

APPENDIX IV

**Archaeobotany of the
Kitwanga Fort Project
Skeena River, British Columbia**

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Introduction

Thirty-one samples were submitted for botanical analysis by George F. MacDonald, Senior Archaeologist, National Museum of Man, National Museums Canada, Ottawa. Thirteen soil samples were received on November 5, 1979, eleven seed samples were received on November 13, 1979 and six soil samples were received on November 27, 1979.

Objectives

Analysis of palaeobotanical remains from archaeological soils was undertaken to obtain data concerning: 1) the nature and importance of plant subsistence to the occupants; 2) the season of occupation; 3) the effect of natural fire episodes and hearth fires on plants; 4) the separation of historic from prehistoric component and 5) the nature and function of house structures.

Pollen Analysis

Pollen analysis and a thermal analysis for organic carbon and calcium carbonate was done on seven samples. Six were archaeological soil: C15 and C19 were ash samples; 108, 115 and 116 were hearth samples, 85 was soil lining a pit. A spring detritus sample from a depth of 25 cm was also analysed to serve as a comparison with the archaeological soil.

Method

Two subsamples were weighed: one was used for pollen analysis and the other was dried to determine moisture content and ashed at 550°C for organic carbon content and at 1000°C to determine CaCO₃ content. The pollen concentration and organic C and CaCO₃ percentages are based on dry weight.

The soil samples concentrated for fossil pollen weighed 20 to 30 g. Before fossil pollen concentration was begun, 23 700 *Lycopodium* spores were added to the subsample. Fossil pollen concentration was by the method of Cwynar et al. (1979) except that both 150 µm and 15 µm sieves were used before acetolysis. The introduced *Lycopodium* spores were counted together with the fossil pollen and spores. Counting proceeded until 100 fossil pollen were identified. The ratio of

introduced *Lycopodium* spores to fossil pollen was used to calculate the fossil pollen concentration per g dry weight of soil.

Results

The organic C, CaCO₃ and fossil pollen are given in Table 1. The C content was high in the spring detritus relative to the soils. CaCO₃ was relatively low in the pit soil and spring detritus. All samples had abundant charcoal and indigestible plant fragments. Fungal fragments were common, indicating an oxidizing environment.

The pollen was rather well preserved. Sample 119 did not produce an adequate abundance of pollen for an efficient percentage analysis. Fossil pollen varied by a factor of 10, from 200 to 2 300 pollen per g in the soil samples. The highest concentration (31 900) occurred in the spring detritus.

Discussion

The spring sample serves as a control for the analyses. Its high content of organic C and low CaCO₃ are consistent with a non-calcareous organic detritus. As expected, the mineral-rich soil had lower organic C but unusually high carbonate (except sample 85 that lined a pit). The carbonate was probably derived from the burning of fishbone. Another possibility is the burning of faeces, but this is unlikely because of the paucity of seeds in the samples.

In general, the tree pollen reflects forest dominance by conifers. The local pine and spruce is well represented, whereas the pollen of fir and western hemlock must be derived from trees growing outside the site locality. The pollen of poplar is absent because it does not preserve. The spring sample confirms the growth of a local stand of alder and suggests a local stand of birch. In contrast, the archaeological soil contains abundant pollen of weedy herbs, particularly grass, composite and chenopod pollen, indicating weedy vegetation. Despite local growth of hazel and presence of hazel nuts, only one pollen grain was found. Most pollen is derived from wind-pollinated species and, except for the composites, there are surprisingly few pollen of insect-pollinated taxa such as heaths, soapberry

and the families exemplified by carrot, pink and evening primrose.

The pollen assemblage does not compare closely with the seed assemblage except that soil samples C15, 108 and 85 (but not 115) have both abundant chenopod pollen and goosefoot seeds. Thus the pollen and seed data are complementary, and therefore they cannot be used to predict one another.

Macrofossil Analysis

Nineteen soil samples and 11 seed samples were submitted for plant macrofossil identification.

The following is the archaeological context of the soil samples;

64, 108, 115, 116, 109, 110 and 111 were hearth samples; 65, 119 and 120 were pit samples; C15 was an ash sample; 66 and 67 were dump samples; 85 was from a pit lining; 78 and 118 were from post moulds; 16, 76 and 79 are 'level' samples.

Method

All soil samples were floated and concentrated in a sieve with a mesh size of 0.5 mm.

