19 ± 19	2 ± 5	1 ± 3	79 ± 20	21 ± 20
HP 3								
G-16	20	10	85	5	-	-	5	95
HP 12								
I-9	15	40	60	-	-	-	0	100

Interior Plateau. Both are common in wet lands. Tule leaves were used for structural and technological purposes, particularly making mats. Like *Carex*, tule was likely harvested in the late summer.

Miscellaneous Unidentified. One seed tentatively assigned to this family was recovered from the roof deposits of HP 7.

Lillaeace (Lily Family)

***Smilacina stellata* (Star-flowered Solomon's-seal).** Two charred star-flowered Solomon's-seal seeds were recovered from the floor of HP 7. This species grows in the more mesic portion of the Interior Douglas-fir Zone. According to ethnographic information, ripe Solomon's-seal berries were eaten raw by several Interior groups, but not by the Fraser River Lillooet. Their presence in the Keatley Creek archaeobotanical assemblage may indicate a shift in food habits from prehistoric to ethnographic times. The berries ripen in late summer.

Miscellaneous Unidentified. A few miscellaneous seeds which may belong to this family were recovered from HP's 7 and 3.

Poaceae (Grass Family)

Miscellaneous Unidentified. Charred grass seeds from two species were recovered from several samples in both pithouses. I have thus far been unable to identify them to species (both are festucoids; Reeder 1957). One is large (3.5 mm × 1.0 mm) and likely originates from one of the larger grasses, perhaps *Elymus cinereus* (rye grass). The second is much smaller (1.0–1.5 × 0.5 mm). The large seeded species is both more abundant and more ubiquitous than the small species.

Charred fragments of grass stems are abundant in several samples from a variety of deposits in HP's 7 and 3. Because of the absence of diagnostic characteristics, the grass stems cannot be identified further. Grass stems were used by Interior Indians for a variety of technological purposes, such as basketry and weaving, lining of caches and steaming pits, and as bedding. Teit (1909:688) notes that meat was wrapped in grass before storing in the winter house.

The abundance of grass seeds and stems in the deposits corroborates the findings of the microfabric analysis, which revealed many grass phytoliths (Vol. I, Chap. 7). Most grasses go to seed in late summer.

Dicotyledons

Aceraceae (Maple Family)

***Acer* sp. (Maple).** This taxon (probably *Acer glabrum*) is represented by one charcoal specimen from the rim of HP 7. Maples are relatively common in the wetter areas of the interior Douglas-fir zone, usually in open areas, and are found at Keatley Creek today. Ethnographically, the tree was considered both an excellent source of wood for fuel and for various technological purposes, but it does not seem to have been preferred at Keatley Creek. The fibrous bark of Rocky Mountain maple was used to make soapberry whippers. The wood could be collected year-round; the bark was probably collected in the spring months.

Asteraceae (Aster Family)

***Artemisia tridentata* (Big Sagebrush).** One charred leaf and one charcoal fragment represents this taxon. Ethnographically, the shredded inner bark of sagebrush served many technological purposes (e.g., weaving clothing, tinder), and the wood was used as a fuel for cooking (Turner 1979:182) and smoking hides.

Today, sagebrush is a common plant throughout the dry Interior, as it is at Keatley Creek. Its relative absence in the Keatley assemblage is striking. The distribution of this shrub may have been somewhat more restricted prior to heavy grazing by cattle in historic times (see "Paleoenvironmental Reconstruction," below; also compare Turner 1992). Its relative absence in the Keatley Creek assemblages compared to pine, Douglas-fir, and *Populus* suggests that either it was less common around the habitation area than today, and/or it was not a preferred fuel wood. Sagebrush could be collected all year.

Miscellaneous Unidentified. One charred seed from this family was recovered from the roof deposit of HP 7. It may come from *Balsamorhiza sagittata*, the seeds of which were eaten ethnographically by the Nlaka'pmx and Okanagan.

Betulaceae (Birch Family)

***Alnus* sp. (Alder).** Alder (probably *A. sinuata*) is represented by occasional specimens of charcoal and uncharred wood from HP 7. Alders are found throughout the Plateau in cool, moist areas. Although they are not present in the gully at Keatley Creek today, this is the type of habitat in which they grow. As a hardwood, it provides relatively high heat when burned. Ethnographically, alder bark was used for dyeing and tanning.

***Betula papyrifera* (Paper Birch).** Paper birch is represented in the assemblage by two pieces of charcoal and numerous pieces of uncharred and charred bark "rolls." Paper birch was highly valued by the Interior Salish for its bark which was peeled off the tree. The bark was used for a variety of technological purposes, primarily for making containers of many types and for lining caches. Its wood was considered a general fuel by Interior groups, and was also used to construct various implements. The ability of birch bark to preserve uncharred is likely to due its high resin content.

Birch grows throughout the Interior in moist, open areas, and is found at Keatley Creek today. The relative absence of paper birch wood at the site, compared to the bark, suggests that the tree may not have grown in the immediate vicinity prehistorically, and only the easier to transport bark was regularly brought back to the site from elsewhere. Of course, the wood of birch may just not have been used. Birch bark could be collected throughout the year, but was primarily gathered in the late spring and early summer months. One uncharred (probably modern) seed from *Betula* was recovered from the rim of HP 7.

Boraginaceae (Borage Family)

***Amsinckia menziesii* (Small-flowered Fiddleneck).** Several uncharred seeds of this species were recovered from the rim of HP 7. *Amsinckia* grows infrequently at low to mid elevations in moist to dry disturbed sites; it was likely part of the flora growing in the vicinity of the Keatley village. No ethnobotanical uses have been recorded for this plant.

***Lithospermum* sp. (Stoneseed).** Several uncharred specimens from three rim samples represent this species; stoneseeds are never found charred at Keatley Creek. The archaeological context of these seeds is questionable. *Lithospermum ruderale* grows in abundance on the dry open areas surrounding the site today.

Its seed (actually a nutlet) is very hard and durable, and it is possible that it would be preserved uncharred in an archaeological context. In fact, *Lithospermum* seeds have been found in hearths and burials excavated in other Interior sites (Smith 1899; Stryd 1973). However, during the Keatley Creek excavations I noted that they are often found in rodent dens. Only the roots of this taxon are reported to have had ethnobotanical significance as both a food and dye. Until charred specimens of these seeds are found, or they are recovered in a context with no rodent disturbance, their prehistoric significance will remain in question.

Cactaceae (Cactus Family)

***Opuntia* sp. (Prickly Pear).** Several uncharred and a few charred seeds of the prickly pear cactus were recovered from both pithouses. Prickly pear cacti grow throughout the Interior in dry, open areas. *Opuntia fragilis* and *O. polyacantha* grow at Keatley Creek today. Prickly pear fruits were only occasionally eaten by the Interior Salish, the stem segments being much preferred. The fruits are small, whereas the stems were easier to harvest, and a more abundant resource. The seeds of the fruit may have been incorporated into the archaeological record attached to the stems, or the presence of the charred seeds may indicate that the fruits were eaten more frequently in the past. The fruits would have been available for harvesting in the summer and into the winter. All the uncharred *Opuntia* seeds which were recovered in the flotation samples had been partially eaten by rodents. Had some not been found charred, and in several secure contexts (i.e., non rim deposits), their prehistoric use would remain in question. Whether the uncharred seeds in the rims are in their primary context remains unclear (see discussion of rims, below).

Caprifoliaceae (Honeysuckle Family)

***Sambucus* cf. *cerulea* (Elderberry).** One charred seed belonging to this taxon was recovered from the rim of HP 7. The Interior Salish collected elderberries in the late summer and ate them fresh or dried them for winter use. *S. cerulea* grows throughout the Interior in valley bottoms and on open, dry slopes.

Miscellaneous Unidentified. Two charred seeds tentatively assigned to this family were recovered from the rim deposits of HP 7.

Caryophyllaceae (Pink Family)

***Silene* sp.** One charred, partially complete seed from this herbaceous taxon was recovered. At least one species (*S. noctiflora*) of this genus may have been used as a charm in ethnographic times. That particular species is a widespread weed in disturbed habitats. To what species this particular seed belongs cannot be determined with such a small sample.

Chenopodiaceae (Goosefoot Family)

***Chenopodium album* and *Chenopodium* sp. (Lamb's Quarters).** This weedy, herbaceous genus is represented by many uncharred seeds from almost every analysed sample. I have identified the uncharred specimens as *C. album*, an introduced species. The *C. album* seeds generally measure to approximately 1.0 mm^2, (they can be as small as 0.5 mm^2). An intact endosperm inside several of the seeds indicates that those specimens are modern.