A total of 1750 mL of float residue was recovered from flotation of 18 375 mL of soil; this is a reduction to 10% of original volume.

A total of 2461 seeds were present; 2209 were uncarbonized and 252 were carbonized (Tables 2 and 3). Charred seeds were picked from float residue under 10x magnification with a stereo-microscope. Uncharred seeds were identified but not picked, except for unknowns. Seeds were identified using seed identification manuals (Montgomery 1977, Martin and Barkley 1973) and by comparison with reference specimens.

Charcoal was prepared for examination by breaking the specimen to obtain a fresh transverse (cross) section (McAndrews, et al. manuscript). Charred wood from nine samples was classified into three categories, 1) pine, 2) conifer (gymnosperm) wood and 3) diffuse porous (angiosperm) wood.

Results

The concentrate was mostly uncharred plant debris such as roots, wood and leaf fragments. Charred seeds were present (Table 2) but uncharred seeds were more common (Table 3). Bone was often present.

There was a total of 14 taxa of charred seeds (N=252) and 22 taxa of uncharred seeds (N=2209) (Table 4).

Two species, bearberry and hawthorne, occur only as charred specimens. Charred seeds were present in 13 of 19 soil samples and 2 of 12 seed samples. Uncharred seeds were present in all but 2 soil samples and 7 of 12 seed samples.

Results - Soil samples

Sample C15, ash (007T, 001A, E13 NO, Lot 5, 15P) Charred seeds include blueberry, sedge and goosefoot. Charred sedge seeds are rare with the other occurrence in sample 66. The unusual dearth of uncharred seeds is shared with sample 118. Uncharred spruce needle fragments are present.

Sample 64, central hearth (7TIC, house 1, level 3) The charred seed assemblage is small. Seeds of two small fleshy fruits are present, elderberry and blueberry. One goosefoot seed and one grass seed (unique in the charred seed assemblage) were also identified. Eight seeds were assigned to the goosefoot family. Goosefoot seeds were the only uncharred seeds in the sample. Like the previous sample, uncharred spruce needle fragments were also present.

Sample 108, central hearth 2 (7T2D, DBD 18 cm) The concentrate contained insect parts and some small bone fragments. Charred seeds were absent. The uncharred assemblage contained seeds of the small fleshy fruits of saskatoonberry, raspberry and blueberry and of two weeds, goosefoot and sedge.

Sample 115, central hearth, house 4 (7T4, 13P west side, Battle Hill, 5-15 cm DBC) This sample contained insect parts and was essentially barren of seeds. It contained one unidentified, poorly-preserved, charred seed and one uncharred cherry (*Prunus*) seed.

Sample 67, side hill dump under house 4 (7T4A, level 2, 5-10 cm) This sample contained pebbles, snails, insect parts and small bone fragments. Charred seeds occurred in small numbers, including seeds of the small fleshy fruits, raspberry and elderberry and seeds of two weeds, plantain and knotweed. These weed seeds are rare, each appear in only one other sample, i.e. plantain (a single seed) in dump sample 66 and knotweed (40 seeds) in pit sample 65.

Sample 67 contains the third largest number of uncharred seeds with ten taxa; most numerous are elderberry and raspberry. Seeds of two weedy plants, goosefoot and sedge are abundant, especially goosefoot. Cherry, dandelion, plantain, vetch, birch and 11 seeds that compare closely with violet were also present.

Sample 66, side hill dump under house 4, level 1, 0-5 cm (7T4A, 20P W12 S4) Insect parts and snails are present. Charred seeds were limited to small fleshy fruits and weeds. Raspberry (most abundant), elderberry, cherry and dogwood are present. Cherry and dogwood are represented by single seeds. Weeds are represented by single seeds of sedge and plantain.

This sample contains the second largest concentration of uncharred seeds. Two weeds dominate the assemblage, sedge and goosefoot. Knotweed, campion, dandelion, violet and birch are present. Grass was identified by the presence of glumes. Soapberry is confined to this sample. A moss (cf. *Isoetecium*) is present.

Sample 16 (7T5A, level 2, 5-10 cm DBS S 0-50 cm E 0-40 cm) Insect parts, snails and spore balls were in the concentrate. This sample is essentially barren of charred seeds, with one unidentified specimen. The few uncharred seeds are represented by raspberry and elderberry, goosefoot and sedge. A hazel nut shell fragment was also identified.