Far fewer charred specimens were recovered. The charred specimens have not been identified to species because the charring has somewhat altered their morphology. The seeds are usually smaller than the uncharred *C. album* (approximately 0.5 mm^2), although the size of the charred seeds does fall within the range of *C. album*. The smaller, charred seeds likely belong to one of the several native varieties of *Chenopodium* which grow in the Interior.

How the native chenopod seeds became introduced into the archaeological record remains a bit of a mystery. The young leaves of *C. album* were boiled and eaten in historic times, and it is possible that the native varieties were used similarly prehistorically. In this scenario, the seeds would have been introduced attached to the stems with the edible leaves. However, *C. album* leaves are most palatable in the spring, before going to seed, and thus would be invisible archaeobotanically. A more likely scenario is that the chenopod plants were harvested accidentally in the fall along with other deliberately collected resources, such as grasses. Finally, given the ubiquitous nature of this weedy species, and the ability of each individual plant to produce abundant seeds, it is also possible that the seeds were accidentally introduced into the deposits (see discussion of rim and floor formation processes, below).

Cornaceae (Dogwood Family)

***Cornus stolonifera* (Red-Osier Dogwood).** A few uncharred and charred seeds from this taxon were recovered from HP 7. Ethnographically, the berries of *C. sericea* were gathered by the Interior Salish in mid-summer. The berries were eaten fresh, and the pits may have also been a snack; the berries were also sometimes dried for later use. Red-osier dogwoods grow throughout the Interior in the moister areas of the Douglas-fir zone, as well as other biogeoclimatic zones in the study area.

Ericaceae (Heather Family)

***Arctostaphylos uva-ursi* (Kinnikinnick).** Kinnikinnick seeds were recovered from several samples in both HP's 7 and 3, and are especially ubiquitous in HP 7. They are mostly found uncharred, but charred specimens were recovered as well. This low, trailing shrub is a common plant throughout the dry slopes of the Plateau, although it does not presently grow at Keatley Creek. The berries were eaten raw or fried by many Interior people and could be harvested from late summer to well into the winter if the snow cover was not too extensive. Kinnikinnick seeds have been recovered from burial sites in the Interior (Smith 1900), and were important in rituals of death and bereavement (Teit 1900). The leaves were also smoked, and the berries may have entered the pithouse attached to the branches. The leaves could have been gathered year-round.

Unidentified Miscellaneous. Uncharred and charred seeds from an unidentified taxon from the Ericaceae family are among the most abundant and ubiquitous of the seeds recovered at the three housepits. They are small seeds (roughly 1.0 mm × 0.5 mm × 0.5 mm). A single specimen which was found with all the seeds still in their original position suggests that they come from a small fruit (approx. 1.0 mm^3). These seeds are often found when no other botanical remains (i.e., except needles and charcoal) were recovered. Its ubiquitous presence in several contexts at this site and other Interior sites (Lepofsky 1987) suggests that it was probably both used extensively in the past, and was a common enough plant to be introduced accidentally into archaeological contexts. The ethnographic literature offers no definite leads; it may be a plant for which there is no recorded ethnobotanical information.

Grossulariaceae (Gooseberry Family)

***Ribes* sp. (Gooseberry).** Charred seeds of a small seeded gooseberry were recovered from the roof of HP 7. Several species of gooseberry grow throughout the more open areas of the Douglas-fir Zone. Gooseberry fruits ripen in mid summer; all species of gooseberry were eaten by the Interior Indians, though some were preferred more than others. The fruits of the preferred species were dried for later use.

Hydrophyllaceae (Waterleaf Family)

***Phacelia* sp.** A few charred seeds from this taxon were recovered from HP's 3 and 7. This may be *P. linearis*, but positive identification has not yet been made. Both *P. linearis* and *P. hastata* are found throughout the Interior Plateau, in dry open sites. Steadman (1930, cited in Turner et al. 1990) reports that *Phacelia* had medicinal value in historic times.

Polygonaceae (Buckwheat Family)

Miscellaneous Unidentified. One uncharred fragment of a seed belonging to this family, and one charred fragment tentatively assigned to this family, was recovered from the rim of HP 7.

Rosaceae (Rose Family)

***Amelanchier alnifolia* (Saskatoon).** Seeds of the saskatoon are among the most common and ubiquitous of the paleoethnobotanical remains at Keatley Creek. They are found charred and uncharred in a variety of contexts. They range in size considerably (from ca. 0.5 mm to 2.5 mm), and probably represent different varieties. Saskatoons were among the most highly valued fruit of the Fraser River people (Turner 1992). Saskatoons were gathered from mid to late summer depending on the locality and variety, and were eaten fresh or dried for later use. A mixture of dried saskatoons and dried salmon was a prefered winter food (Sam Mitchell in Romanoff 1992:237). Saskatoons are the most consistently abundant, from year to year, of all the berries eaten. The shrub is common in the Interior, growing on dry open hillsides and woods, especially in old burn sites. In fact, it is possible that areas were regularly burned to maintain its abundance (Turner 1992:413). It does not grow in the immediate vicinity of the Keatley Site today.

***Prunus* sp. (Cherry).** A few charred and uncharred seeds from this taxon were recovered from the rim and floor of HP 7. Three cherry species grow in the southern Interior today: *P. virginiana*, *P. emarginata*, and *P. pensylvanica*. The fruits of all three species were eaten by Interior Plateau peoples, but only *P. virginiana* was gathered in abundance and either eaten fresh or dried for later use.

***Rosa* cf. *woodsii* (Wood Rose).** This taxon is represented by charred and uncharred seeds from HP's 3 and 7. The fruits of all the rose species were eaten sparingly by the Interior Salish. They ripen in the late summer, but can be harvested through the winter because they remain on the bushes. They were sometimes dried. *Rosa* grow in the moister areas of the Interior Douglas-fir forests, as well as the Interior Subalpine and Ponderosa Pine Biogeoclimatic Zones.

Salicaeae (Willow Family)

***Populus* sp. (Aspens/Cottonwoods).** Aspen/cottonwoods are represented at Keatley Creek by an abundance of charcoal from all pithouses. After Douglas-fir and pine charcoal, it is the most commonly represented charcoal category at the site. It was used

Table 10. Identified Beams, Planks, and Posts from Three Housepits

Sq.-subsq.	Total N	Pin	Pmen	Pop
HP 7				
Roof beams	12	1	8	3
Floor posts	4	2	2	0
HP 3				
Floor planks	6	1	0	5
Floor posts	2	0	0	2
HP 12				
Roof beams	4	3	1	0

in roof construction at HP 7, and for posts and a bench plank in HP 3 (Table 10). *Populus* sp. are generally found along watercourses or moist areas throughout the Interior. Today both *P. balsamifera* and *tremuloides* are common around Keatley Creek itself. *Populus* is a good self-pruner. *P. balsamifera* is reported to have been valued in historic times by the Lil'wet'ul both to smoke fish and for fuel. *P. balsamifera* was also used for making dugout canoes and rafts, and the bark and branches served a variety of technological purposes.

***Salix* sp. (Willows).** Willows are rare in the assemblage, and are only represented by uncharred wood fragments from the rim. It is never found as charcoal. It may not have been highly valued for fuel, as it is a poor self-pruner, and is difficult to collect. Ethnographically, the willow branches were used for various technological purposes such as making fishing weirs and basket traps. It could have been collected year-round.

Scropulariaceae (Figwort Family)

***Collinsia parviflora* (Small-flowered Blue-eyed Mary).** One charred seed of this species was recovered from the rim of HP 7. *Collinsia* grows throughout the Plateau in ponderosa pine and Douglas-fir forests and in grasslands. No ethnobotanical uses have been recorded for this species.

Other Unidentified Plant Remains

Outer Tissues. This miscellaneous category includes both woody and soft outer tissues. Many different taxa are represented in these general groupings, probably from several different plant parts (i.e., fruit "skins," root/bulb outer skins, bark). No doubt there is much information on prehistoric plant use to be learned from these specimens. However, their identification to taxa is dependent on acquiring a larger sample size, assembling a more complete comparative collection, and examination with special microscopy techniques (i.e., SEM; cf. Hather 1991).

Unidentified Fruit, Bud, and Fruit Pedicel. These are other miscellaneous categories into which several unidentified taxa have been placed.

Unidentified Plant Material. This category includes botanical specimens which could not be identified taxonomically or anatomically. Usually the specimen is too small or decayed for identification.

Formation Processes

Source and Preservation

Determining the source of remains is a basic consideration in any discussion of formation processes. For botanical remains, of interest is both how remains entered the site as well as how they came to be preserved in the archaeobotanical record (Pearsall 1988). The following section outlines the source and context of preservation of the plant remains recovered in the Keatley deposits. This information is a critical component of the subsequent discussion of the formation history of the roof, rim, and floor deposits.

Source of Archaeobotanical Remains

The plant remains recovered from the three housepits can be grouped into four categories: charcoal and wood (including bark), needles and grass, seeds, and birch bark. The first three categories are composed of taxa which potentially originate from several different sources. Below, I outline the potential sources of each of these categories; the possible sources of individual identified seed taxa are presented in Table 11. The following analyses of the formation histories of the roof, rim, and floor focus only on charcoal, needles, and seeds. Birch bark remains were not recovered in sufficient quantities from flotation samples to include in the analyses.

Charcoal and Wood

1) Collected for fuel or as fire starter.
2) Collected for tools.
3) Used in pithouse construction.

Needles and Grass stems

1) Collected for mats, bedding, pit liners, or roofing material.
2) Collected for fire starter.
3) Accidentally introduced by humans.
4) Introduced by rodents.

Seeds

1) Gathered for the edible fruit.
2) Gathered as non-food item (medicinal, ritual).

3) Gathered incidentally with plant parts deliberately gathered for food.
4) Gathered incidentally with plant parts deliberately gathered for non-food purposes (e.g., roofing material).
5) Accidentally introduced by humans.
6) Introduced by rodents.

Birch Bark

1) Collected with birch wood for fuel.
2) Collected as fire starter.
3) Collected for artifact construction, pit liner, or for roof construction.

Preservation of Plant Remains

There are several processes through which the archaeobotanical remains came to be preserved in the pithouses. Given the preservation conditions in the floor and roof, only charred remains are considered to be prehistoric in these deposits. The exception to this is birch bark "rolls" which are found uncharred throughout the deposits (see Plant Inventory). The high resin content in the birch bark probably makes it more resistant to decay than other plant materials.

Charred plant remains may have entered the record in one of several ways. Some remains became charred during the occupation of the pithouses via accidental or purposeful charring in one the floor hearths. In addition, plants were charred after abandonment, when the entire structure burned. The burning of the structure likely preserved plants which were introduced to the record both during and after pithouse occupation. An important question about site formation processes involves distinguishing between these two scenarios.

Unusually dry conditions in the rim deposits promotes the preservation of uncharred as well as charred plant remains. Distinguishing the source of uncharred remains in the dry rim deposits is somewhat problematical since these remains may have been introduced to the rims during pithouse occupation (purposefully or accidentally), or they may be considerably more recent introductions (via rodents). Identifying the source of the uncharred specimens is an important component in understanding the formation history of the rim deposits.

How the Roof Deposits were Formed

Despite the small number of flotation samples from HP 7 roof deposit (N=10; Table 1), the archaeobotanical analysis does offer some insights into roof formation processes. A non-random distribution of remains across the roof is suggested in Figure 1. There appears to be a trend towards a concentration of remains along the periphery of the structure, but confirmation of this requires more extensive sampling. More certain is the fact that there is a general correlation in density of remains across the three categories.

An examination of the range of taxa comprising the roof assemblage suggests the remains originate from plants collected for food (Table 11) and for roof construction. There are three possible sources of the plant food remains on the roof: 1) they are the remains of food processing on the roof itself; 2) they are the remains which originated from processing which took place inside the house or elsewhere, and then were later dumped onto the roof in a cleaning event; or 3) they are the remains of food that was originally stored in the rafters of the house and became incorporated in the roof deposit when the roof collapsed.

Table 11. Potential Sources of Seed Taxa Recovered from the Keatley Creek Housepits[1]

1. Collected for edible fruit
Amelanchier alnifolia
Arctostaphylos uva-ursi
Cornus stolonifera
Ericaceae
Prunus sp.
Ribes sp.
Rosa cf. woodsii
Sambucus cerulea
Smilacina stellata

2. Collected as non-food item
Silene sp.

3. Collected incidentally with food
Chenopodium sp.?[2]
Opuntia sp.

4. Collected incidentally with non-food item
Pinus sp.
Psuedotsuga menziesii
Poaceae
Carex/Scirpus sp.
Chenopodium sp.
Silene sp.
Arctostaphylos uva-ursi
Phacelia sp.

5. Unknown source
Amsinckia menziesii
Collinsia parviflora
Lithospermum ruderale

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1. Categories of potential sources correspond to those outlined in Table 3 for sources of seeds. Since any taxon can be introduced accidentally by humans or by rodents, these potential sources have been excluded from the table. Taxa identified to family level which contain a wide variety of species (e.g., Caprifoliaceae, Compositae, Polygonaceae) are not included in the table.
2. The leaves of chenopods were eaten by Europeans in the early contact era, and it possible that they were eaten in prehistoric times as well. Chenopod seeds may have entered the archaeological record attached to plants collected for their edible leaves. However, the leaves were eaten in the spring when they were tender; seeds are not produced until mid to late summer.

Though the archaeobotanical data do not allow further evaluation of the three alternative scenarios, other independent data provide some insights into the formation of the roof deposits. Concerning the first scenario, the absence of features on the roof of HP 7 argues against food plants being processed on the roof itself. The second scenario, that the remains originate from elsewhere and then were dumped on the roof, is supported by the fact that the eastern side of the roof was used as a discard area for fauna and FCR. We have no way of independently evaluating the third scenario.

If, in fact, the plant food remains originate from elsewhere, the floor is a likely source of those remains. To explore this possibility, I compared the density and diversity of remains on the roof to that of the floor. If the floor is indeed the orginal source of the plant remains, the density and diversity of remains in the roof should be higher than on the floor. The reasoning for this is that if the debris from multiple activities was regularly cleaned from the floor and then deposited on the roof, over time the roof should display a greater density and diversity of remains than the floor. However, when the density of remains on the roof and the floor are compared, they can not be distinguished statistically (Table 12). In terms of diversity, more taxa are recovered from the floor deposit than the roof (Tables 1 and 3), but this may be a factor of sample size. Taken together, these analyses lend no support for the hypothesis that the floor was a source of the roof remains.[1]

Of the non-food plants, the abundance of chenopods and grasses recovered from the roof requires explanation (Table 1). Two possible explanations emerge. In the first scenario, the seeds were introduced accidentally when the roof was being constructed. The grass seeds may have been collected incidentally with grass stems that were collected for roofing material, and the chenopods may have also been gathered accidentally with the grasses (Table 11). In fact, the editor of this volume has observed hundreds of chenopod seeds among the grasses he has collected from his own garden.

An alternative explanation for the presence of the chenopods and grasses is that they were not collected, but were growing naturally on the roof and perimeter of the structure. Pollen analysis from the Keatley and Bridge River sites does indicate that both grasses and chenopods grew in abundance at the site (see Vol. I, Chap. 4). At this time, we have no way of evaluating further these two alternate scenarios.

Post-occupation formation processes, specifically the burning of the structure after abandonment, was clearly a major factor influencing the patterning of plant remains on the roof. In the case of the chenopods and grasses, regardless of how they were introduced into the roof deposit, they became preserved in the archaeobotanical record when the roof burned. The charring of remains during the burning of the structure also accounts for the preservation of the wood (as charcoal) and the needles recovered in the roof deposit.

The post-occupation burning of HP 7 may also explain the relatively low abundance of remains overall across the roof. Given that pithouse roofs were constructed of a superstructure of wooden beams with a covering of needles, boughs, and possibly grasses, a considerable amount of charred wood, needles, and grasses should be distributed throughout the roof deposit. Yet the abundance of these remains on the roof is quite low (Table 1). In fact, a statistical comparison of abundance of charcoal and needles in the roof relative to the floor and rim deposits indicates that the roof and floor have a similar abundance of remains, while the rim has a far greater abundance of both charcoal and needles (Table 12).

Again, I can think of two alternate scenarios which may explain the low overall abundance of plant remains recovered from the roof deposit. A possible explanation for the low abundance of structural remains is that wood was salvaged from the roof prior to the burning of the structure. However, this does not explain the relatively low abundance of other roofing materials, such as needles and grasses. An alternative explanation for the low abundance of all roof material is that the house fire was of sufficient intensity to burn much of the remains completely to ash.

How the Rim Deposits were Formed

The rims are by far the most complex of the pithouse deposits. Unlike the more internally homogenous roof and floor deposits, portions of the rims are composed of layers and lenses, which are in turn comprised of both charred and uncharred plant remains. Determining the source of these sediments is fundamental to an understanding of the formation history of the rim.

The complexity of the rim deposits is reflected in the multiple components of the analysis of rim formation processes. The following questions are explored in turn, below: 1) what are the effects of

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[1] In the first field season I analyzed 27 samples from secure roof and floor deposits from four pithouses (HP's 1, 3, 4, 7) in an attempt to identify criteria for distinguishing between roof and the floor deposits. I examined number and kind of floral remains and degree of rounding of charcoal fragments, but found no statistical differences between the deposits (Lepofsky 1986). With a larger sample from the roof, differences between the taxa represented in the two deposits may have emerged.