Sample 78, 'post' feature (7T9C 13P, near bottoming out, level 9, DBS 45 cm, DBD 48-52 cm) Charred seeds are absent.

Uncharred seeds are mostly goosefoot. A few seeds of saskatoonberry and elderberry were also present.

Sample 85, folded bank pit lining, level 13 (7T9E extension) The concentrate included small

uncharred bark fragments, insect parts, spore balls and clumps of dirt.

One charred elderberry seed was identified.

The uncharred seed assemblage was limited to three elderberry, three goosefoot and two sedge seeds.

Sample 116, central hearth, house 5 (7T10 24.5 ME/5 m S oper. 10, 5-15 cm DBS) The concentrate was composed of ash and many small mammal bones; a fish vertebra was also present. This sample was virtually barren of seeds. Charred seeds were absent. One uncharred dandelion seed and one snowberry seed were present.

Sample 109, central hearth, house 3, level 1 (7T3T1) The concentrate contained insect parts and clumps of dirt. Nine charred goosefoot seeds were present.

The uncharred seed assemblage is dominated by sedge and dandelion. Goosefoot, strawberry and saskatoonberry also occur in small numbers.

Sample 110, hearth (7T3T1 17P, from W. section of rock feature - DBS 17-25 cm) Insect parts were present in the concentrate. The sample contained two charred goosefoot seeds and one uncharred strawberry seed. Strawberry seeds are limited to this sample and sample 109.

Sample 119, ash pit (7T1T1 06P, in wall - see p. 57 and floor plan T1 S3 E14 DBD, 37-40 cm S 10-100 cm E 40-80 cm) Leaf fragments, small bone fragments and insect parts were present in the concentrate. This sample contains charred seeds of three small fleshy fruits; saskatoonberry, bearberry and hawthorne. This sample has the largest quantity of bearberry seeds and the only occurrence of hawthorne. One charred goosefoot seed was also present.

Uncharred seeds of sedge and dandelion also occur.

Spruce needle fragments were also present.

Sample 76 (7T3B 07 28/7/79 - house 3, level 4, 15-20 cm N 0-100 cm W 20-100 cm) The concentrate contained insect parts and larvae. The sample was barren of charred seeds. Twenty uncharred seeds were identified, i.e., 18 goosefoot seeds, one elderberry seed and one sedge seed.

Sample 118, house post feature (TTIT1 06p 10/8/79, 15-17E 30-35 DBS from house post feature) The sample was essentially barren except for one unidentified uncharred seed.

Sample 65 (7T9G 20p 27/7/79, SE corner of pit, level 3, 10-15 cm, palisade) The sample contained small bone fragments, probably mammal, and insect parts.

This sample contained the greatest number of seeds, both charred and uncharred. Four taxa of charred and eight taxa of uncharred seeds are present. The charred seed assemblage is dominated by knotweed. Charred knotweed occurs elsewhere only in dump sample 67. The greatest concentration of elderberry occurs here together with a few saskatoonberry seeds. One bearberry seed was also identified. The uncharred seed assemblage in this sample accounts for 40% of the seeds of all samples. It has 811 goosefoot, followed in descending order of abundance by: elderberry, sedge, saskatoonberry, raspberry, dragon head (*Dracocephalum parviflorum*) and cherry. Two seeds, one in the grass family and one in the rose family, could not be further identified. Ninety-four identifiable seeds have yet to be identified. Analysis of these seeds is being continued.

Sample 111, ash from hearth (7T9K 06P 9/8/78, 5-15 cm DBS, lot 2) This sample was essentially barren of seeds. No charred seeds were present. Four uncharred goosefoot seeds and two elderberry seeds were present; one seed was unidentified.

Sample 120, puberty pit (7T5B, 10/8/79 07P, bottom of pit - humus layer DBU 70-75 cm, S 0-20 cm E 80-100 cm)

The concentrate of miscellaneous plant fragments, charred and uncharred, also contained insect parts. This sample was one of three samples containing charred bearberry, the others were samples 65 and 119. One bearberry was identified. Two charred raspberry seeds were also present.

The uncharred seed assemblage is dominated by raspberry. One whole hazel nut and hazel nut fragments were present. dandelion, vetch, birch seeds also occurred, and one seed assigned to the composite family was identified.