Table 12. Comparisons of Average Density of Remains in Roof, Floor, and Rim Deposits in HP 7*

		N	*X*	sd
Roof vs Floor				
charred wood (g)	$p = 0.11$			
	roof	10	7.9	6.5
	floor	65	4.7	4.3
charred needles (N)	$p = 0.87$			
	roof	10	307.2	461.5
	floor	65	444.7	971.8
charred seeds (N)	$p = 0.772$			
	roof	10	11.3	19.6
	floor	65	6.8	9.1
Roof vs Rim				
charred wood (g)	$p = 0.001$			
	roof	10	7.9	6.5
	rim	19	21.8	10.1
charred needles (N)	$p < 0.0001$			
	roof	10	307.2	461.5
	rim	19	4915.8	4460.0
charred seeds (N)	$p = 0.128$			
	roof	10	11.3	19.6
	rim	19	21.8	10.1
Rim vs Floor				
charred wood (N)	$p < 0.0001$			
	rim	19	13.8	13.1
	floor	65	4.7	4.3
charred needles (N)	$p < 0.0001$			
	rim	19	4915.8	4460.0
	floor	65	444.7	971.8
charred seeds (N)	$p = 0.04$			
	rim	19	13.8	13.1
	floor	65	6.8	9.1

* Comparisons of roof vs. floor and roof vs rim are Mann Whitney U tests; rim vs floor comparisions are t-tests. All tests are calculated on abundance per 1 liter flotation sample.

bioturbation; 2) is the uppermost layer of the rim (layer XIIIA) redeposited sediment derived from the roof; 3) are there differences in composition of the layers within the rim; and 4) is the rim a disposal area for refuse from the pithouse.

Bioturbation in the Rims

There are several indications that the rim deposits have been disturbed to some degree by rodents or other biological agents. Although internal stratigraphy was observed in some portions of the rim, other portions of the deposit are internally homogenous. The rarity of discrete lens of either burned or unburned remains suggests that some of the deposit has experienced some mixing. Bioturbation, possibly combined with trampling of deposits by walking on the rim surface, may in part be responsible for the mixed matrix.

More definitive evidence of rodent activity in the rims is provided by the many uncharred seeds which have been gnawed (e.g., all the uncharred *Opuntia* seeds have been partially eaten), and the higher concentration of rodent coprolites in the rims relative to other contexts. Given that uncharred plant remains are potential food sources for rodents, it is important to distinguish those remains which may have been introduced to the deposits by rodents (either during or after occupation) and those which were deposited as part of a cultural event.

To examine the relationship between rodent disturbance and the uncharred remains, I compared the abundance of coprolites and uncharred seeds. Assuming that the rodent coprolites are a measure of rodent activity, we would expect a positive relationship to exist between the coprolites and the uncharred seeds if the uncharred seeds were introduced by rodents. The absence of such a relationship would suggest that the source of the uncharred remains cannot be attributed solely to rodents.

A comparison between the two categories of remains indicates that the relationship between uncharred remains and rodent coprolites is not straightforward. There is no statistical relationship between the number of rodent coprolites and all uncharred seeds in the rim samples ($r^2=0.004$), nor are there significant relationships between coprolites and the most abundant uncharred seed taxa (*Amelanchier* $r^2=0.16$; *Arctostaphylos* $r^2=0.001$; *Opuntia* $r^2=0.000$; *Chenopodium album*; $r^2=0.004$).

It may be that coprolites are not a sufficient measure of rodent disturbance in the rim deposits. However, until a better measure is devised, I will assume that the uncharred remains which are not obviously modern (i.e., have an intact embryo or are an introduced species [e.g., *C. album*]) are part of the initial cultural depositional event.

Relationship of Upper Rim Layers to Roof Deposits

A working hypothesis during excavation of the Keatley Creek pithouses was that the uppermost level of the rims (level XIIIA in HP 7, see Vol. III, Chap. 6) is redeposited roof material from prior rebuilding events (Hayden 1987). This hypothesis resulted from the field observations that level XIIIA had a similar appearance to the roof deposits, and contrasted with the other rim deposits both in color and apparent composition.

To test the notion that level XIIIA of the rim originates from the roof, I compared the density and diversity of botanical remains in the two deposits. Since there is no evidence to suggest that the two deposits underwent different post-depostional processes, I assumed that any differences observed reflected the original composition of the deposit. Thus, similar density and diversity of floral remains in the roof and upper rim deposits would support the hypothesis that rim XIIIA sediments originated in the roof. Furthermore, differences in density and diversity between the upper rim stratum and the other rim strata are expected if rim XIIIA has a unique history from that of the rest of the rim deposit.

A comparison of remains indicates that XIIIA rim and the roof generally differ in density, but not diversity of charred botanical remains. Statistically, more charcoal and charred needles were recovered from the rim XIIIA samples than from the roof, but the abundance of seeds in the two samples are similar (Table 13). The two deposits cannot be distinguished in terms of diversity of taxa, based on the average number of taxa per flotation sample (Mann Whitney U test, *p*=0.27, roof *X*=3.8 ± 3.9, N=10; XIIIA *X*=6.7 ± 7.7, N=6).

Rim XIIIA also differs from the rest of the rim deposit in density of remains. With the exception of seeds, the rim XIIIC samples have more remains on average than the uppermost rim level (Table 13). However, the two rim deposits cannot be distinguished based on average diversity of seed taxa (Mann Whitney U test, *p*=0.772, XIIIC *X*=4.3 ± 2.2, N=7).

The results of the analyses do not clearly support or negate the hypothesis about the origin of the upper rim material. That rim XIIIA and the roof differ in density or remains suggests that Stratum XIIIA did not originate solely from the roof. However, a more complex formation history of XIIIA which involved a mixing of sediments both from the roof and other sources (such as organic rich lenses from the rim) still remains a possibility. The differences in density of charred remains between the upper rim and the rest of the rim deposit do suggest that rim XIIIA may have a unique depositional history, but what that is cannot be determined with the given sample.

The greatest deterrent to deciphering the origin of the rim deposits is the small sample size available. The large standard deviations in abundances within the levels of the rim (Table 13) reflect a great amount of internal diversity within the strata. It is likely that we have not adequately sampled the internal variation of this complex strata, and our comparison may be premature. Larger samples composed either of sediment originating from only one lens, or several large pinch samples from throughout the entire stratum would be more representative of the internal variation. A detailed study of the formation processes involved in rim formation would be an undertaking of major proportions.

Table 13. Comparisons of Average Density of Remains in Rim and Roof Deposits in HP 7*

		N	*X*	sd
Roof XIIIA vs Roof V				
charred wood (g)	$p = 0.04$			
	rim a	7	17.3	4.8
	roof	9	9.2	6.1
charred needles (N)	$p = 0.04$			
	rim a	7	3141.0	1992.0
	roof	9	518.0	804.0
charred seeds (N)	$p = 0.75$			
	rim a	7	17.0	16.0
	roof	9	17.0	21.0
Rim XIIIA vs Rim XIIIC				
charred wood (g)	$p = 0.07$			
	rim a	7	17.3	4.8
	rim c	7	28.9	12.8
uncharred wood (g)	$p = 0.03$			
	rim a	7	1.4	2.8
	rim c	7	13.8	15.2
charred needles (N)	$p = 0.02$			
	rim a	7	3212.7	2088.8
	rim c	7	8716.9	5109.2
uncharred needles (N)	$p = 0.05$			
	rim a	7	509.6	952.9
	rim c	7	11187.0	11845.0
charred seeds (N)	$p = 0.95$			
	rim a	7	17	16
	rim c	7	15	14
uncharred seeds (N)	$p = 0.04$			
	rim a	7	142	182
	rim c	7	864	850

* All tests are Mann Whitney U tests, calculated on abundance of remains per 1 liter flotation sample.

Variation within the Rim Deposit

As discussed above, inadequate sampling prohibits a detailed statistical comparison of the variation in rim layers. However, qualitative differences between the strata can reveal some aspects of interest about the formation history of the rim deposits. For instance, in contrast to other rim contexts, uncharred wood is completely absent from samples from Square M, from Strata XIIID, and is largely absent from samples from Strata XIIIA (see Vol. III, Chap. 6). Uncharred needles are also rare or absent in these strata.

The relative absence of uncharred material in these deposits is likely due to differential preservation across the rim. Uncharred remains are less likely to survive in the bottom of the rim (XIIID) where water can collect at the interface between the rim and the more compact sterile layer underneath. Furthermore, when the initial rim deposits were laid down, the surrounding matrix may not have been suitable for preservation of uncharred remains (i.e., the soil may have been too basic or too moist). In essence, the buildup of the first strata of remains (XIIID) was probably needed to gradually change the conditions of the matrix to encourage preservation of other uncharred remains. This is analogous to the formation of shell middens in coastal sites where shells have deteriorated in the initial deposits but are better preserved as the midden accumulates.

Similarly, uncharred remains are less likely to be preserved in the uppermost stratum of the rim (XIIIA) because the deposit was apparently churned repeatedly and is subject to more moisture than the lower deposits. A similar reason may apply to the sample at the northern periphery of the rim (Square M). The rim deposits are thinner along the structure's edge, and more of the remains are subject to degradation either from surface moisture or moisture collected at the bottom of the rim.

The nature of the matrix provides another difference between rim samples. In most rim samples the matrix is composed of an extremely fine, loose sediment. By contrast, sediment is more consolidated in samples K/b-22 from Stratum XIII and K/c-26 from Stratum XIII. In addition, horizontal bands of decayed plant material were noted during excavation (Vol. III, Chap. 6). The plant material is too decayed for identification, but appears to be composed of several species with both woody and non-woody materials.

The Rims as a Disposal Area for Refuse from the Pithouse

The presence of discrete lenses in some parts of the rims, as well as the overall thickness of the deposit, suggests that the rims were formed by multiple dumping events. One possible source of the sediments may be refuse from activities which were conducted on the pithouse floor and then later redeposited on the rims when the floor was cleaned. If the floor was the source of the rim sediments, there should be a higher density of remains in the rims than on the floor of the housepit. Diversity in the rims may also be higher, but since density and diversity are correlated in the pithouse floor deposits (Vol. II, Chap. 4, Fig. 5), diversity would not be a useful measure of the source of the material.

A comparison of density of charred remains in the two deposits indicate a higher density of all categories of plant remains in the rim than the floor (Table 12). The rims are also more diverse than the floor, as indicated by the average number of seed taxa per flotation sample (t-test, p=0.06; rim X=4.9 ± 5.0, N=18; floor X=3.1 ± 3.1, N=65), but this may simply be a reflection of density. These data support the hypothesis that the floor as a whole may be a source of the rim sediments. The wide array of potential sources of seed taxa in the rim (Table 11) suggests the seeds originated from several, discrete dumping events.

Thus far, the analyses of rim formation has focused on charred remains, since only charred remains can be used in comparisons between the three deposits. What remains now is to examine the potential source(s) of the uncharred remains within the rim and to examine whether they differ from that of the charred remains from the same deposit. The uncharred and charred remains clearly differ in that only one set was burned prior to deposition, but what is not immediately obvious is whether the two groups of remains also initially originate from different activities.

To examine the source of the uncharred remains in the rim, I compared the relative abundance of uncharred and charred taxa within the rim itself. I limited the analysis only to wood remains, since the distribution of uncharred wood is less likely to be affected by rodent disturbance than uncharred food remains. If the charred and uncharred wood originate from a different source, on average the same taxa should be represented in different relative abundances of both the charred and uncharred material.

A comparison of the three most abundant wood and charcoal taxa (Table 6) suggests the charred and uncharred wood within the rim were subject to different formation processes. Charred *Populus* wood from the rim was recovered in greater abundance than uncharred *Populus* taxa (Mann Whitney U test, p=0.031), which suggests that charred and uncharred *Populus* fragments resulted from different activities. The charred and uncharred pine and Douglas-fir, however, were recovered in similar abundances. This suggests that the uncharred and charred remains of these taxa may have originated from the same source, and only differ in that some portion of the remains were charred before dumping.

A more qualitative examination of the source of the uncharred wood involves examining the presence/absence of the taxa represented. Comparisons of the uncharred and charred taxa demonstrate that whereas only the charred specimens produced maple and sagebrush, only the uncharred specimens produced willow and elderberry (Table 6). Though these differences may be due to small sample size, the fact that both the uncharred and charred populations produced the same number of identifiable taxa (six), even though the sample size for charcoal identifications is double that of uncharred wood, suggests there may be real differences in the sources of the uncharred versus the charred wood. Clearly, a considerably larger sample size is needed to refine the analyses of the source of the uncharred remains in the rim.

Taken together, the analyses support the notion that the rims were used as disposal areas for waste from the pithouse floor. The uncharred wood may have also originated from different activities than the charcoal (debris from woodworking?), but the small sample size prohibits further investigation of this.

How the Floor Deposits were Formed

Unlike the roof and rim deposits, flotation samples were analysed from the floors of HP 3 and HP 12, as well as HP 7. However, the overall density of archaeobotanical remains on the floor of HP 12 is too low to discern patterning. Thus, the following discussion focuses on the formation history of the floors from the larger houses.

Several lines of evidence suggest that the floors of the housepits are relatively intact and undisturbed. The discrete patterning of small archaeobotanical remains on the floors of the two larger housepits (Vol. II, Chap. 4, Figs. 1–2) likely reflects intact activity areas on the floor. The clearly in situ location of roof beams HP's 7, 3, and 12 also suggest that post-depositional movements of plant remains is slight. Modern plant intrusions (uncharred and/or Eurasian introduced species) are found sporadically throughout the floor deposits, but their density is typical of minor soil movement via roots and insects, and do not seem to have played a major role in the floor's formation history.

In all three housepits, the concentration of plant remains across the floors is generally quite low (Tables 3–5; Vol. II, Chap. 4, Figs. 1–3). This is especially apparent in HP 12, but even in the high density areas in the large structures, overall recovery was minimal. This is surprising given the diversity of taxa represented in the larger structures and the number of potential sources of those taxa (Table 11). The clusters of these diverse taxa suggests a variety of plant processing activities took place in discrete areas throughout the use-life of the floors of HP's 7 and 3. However, the low density of remains even in these clusters indicates that the floors must have been regularly cleaned at frequent intervals or that fires were used relatively infrequently (Vol. I, Chap. 17) resulting in low incidences of seeds carbonized by chance. Large quantities of plant materials were evidently being processed and used by pithouse residents as indicated by the abundant botanical remains in the rim middens of the houses. Even in areas that are regularly cleaned, small seeds are likely to remain in situ (Miksicek 1987:227).

Although post-depositional disturbance of the floor appears to have been minimal, we cannot entirely discount all post-occupation formation processes. There is a high density of grass and chenopod or just chenopod seeds along the periphery of the floors of HP's 7 and 3, respectively. As in the roof deposits, these concentrations may be the result of cultural activities during the pithouse occupation, or may have been introduced after pithouse abandonment.

As in the roof deposits, a possible explanation for the chenopod and grass seeds on the floor is that they were accidentally introduced into the deposits. In this case, the chenopod and grass seeds on the floor may have been collected incidentally with grass stems that were deliberately collected for bedding material. In fact, the distribution of these seeds closely parallels the distribution of needles, which are likely the remains of boughs collected for bedding or sitting. In both HP's 3 and 7 grass stems are abundant along the periphery of the floor (Tables 3 and 4; Vol. II, Chap. 4).

A major event effecting the floor deposits was the burning of the structure after abandonment. Although many of the plant remains associated with the hearths may have been charred during processing, the concentrations of remains away from the hearths must have been charred when the structure burned. This particularly applies to the concentrations of remains on the periphery. If the structure had not burned, there would have been quite a different distribution of archaeobotanical remains on the floor (cf. Hally 1981).

Summary of Formation Processes

The formation history of the Keatley Creek deposits is complex. Each deposit has it own unique history (Table 14), being formed by a variety of events which took place during occupation and after the house was abandoned. The formation history of each of the deposits is summarised briefly below.

Roof Formation Processes

In hindsight, the analysis of roof formation processes is severely limited by the small sample size. A larger sample would not only have resulted in a better understanding of the spatial patterning across the deposit, but also the relationship of the roof formation history to the rim and floor (cf. Lennstrom and Hastorf 1996). Despite the limited sample, we can draw some conclusions about the formation history of the roof of HP 7.

The distribution of plant remains across the roof can be best explained as a combination of primary and secondary deposition during pithouse occupation and post-occupation formation processes. The remains of primary deposition are the roofing material, including the charred roof beams and possibly the needles and grasses, and also possibly the remains of the plant food stored in the rafters. The redeposited food remains, either processed inside the pithouse or elsewhere, are the remains of the secondarily deposited material. Finally, the post-occupation formation processes involve the preservation of the roofing material through charring, the differential burning of parts of the roof, and the incorporation of the grasses and chenopods growing on the roof when the structure burned.