Sample 79 (7T1A, lot 8, 15P 72 cm) This sample was barren of seeds except for one uncharred goosefoot seed.

Results - Seed samples

Sample S 10 This sample contained uncharred hazel nuts, 7 whole, 48 halves and 10 fragments.

Sample S 12 Like sample S 10, only uncharred hazel nuts were present.

Sample S 13 The three uncharred seeds are red osier dogwood. Two charred seeds could not be identified.

Sample 133 This sample contained one uncharred pin cherry seed.

Sample 152 B This sample contained an uncharred nutshell fragment of hazel.

Sample 152 C The uncharred seed is chokecherry.

Sample 183 Five charred chokecherry seeds were present. Charred cherry seed fragments were also present.

Sample 215 This sample contains three uncharred chokecherry seeds. All seeds have a hole at the proximal end, suggesting insect-boring.

Sample 431 This sample contained dirt clumps; no seeds were present.

Results - charred wood

Charred wood from most samples was small (4 mm), thus making a positive identification difficult. However, some fragments were large enough to make a partial identification.

Pine charcoal was identified in six of nine samples (Table 5).

The pieces of indeterminate conifer were too small to be sure that the resin canals of pine were absent. The diffuse porous angiosperm wood could be poplar. There is no apparent correlation between species and features.

Discussion

The interpretation of the seeds found in the archaeological soil is difficult. Their relative sparseness (except sample 65) indicates that they are more or less randomly distributed and do not represent caches. Except for birch, the seeds are from shrub and herb species that mostly occupy weedy habitats. Most species occur on the site today, and the seeds could be modern and intrusive or could have persisted in the soil since occupation. The charred seeds are likely to be in situ because they are less likely to decay than uncharred seeds.

With regard to their seeds, plant species have varying strategies of reproduction (Grime 1979). Most Canadian tree species have seeds that germinate within a few months of dispersal to produce a more or less annual crop of seedlings. These seedlings usually die unless an opening in the canopy occurs. Such species, with limited dormancy, usually have thin-coated seeds that decay rapidly and do not persist in the soil. On the other hand, many weed species such as cherry and goosefoot (*Chenopodium*), have seeds capable of prolonged dormancy. These seeds have relatively thick seed coats and persist in the soil as a seed bank, until they are stimulated to germinate by change in light and temperature that is associated with soil disturbance and the renewal of a weed habitat.

Soil disturbance during human occupation produces a weedy habitat and weed vegetation. Local burning would produce charred weed seeds and these, together with unburned weed seeds, would result in the archaeological soil becoming a seed bank. Thus, the charred seeds are in situ and the uncharred seeds are probably contemporaneous. The presence of pollen of weedy plants supports the conclusion that the seeds are in situ.

Conclusions

1. Hazel nut and the berries of blueberry, hawthorn, saskatoon, raspberry, elderberry, chokecherry and strawberry were available and perhaps eaten, but there is no evidence that they were quantitatively important.

Goosefoot seeds are abundant and could have been collected for food.

There is no indication of crop plants.

2. The seed assemblage hints at a summer-autumn occupation, because the edible fruits ripen then. However, because the seeds belong to 'weedy' species that probably grew spontaneously on the site, their seeds could be naturally introduced into the soil.
3. There is no evidence as to the season of burning. The seeds, needles and wood are all available on the soil surface and could be burned at any season.
4. Assuming that uncharred seeds eventually decay and only charred seeds persist, then samples with mostly charred seeds would be relatively older. Applying this criteria, samples C15 and 119 are older than samples 65, 66, 67 and 78. However, samples 65, 66 and 67 are near the surface and the uncharred seeds could be modern intrusives.
5. The botanical analyses provide no insight as to feature function.
6. The surprisingly high calcium carbonate content of samples C15, 108, 115, 116 and 119 indicate much burned bone in contrast to the spring sample and sample 85.
7. The pollen analysis indicates the regional forest was dominated by conifers. Birch and alder were locally abundant around the spring. Analyses of the archaeological soils indicate local weedy herbs.

Acknowledgements

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Table 1

Pollen and spore counts in six samples. Identified pollen totals 100. Organic carbon and calcium carbonate determined by method of Dean (1974).