Table 14. Summary of Formation Processes of Roof, Rim, and Floor in HP 7

	Primary Deposition During Occupation	Secondary Deposition During Occupation	Post-Occupation
Roof	• roof construction	• dumping of food plants	• removal of larger beams • charring of roofing material when structure burned • differential burning of roofing • material when structure burned
Rim		• dumping from floor • biotubation?	• bioturbation? • differential preservation of uncharred remains
Floor	• food and non-food processing • bedding		• charring of remains on periphery when structure burned

The distribution of plant remains in the HP 7 roof deposit also provides insight into the roof's original structure. The archaeobotanical analysis revealed that Douglas-fir and pine wood were used to construct the roof (Table 10), and field observations indicate that *Populus* bark was also used in roof construction. Conifer boughs, as suggested by the concentrations of conifer needles associated with twigs and small branches, were used as roofing material. Both pine and Douglas-fir boughs were used for roof construction, with no clear preference for either species.

Observations from roof deposits in other structures augment the paleoethnobotanical analysis of HP 7's roof deposit. Excavators observed concentrations of conifer boughs in the roof of HP 12 (Vol. III, Chap. 8), and thick pieces of bark from pine and other species were recovered from the roofs of HP's 12, 58, and 47 (Vol. III, Chap. 10). Bark was used as a component of the roofing material in ethnographic pithouses as well (Laforet and York 1981; Teit 1900).

Rim Formation Processes

The paleoethnobotanical analysis of the HP 7 rim deposits suggest that the rims were formed by a combination of secondary deposition during pithouse occupation and post-occupational formation processes. The diverse source of material composing the rims, the presence of both charred and uncharred remains, some internal stratigraphy, large standard deviations in abundance of remains within rim layers, and the differences in diversity and abundance between rim layers, indicate that the rims are composed of material from several discrete events. The relatively more dense botanical remains in the rim than the floor suggest that the floor may be the source of the rim deposits. The analyses do not indicate that the roof deposits played a major role in the formation of the rims.

Some bioturbation of the rims is apparently extensive, and likely occurred both during and after pithouse occupation. However, at present, we cannot discriminate the effects of bioturbation in the rims from cultural deposition. Bioturbation is indicated by the presence of rodent coprolites, rodent-gnawed seeds, and the lack of internal stratigraphy in parts of the rims. Unfortunately, the analysis of the relationship of uncharred seeds and rodent coprolites is inconclusive and suggests that the relationship between uncharred remains and rodent activity is not a direct one.

Differential preservation of remains appears to be the primary post-depositional formation process of the rim. In the uppermost, lowermost, and peripheral portions of the rim, conditions were not conducive to the preservation of uncharred remains. In the bulk of the deposit, however, charred and uncharred remains seem to have had an equally likely chance of being preserved. Unlike the roof and the floor, the post-occupation burning of the structure did not play a significant role in the formation history of the rim deposit.

Finally, it is important to note that the results of the analysis of site formation history of the rims of HP 7 may not apply to some other housepits. The rim deposit of HP 7 is similar to many other large housepits in that it is quite thick. However, it contrasts with the rims of smaller housepits which lack any clear accumulation of botanical or artifactual remains. This is likely due to the shorter occupation periods of smaller housepits. Since less waste was discarded on those rims insufficient organic matter was deposited to create an extraordinary preservation environment similar to that of the rim of HP 7.

Floor Formation Processes

The floor deposits were formed by a combination of primary deposition during pithouse occupation and post-occupation formation processes. Primary deposition resulted from the processing of food and non-food plants and the use of various plant materials as bedding. The discrete patterning of remains from these activities indicates that the floor deposit is relatively undisturbed. The diversity of taxa within and between activity areas indicates that the deposits likely reflect the accumulation of material from multiple activities. Use of lithic and faunal materials on the floor of HP 7 seems to have followed a similar pattern (Vol. I, Chap. 13; Vol. II, Chaps. 7 and 11).

The botanical analysis illustrates that the pithouse floors were kept relatively clean and free of garbage. This is particularly apparent in the center of the structures, where we recovered almost no floral remains. This pattern parallels that found for the faunal remains (Vol. II, Chap. 7) and to some degree for lithics (Vol. II, Chap. 11). The density and diversity of remains on the floor indicates that the floors were regularly cleaned. The analysis of the rims suggests that the debris cleaned from the floors may have been dumped into the rims.

Post-occupational formation processes play a significant role in the formation of the floor deposits. We cannot know to what extent plants would have been preserved through accidental charring while the pithouse was occupied, but the burning of the structure certainly increased the number of charred remains incorporated into the deposit. This was especially important for the preservation of the remains on the periphery, whenever they were introduced into the pithouse.

Prehistoric Plant Use at Keatley Creek

Paleoenvironmental Reconstruction

The paleoethnobotanical analysis, in combination with already completed pollen analyses (Vol. I, Chap. 4), provides some insights into the environmental setting of Keatley Creek. In general, these data suggest the environment at the time of occupation was similar to that of today. Most of the archaeobotanical remains grow today in the vicinity of the site. The exception to this is the unidentified Ericaceae seeds and possibly the birch bark rolls. The relative absence of birch *wood* in the assemblage, and the abundance of birch *bark* may indicate that the tree did not grow nearby in abundance, and only the bark was transported back to the site. That birch was not common around the site is further suggested by the low frequency of birch pollen recovered from a sediment sample from HP 7 (Vol. I, Chap. 4).

There are inconsistencies in the archaeobotanical and pollen data about the abundance of sagebrush in the prehistoric environment. Today, the shrub is the single most common plant around the site and along most of the Fraser River terraces. Yet it was absent from the pollen record from the nearby Lillooet site of EeRl 4 (Vol. I, Chap. 4), and is almost absent from the assemblage of identified wood from Keatley Creek. The Lillooet data conflicts with the preliminary pollen analysis from the HP 7 floor where sagebrush made up 31% of the identified taxa (Vol. I, Chap. 4). Thus, although it is difficult to interpret the conflicting data, both the Lillooet pollen study and the archaeobotanical remains suggest the massive invasion of sagebrush onto the river terraces may have been a historic phenomenon.

A combination of events may have interacted to change the frequency of sage on the Keatley Creek landscape. Prior to European arrival in the Lillooet area, natural fires would have played a major role in maintaining the structure of the natural landscape. Low-intensity ground fires, ignited by lightning or by people and fuelled by the high grass cover that was characteristic of the area, were a frequent phenomenon. Fire histories from the Kamloops region, in the same biogeoclimatic zones as Keatley Creek, revealed evidence of such fires on an average of every 12.1 years, with none occurring since 1902 (Low 1988). Such fires would have maintained the open parkland-like structure of this forest by keeping the growth of shrubs, such as sagebrush, in check (Barry Booth, School of Forestry, UBC, personal communication).

The European presence in the Lillooet region effected the natural regeneration cycle in two significant ways. The first was the supression of the natural and culturally-induced fire cycle. In the Kamloops region, for instance, this seems to have begun in 1902. By controlling fire frequency, the main source of disturbance and subsequent vegetation regeneration would have been altered.

In addition, the European introduction of cattle into the region likely played an important part in creating the current habitat surrounding Keatley Creek. Cattle were brought into the region by the early settlers of the late 1800's, and there is no doubt that over-grazing has changed the local vegetation by denuding the grass and tree seedling population. This, combined with fire restrictions, could have dramatically altered the vegetation communities.

Site Seasonality

Determining site seasonality with archaeobotanical material from the Pacific Northwest is difficult since clear seasonal indicators are rare. This is true, despite the fact that many plants, or specific plant parts, are only seasonally available. For instance, spring plant resources were eaten fresh as they became available, and thus rarely entered the archaeobotanical record. Even when processed, most spring plant foods are unlikely to be preserved archaeologically (e.g., fresh greens, processed tree cambium). Summer and early fall plant foods have better potential to be represented because berries and seeds are more likely to leave lasting archaeobotanical remains. However, it is these species that were often preserved for later consumption, and thus may not be accurate indicators of season of use. Finally, inferring winter seasonality based on floral remains is hampered by the fact that although some plants were available for harvesting during the winter months, most are species which would have been available in the fall and spring as well (e.g., cacti, rose hips).

The archaeobotanical seasonal indicators from Keatley Creek are summarised in Table 15. In this table, I have tabulated the seasonally available species by the seasons in which they were available for harvesting. I have divided summer into mid (corresponding to June and July) and late (corresponding to August), because this level of specificity of information was available for those resources. Species in brackets are those known ethnographically to have been processed and stored for later use as well as eaten fresh. As these species are not necessarily reliable seasonal indicators, I do not include them in my evaluation of site seasonality.

The compilation of seasonal indicators suggests that the Keatley Creek village was occupied at least in the late summer (possibly in connection with transporting and storing fish at the site) and likely throughout the winter. There is nothing in the archaeobotanical assemblage to indicate spring use of the village. Mid-summer occupation is also questionable since all the plants recovered are processes for winter use. Thus, with the given data, we can neither demonstrate nor dismiss spring and mid-summer occupation. Late summer and winter occupation is also suggested by the fauna at Keatley Creek (Vol. I, Chap. 10), and is consistant with the ethnographic descriptions of permanent villages (e.g., Teit 1900; Alexander 1992).

A Model of Prehistoric Plant Use at Keatley Creek

In this section, I construct a model of prehistoric plant use at Keatley Creek based on the ethnobotanical information for the Interior Salish and the archaeobotanical remains at the site. The review of ethnographic plant use by the Interior Salish (based primarily on Alexander 1992, Turner 1997, Turner 1992) is organized into general categories of plants that are likely to be involved in similar site formation processes. These categries are food, technology, and medicinal and ritual plants. Based on the ethnographic record, I then make predictions about how these major categories of plants may have been introduced into the archaeological record at Keatley Creek. Finally, a comparison of the actual archaeobotanical data with the ethnographic predictions allows a detailed reconstruction of plant use at the Keatley Creek village.

Table 15. Archaeobotanical Seasonal Indicators at Keatley Creek[1]

Winter	Spring	Mid Summer	Late Summer	Fall
conifer buds				conifer buds
				Pinus
			Carex	
			Scirpus	
			Poaceae	
			Smilacina	
Opuntia			Opuntia	→
			[Sambucus]	
		Chenopodium[2]		
		[Cornus]		
Arctostaphylos			Arctostaphylos	→
		[Ribes]		
		Phacelia[2]		
		[Amelanchier]		
			[Prunus]	
Rosa			Rosa	→

1. All remains are seeds unless otherwise noted. Species in brackets [ ] are those which are reported ethnographically to have been dried for later use as well as eaten fresh. I have listed these under the season in which they would have been harvested. Such species are not reliable seasonal indicators.
2. These species are questionable as seasonal indicators as I cannot confirm their actual seeding time for the Keatley area. Whether the chenopod seeds are contemporaneous with the archaeological deposits is another confounding problem (see text).

Ethnographic Plant Use by the Interior Salish

The ethnographic sources are clear that a range of plant taxa for food, technology, medicine, and ritual, were collected by the Interior Salish from a variety of ecosystems throughout the year. Among the Fraser River Lillooet, at least three plant harvesting expeditions may have been made to the upland zones in the course of a year: in spring, mid-summer, and fall (Turner 1992). These trips would have been interspersed with plant collecting trips in the lower elevations. Many of the low elevation trips likely occurred near the winter village site. During the warmer months villagers likely made regular visits back to Keatley Creek to store supplies (Alexander 1992).

Among the plant foods, geophytes (root foods or plants with other underground parts such as balsam root, lilies, mountain potatoes, onion) are considered in some ethnographic models to be the most important plant food group. In fact, after salmon, they are considered the most important food group for some Plateau groups (e.g., Ames and Marshall 1981; Pokotylo and Froese 1985; Thoms 1989; Peacock 1998). This view differs from recent analyses of Fraser River Lillooet plant use, specifically those which suggest that geophytes were not extensively used because they were too heavy and cumbersome to be transported to the winter village from the relatively distant harvesting sites (Hayden 1992:528; Turner 1992) and were never exremely common in the area (Turner 1992; Alexander 1992; Tyhurst 1992).

Geophytes were gathered from low to high elevation areas from spring to the end of summer. After harvesting they were roasted in large pits and eaten immediately or dried for winter consumption. Small quantities could also be dried without roasting if they were to be eaten later. To facilitate transport, it is likely that all processing occurred near the harvesting site. Several of the early spring bulbs could have been harvested in small quantities and processed at Keatley Creek itself, and then stored for later use. Dried bulbs could be reconstituted by boiling or steaming.

Berries and fruits were another major component of the diet. Berries and fruits offered a variety of essential vitamins and nutrients not available in other foods. They were harvested in the summer and fall, depending on location and species, and then eaten immediately, or dried and stored for later use. Berries and other upland plants were probably processed at the collection site, and then transported to the winter village in a lighter and more portable state, whereas berries collected close to the village site may have been processed at the village site. Berries were processed either by cooking and then drying, or by drying immediately after harvesting. They were eaten during the winter months either dried or reconstituted by adding water. Among the Fraser River Lillooet, saskatoons were among the most preferred of the berries (Turner 1992; Romanoff 1992:237).

Relative to the other food groups, seeds were a minor component of the traditional diet. Conifer seeds are the major component of this category, with whitebark pine seeds (*Pinus albicaulis*) being the most important species. These seeds were gathered in the uplands in the fall. All conifer seeds were often roasted before being eaten, probably at the harvesting site. Other seeds (for example *Cornus sericea*) were incidental components of the diet and were eaten fresh at the time of harvest. Conifer seeds would have stored well throughout the winter months in cool, dry places.

Various types of mushrooms and lichens were also consumed by the Interior Salish. These foods could be eaten immediately or dried for later consumption. Mushrooms and lichens were predominantly gathered in the fall.

Fresh greens (leaves, shoots) and tree cambium comprise the remaining major category of plant food utilized by the Interior Salish. Both were harvested predominantly during the spring, the former at the beginning of the season, the latter towards the end. Greens were only eaten fresh at the time of harvest. Lodgepole pine cambium was eaten fresh and sometimes dried for later use, whereas cottonwood cambium was only eaten fresh.

The plants collected for technological purposes were many and varied. They include wood from trees and shrubs for construction, fuel, and tool making; conifer boughs for bedding; inner barks, leaves, and fibrous roots and stems for cordage and mats; outer barks for construction, fuel, and containers; and pitch for various construction purposes. Most of the necessary technological resources were available year-round from a variety of habitats, or as the habitat became seasonally accessible. Major exceptions to this are Indian hemp (*Apocynum cannabinum*), the most valued of the fibres, and paper birch bark. Hemp was only suitable for harvesting in the late fall, and birch bark was collected in the late spring. The initial processing of most technological plants likely occurred at the harvest site, but much of the final processing was probably conducted in the winter village.

Even in a brief summary such as this, the role of plants in medicine and rituals cannot be ignored. Although probably constituting a smaller total bulk than most of the other categories, these plants were highly culturally signficant. Unfortunately, this diverse category is perhaps the least well known of the ethnographically used plant groups. It is known that medicinal and ritual plants were harvested from a variety of habitats throughout the year. Some plants were likely used fresh, while others that could be preserved were probably stored for later use.

Processed food plants collected throughout the year were stored at or near the winter home for easy access throughout the cold months. Teit recorded that the most common method of food storage was in underground caches. Berries or roots stored in these cache pits were first placed in baskets and then wrapped in birch bark (Teit 1900:199). Presumably, some plant foods were also stored in the rafters of the pithouse in various types of containers or in above ground elevated caches. There is little information on how technological, medicinal, or ritual plant resources were stored at the winter village.

Archaeological Predictions from the Ethnographic Record

The ethnographic record indicates that a wide range of plants were brought to the winter village throughout the year. However, not all of these plants had an equal chance of survival in the archaeobotanical record. In general, the likelihood that a plant will survive is directly proportional to how likely it is to come in contact with fire and thus be charred. At Keatley Creek, for instance, the only plants that would survive in the roof and floor deposits were those that were deliberatey or accidentally charred in a hearth or charred when the structure burned. In the rims, where both uncharred and charred remains preserve, all plants had a roughly equal chance of survival.

Among the food plants, those that were completely or partially processed at the village site had the greatest chance of being preserved through charring. According to the ethnographic model, the remains of primary processing activities should have included roasting pits for early spring roots, and drying sites for berries. The reconstituting of roots and berries in the winter home by boiling or steaming should have also resulted in the accidental introduction of charred remains into the deposits. Several roasting pits have been recorded at the Keatley Creek village, but their contents have not been analyzed and their function is unknown. Berry drying sites have yet to be recorded at a winter village site, but they should appear similar to limited activity processing sites found on the coast (e.g., Mack 1992).

Furthermore, dried plants (berries, roots, mushrooms, cambium, and lichens) are more likely to survive archaeobotanically than those deposited in a fresh state. The removal of water in the drying process associated with preserving for winter consumption should have also enhanced the chances that they would be preserved in the archaeological record. This particularly applies to the rim deposits, where uncharred remains are preserved, but completely dried uncharred specimens may also be preserved in other deposits if the conditions are right. Indeed, uncharred, dried mushrooms have been recovered from the floor of a pithouse at the nearby Mitchell site (Compton et al. 1995).

Of all the plant food categories, fresh greens are the most unlikely to be preserved in the archaeobotanical record. According to the ethnographies, these plants were likely an important spring food source to the village inhabitants. However, the greens are unlikely to show up in the archaeological record because they were consumed fresh without processing. Even if some accidentally fell in a fire, due to their high water and low fiber content they are not likely to survive the charring process.