Catalogue number	% Organic carbon	% CaCO ₃		
C15	4.7	37.5	} of dry weight	
108	1.8	19.5		
115	2.1	17.5		
85	6.7	2.7		
116	1.6	10.7		
spring	21.3	2.7		
119	3.9	16.8		
2	7	4		<u>Picea</u> spruce
2	4	3		<u>Abies</u> fir
39	50	6		<u>Pinus</u> pine
7	44	19		<u>Tsuga heterophylla</u> western hemlock
1	19	1		<u>Tsuga mertensiana</u> mountain hemlock
1	1	1		Cupressaceae cedar family
10	3	1		<u>Betula</u> birch
33	3	3		<u>Alnus</u> alder
1	1	1		<u>Corylus</u> hazel
2	1	1		<u>Shepherdia canadensis</u> soap berry
1	1	1		Ericaceae heath family
2	3	3		Gramineae grass family
1	4	4		Tubulifloreae aster group
1	7	1	} composite family	Liguliflorae chickory group
1	11	1		
1	3	23		Chenopodiineae chenopods
1	1	18		Umbelliferae carrot family
1	1	27		Caryophyllaceae pink family
1	1	1		Onagraceae evening primrose family
		1,000		Identified pollen per g dry soil
		200		
		1,200		
		2,300		
		1,400		
		31,900		
5	1	1		<u>Dryopteris</u> type fern
2	1	1		<u>Lycopodium</u> club moss
1	1	2		<u>Sphagnum</u> spnagnum moss
7	4	4		Indeterminable
1	2	1		

trees

shrubs

herbs

Table 2

Charred seeds from the Kitwanga Fort Project, Skeena River, B.C.

SAMPLE NUMBER	SOIL	Nut	Berry	Seed	Total %
C15		<u>Corylus</u> sp. hazel			7
64		<u>Amelanchier</u> sp. saskatoon berry			2.7
115		<u>Arctostaphylos</u> <u>uva-ursi</u> bearberry			10
66		<u>Cornus</u> sp. dogwood			3.9
67		<u>Crataegus</u> sp. hawthorne			1
16		<u>Prunus</u> sp. cherry			.4
85		<u>Prunus virginiana</u> choke cherry			1
109		<u>Rubus</u> sp. raspberry			.4
110		<u>Sambucus</u> sp. elderberry			5
119		<u>Vaccinium</u> sp. blueberry			10
118		<u>Carex</u> sp. sedge			3.9
65		<u>Chenopodium</u> sp. goosefoot			26
120		<u>Plantago</u> sp. plantain			10.3
S13		<u>Polygonum</u> sp. knotweed			8
183		CHENOPODIACEAE chenopods			3.2
		CYPERACEAE sedge			1
		GRAMINEAE grass family			.4
		Unknown			24
		<u>Picea</u> sp. (needles)			9.5
		TOTAL			252

F = Fragment
+ = present

Uncharred seeds from the Kitwanga Fort Project,

Skeena River, B.C.

Soil sample	C15	64	108	115	66	10	78	18	109	110	197	118	65	111	112	79	Seed sample	Total
<i>Corylus hazel</i>																	12	12
<i>Amelanchier</i> sp. saskatoon berry																	20	20
<i>Cornus</i> sp. dogwood																	11	11
<i>Cornus stolonifera</i> red-osier dogwood																	2	2
<i>Fragaria</i> sp. strawberry																	1	1
<i>Fragus</i> sp. cherry																	4	4
<i>Fragus pennsylvanica</i> pin cherry																	1	1
<i>Fragus virginiana</i> choke cherry																	4	4
<i>Rubus</i> sp. raspberry																	218	218
<i>Sambucus</i> sp. elderberry																	109	109
<i>Shepherdia</i> cf. <i>canadensis</i> soapberry																	32	32
<i>Symphoricarpos</i> sp. snowberry																	11	11
<i>Vaccinium</i> sp. blueberry																	1	1
<i>Carex</i> sp. sedge																	29	29
<i>Chenopodium</i> sp. goosefoot																	1	1
<i>Dracopcephalum parviflorum</i> dragon head																	1	1
<i>Galium</i> sp. bedstraw																	1	1
<i>Plantago</i> cf. <i>lanceolata</i> plantain																	1	1
<i>Polygonum</i> sp. knotweed																	1	1
<i>Silene</i> sp. campion																	1	1
<i>Taraxacum officinale</i> dandelion																	17	17
<i>Viola</i> sp. vetch																	3	3
<i>Viola</i> sp. violet																	12	12
<i>Betula</i> sp. birch																	10	10
COMPOSITAE composite family																	1	1
GRAMINEAE grass family																	5	5
ROSACEAE rose family																	2	2
unknown																	13	13
TOTAL																	2,209	2,209
Moss																	1	1
<i>Picea</i> sp. (needles) spruce																	4	4
Soil volume (mL)																	1,000	1,000
Concentrate volume (mL)																	50	50