The method of storage also effects the likelihood of recovering archaeobotanical remains. For instance, roots and berries (and possibly seeds) that were contained within baskets within storage pits would be less likely to leave remains than if they were stored without a container. The remains of spilled contents of the basket, or forgotten or partially used caches, however, would be retrievable from the archaeological record only if uncharred remains were preserved in that context, or if the entire contents burned when the structure burned. Remains of the baskets themselves, either in the pit, or the refuse pile, could be recovered from the archaeological record. In fact, the remains of one birch bark container found at a pithouse village in the Lillooet area contained a saskatoon berry cake (Mathewes 1980). The high oil content of birch seems to encourage the preservation of uncharred bark in archaeological sites throughout the Plateau. Finally, in addition to pit storage, plants stored in rafters could be incorporated into the roof deposit as the structure burned and collapsed.

Although initial preparation of plants used in technology probably occurred at the harvest site, the remains of fine finishing should be archaeologically visible at the village. Woodworking must have produced copious debris, and such debris is likely to end up in the hearths or in the discard area. However, it would be difficult to distinguish wood which was intended for some technological purpose and fell accidentally or was discarded into the hearth, from wood which was intended to be used to fuel a hearth fire. Shavings, bark, and other debris produced from making other artifacts of plant material are likely to have been thrown in the hearth to be burned, or thrown directly into the discard area. Again, it would not be possible to distinguish these hearth contents from any other burn event, but the uncharred material, if preserved, might be distinctive. Obviously, any tools, construction material, mats, baskets, etc., left in the abandoned pithouse are likely to preserve through charring when the structure burned, (e.g., HP 104; Vol. III, Chap. 10).

The recovery of medicinal and ritual plants in the archaeobotanical record of the winter village is largely hampered by our ability to identify their ethnobotanical use. In general, it would be difficult to differentiate these plants from those used for more mundane purposes, or even from weeds which were accidentally introduced into the deposit. Those plant remains which are found in extraordinary contexts (special structures, containers, etc.), and/or are an extraordinary species (e.g., Compton et al. 1995), may be recognizable as medicinal or ritual.

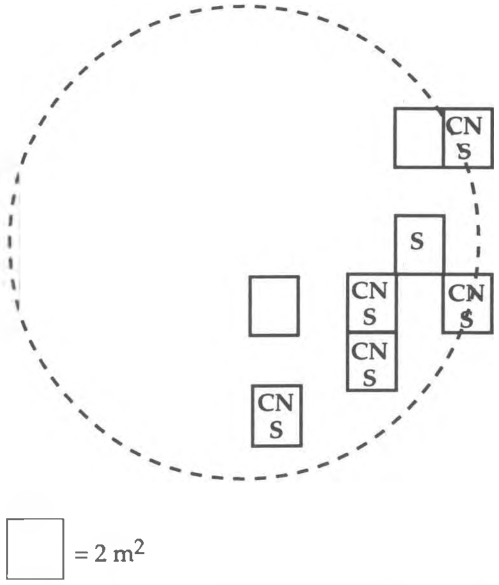
Comparison of Ethnographic Data with Keatley Creek Archaeobotanical Record

In general, the botanical record from Keatley Creek is consistent with the ethnographic model for winter village life. In this model, the inhabitants were dependent on readily accessible storable foods which were gathered from diverse ecosystems, sometimes at a distance from the village. At Keatley Creek, the diversity of remains does indicate gathering from varied environments, but most of these resources could have been collected in some quantity locally. Thus, the need for diverse winter foods appears to have been met by gathering in a relatively small catchment area. Even if birch bark and the Ericaceae were the only resources that did not occur in the immediate vicinity of the site, it is difficult to imagine that the modest stands of cottonwood, saskatoon, and other resources in the Keatley Creek drainage would have been adequate for a seasonally returning community of over a thousand people.

The archaeobotanical record offers little insight into how plants were stored for winter use. There is no evidence to suggest that plant foods were stored in containers in caches as the ethnographies suggest. However, the relative absence of floral remains in all pit features more likely indicates that at the time the structures were burned they had already been cleared of stored plants. Placement in birch containers or wrappers would account for the fact that no remains were left behind at the bottom of pits. At Keatley Creek, storage pits have been found both with and without a layer of birch bark on the bottom. The abundance of birch bark fragments found in the rims may be the remains of containers used to store plants and other foods.

The paleoethnobotanical analysis suggests that fruits and berries were the primary plant foods used by the inhabitants of Keatley Creek. If the village was indeed occupied only during the late summer and through the winter, many of the berries and fruits entered the pithouse in some preserved form. To date, no evidence has been recovered at Keatley Creek to suggest that locally gathered berries were processed at the site. As in ethnographic times, saskatoons were among the most important of the berry foods for the Keatley Creek inhabitants. Contrary to ethnographic observations, some foods, such as star-flowered Solomon's-seal and prickly pear fruits may have been important prehistorically, but were used only infrequently in ethnographic times.

The absence of geophytes in the Keatley Creek archaeobotanical record contrasts with the ethnographic model for intensive "root" use among Plateau peoples, (e.g., Peacock 1998; Thoms 1989) but is consistent with the specific ethnobotany of the Fraser River Lillooet people. The unidentified epithelial tissue recovered from some of the samples may prove to be the remains of such roots. However, even if all the fragments in this catch-all category are from roots, their relative scarcity in the archaeobotanical record does not argue for an abundance of root processing or consumption at Keatley Creek. Further, even if the unanalyzed roasting pits at the site were primarily for root processing, there are few enough such features to argue against root consumption being a daily activity. The relative absence of geophyte remains and roasting features at the site supports Turner's (1992) assessment of the quantities and main consumption locations of geophytes in the Keatley Creek band range.



C: $\geq$ 5 g charcoal/1 liter flotation sample
N: $\geq$ 200 needles/1 liter flotation sample
S: $\geq$ 5 seeds/1 liter flotation sample

Figure 1. Distribution of plant remains on the roof of HP 7.

The archaeobotanical analysis suggests that a wide range of technologically important plants were used at the winter village. The rush and tule seeds may have come from leaves and stems collected for weaving, and conifer boughs appear to have been used as bedding. Birch bark obviously served a variety of technological purposes, and various woods were used both structurally and for fuel. The dominant woods used seem to be those which were the most common in the environment. The uncharred wood remains in the rim may have been used for a different purpose than the charred wood, but the statistical analyses at this point can not adequately assess this.

Among the wood taxa used, there is evidence that some species were selected preferentially for certain purposes. For instance, the relative abundance of the three most common wood taxa on the floors of HP's 7 and 3 are strikingly similar to each other (Tables 7 and 8) suggesting the same selection process of woods by both sets of pithouse inhabitants. In both structures Douglas-fir is clearly the preferred wood, followed by *Pinus* and *Populus*. By contrast, Douglas-fir and *Pinus* co-dominate in the hearth and rim samples from HP 7 (Tables 6 and 9), suggesting that a different selection process was going on for wood used in these contexts. The sample size of identified structural elements from the three houses is too small to make definitive statements about wood preferences for these purposes (Table 10).

Finally, as expected, we are on weak ground when making interpretations about medicinal and ritual use of plants. No plants were recovered at Keatley Creek in a distinct enough context to *de facto* indicate such special uses. Several of the plants recovered at Keatley Creek are known ethnographically to have been used medicinally or ritually, but this alone cannot be used to indicate special use. *Phacelia* stands out as the only species in the archaeobotanical record for which only medicinal uses have been identified. However, *Phacelia* is a weedy species which likely grew on the terraces surrounding the site, and thus could have been introduced into the record accidentally as well.

Summary

The foregoing analysis demonstrates the complexity of the formation history at Keatley Creek. At the most fundamental level, the many potential sources of the individual plant taxa and even parts of those taxa, contribute to the complex history. This is compounded by the variety of potential contexts for preservation (i.e., charred accidentally or deliberately in a hearth, charred when the pithouse burned, or uncharred in the rims). The combination of possible sources and preservation conditions result in a range of potential formation histories.

To decipher the individual formation histories of the Keatley Creek deposits required examining the distribution, density, and diversity of plant remains both within and between deposits. The results clearly indicate a unique depositional history for the roof, rim, and floor deposits at Keatley Creek. Unfortunately, small sample sizes especially from the rim and roof, have ultimately limited our understanding of the formation histories.

At a more general level, we can draw several conclusions about specific prehistoric plant use, and life in general, at Keatley Creek. A comparison of the ethnographic model with the archaeobotanical record indicates that ethnographic plant use was both similar to and different than prehistoric plant use. The most striking discrepancy between the two is the paucity of evidence for prehistoric root food consumption. Although this agrees with recent ethnographies of the Fraser River Lillooet, it differs from other models of Plateau plant use. This should serve as cautionary note about how widely general models of prehistoric adaptation on the Plateau can be applied to specific areas.

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