Table 4

**List of macrofossils from the Kitwanga Fort Project, Skeena River, B.C.
Asterisk indicates plants used by natives (Turner 1975).**

Uncharred	Charred
* <u>Corylus cornuta</u> beaked hazel BETULACEAE	* <u>Corylus</u> sp. hazel BETULACEAE
* <u>Amelanchier</u> sp. saskatoon berry ROSACEAE	* <u>Amelanchier</u> sp. saskatoon berry ROSACEAE
* <u>Cornus</u> sp. dogwood CORNACEAE	* <u>Arctostaphylos uva-ursi</u> bearberry ERICACEAE
<u>Cornus stolonifera</u> red-osier dogwood CORNACEAE	* <u>Cornus</u> sp. dogwood CORNACEAE
* <u>Fragaria</u> sp. strawberry ROSACEAE	* <u>Crataegus</u> sp. hawthorne ROSACEAE
* <u>Prunus</u> sp. cherry ROSACEAE	* <u>Prunus</u> sp. cherry ROSACEAE
* <u>Prunus pensylvanica</u> pin cherry ROSACEAE	* <u>Prunus virginiana</u> choke cherry ROSACEAE
* <u>Prunus virginiana</u> choke cherry ROSACEAE	* <u>Rubus</u> sp. raspberry ROSACEAE
* <u>Rubus</u> sp. raspberry ROSACEAE	* <u>Sambucus</u> sp. elderberry CAPRIFOLIACEAE
* <u>Sambucus</u> sp. elderberry CAPRIFOLIACEAE	* <u>Vaccinium</u> sp. blueberry ERICACEAE
* <u>Shepherdia canadensis</u> soapberry ELAEAGNACEAE	<u>Carex</u> sp. sedge CYPERACEAE
<u>Symphoricarpos</u> sp. snowberry CAPRIFOLIACEAE	* <u>Chenopodium</u> sp. goosefoot CHENOPODIACEAE
* <u>Vaccinium</u> sp. blueberry ERICACEAE	<u>Plantago</u> sp. ribgrass Plantain PLANTAGINACEAE
<u>Carex</u> sp. sedge CYPERACEAE	<u>Polygonum</u> sp. knotweed POLYGONACEAE
* <u>Chenopodium</u> sp. goosefoot CHENOPODIACEAE	<u>Polygonum</u> sp. knotweed POLYGONACEAE
<u>Dracocephalum parviflorum</u> dragon head LIBIATAE	CHENOPODIACEAE
<u>Galium</u> sp. bedstraw RUBIACEAE	GRAMINEAE
<u>Plantago</u> cf. lanceolata ribgrass plantain PLANTAGINACEAE	<u>Picea</u> sp. spruce (needle) PINACEAE
<u>Polygonum</u> sp. knotweed POLYGONACEAE	
<u>Silene</u> sp. campion CARYOPHYLLACEAE	
<u>Taraxacum officinale</u> dandelion COMPOSITAE	
? <u>Vicia</u> sp. vetch LEGUMINOSAE	
<u>Viola</u> sp. violet VIOLECEAE	
* <u>Betula</u> sp. birch BETULACEAE	
COMPOSITAE	
GRAMINEAE	
ROSACEAE	
<u>Picea</u> sp. (needle) PINACEAE	
Nbr. FAMILIES 19	Nbr. FAMILIES 12
Nbr. TAXA 22	Nbr. TAXA 14

Table 5**Charred wood from the Kitwanga Fort Project, Skeena River, B.C.**

Catalogue number	ANGIOSPERM	GYMNOSPERM	
	Indeterminable diffuse porous	Pinus pine	Indeterminable Conifer
16	+	-	-
65	-	+	-
67	-	+	+
108	-	-	+
110	+	+	-
111	-	+	-
118	-	+	-
119	+	+	+
120	+	-	-