U.S. DEPAERTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Boreal Ecosystem-Atmosphere Study (BOREAS) 1993 Field Notes; Thompson, Manitoba

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Table of Contents

I. Introduction

Data reported within this document was collected during August of 1993 as part of the Boreal Ecosystem-Atmosphere Study (BOREAS) project. BOREAS is a joint effort of the U.S. and Canadian government sponsored by the National Aeronautics and Space Administration (NASA). The objective of the study is to improve understanding of the interactions between the boreal forest biome and the atmosphere in order to clarify their roles in global change. Detailed information about the BOREAS project and other studies associated with BOREAS may be found in the BOREAS Experiment Plan produced by NASA.

During the 1993 field campaign, soil samples were collected at each of the five BOREAS tower sites and the Gilliam Road auxiliary site (1964 burn). 500 meter transects were made across each of these locations, brief descriptions of soil and vegetation made every 50 m, and a representative transect point selected for more detailed description and sampling. An age-sequence of three fire scars (ranging from 4 to 37 years in age) located near the Thompson area was also described and sampled in the same manner. Field notes from the fire sequence transects are included in this report.

The following document includes sampling locations, field descriptions, and other field notes from soils sampled during the 1993 field season. Laboratory analyses may be found in the Open File Report by O'Neill *et al* , in review.

II. Setting

Data in this report reflect observations and measurements made at the Northern Study Area (NSA) of BOREAS. The NSA supersite is located in the boreal forest west of Thompson, Manitoba (Figs 1 and 2). Tower sites lie within the super site boundaries; only one of the fire sequence sites, the Footprint River Fire, is shown on the Super site map (Fig. 2). Detailed directions to the Gilliam Road and Soab River burn sites are included in the field notes for those sites.

III. Field Procedure

500 m transects were made across each fire site. Every 50 meters, a small soil pit was dug down to the B horizon. Horizon thicknesses, vegetation, and observed hydrology (drainage, slope, standing water, depth to permafrost, depth to water table) was noted. This information was used to locate a detailed soil pit which was representative of conditions across the site.

Sample locations may be divided into categories on the basis of B horizon particle size (sand vs. clay) and surface moisture content. Our designations are: dry clay, wet clay, and sand.

Sites were sampled as follows:

Dry Clay

1. Soil pit was dug and described. Horizon depths and thicknesses, moist color (Munsell color chart), root size and density, particle size, structure, consistency, clay films, and other information were recorded for each organic and mineral horizon.

2. Organic horizons were sampled once, mineral horizons twice. For mineral horizons, one sample was taken volumetrically and used for moisture and density determinations; the other, a channel sample (grab sample integrating material from depths within a horizon), was taken for chemical analysis. Both sample types (volumetric and channel) were placed in zip lock bags for transport to the lab. (**NOTE:** Significant water loss occurred through the plastic bags. As best as possible, this water exchange was corrected for in the 1993 data set. Moisture samples from following field campaigns were stored in air tight glass canning jars).

Wet Clay

1. Soil pit was dug and described as above.

2. Mineral and organic horizons were sampled as above.

3. If moss and brown moss were thick (i.e. *Sphagnum* hummock) then entire hummock was excavated with a saw. Care was taken to prevent deformation or compaction of hummock dimensions. To account for volume changes due to moisture loss, lines were drawn every 5 cm across one face of the sample with correction fluid (White-out). Entire sample was placed in a Tupperware container to minimize moisture loss and transported to the lab.

Sand

1. Soil pit was dug and described as above.

2. Organic horizons were sampled as above.

4. Mineral horizons were sampled as above. In some instances, a mineral horizon was too gravelly to allow for a representative bulk density sample to be taken with standard volumetric coring devices. In this case, a larger area was excavated with a shovel and the material removed to a large plastic bag. As bags filled, they were weighed with a fish scale and dumped onto a tarp. When the entire horizon has been removed, the area of the excavation is measured and recorded. The material on the tarp was piled, cone and quartered, and split into a manageable size. This split was returned to the plastic bag, weighed with the fish scale and the weight recorded. Cobbles and large gravel were removed from this split, and the bag weighed again (this weight is later used to calc. % > 2mm material). The gravel-free sample was rebagged and taken to the lab.

References sited

O'Neill, Katherine P., Harden, Jennifer W. and Trumbore, Susan E., in review, Boreal Ecosystem-Atmosphere Study (BOREAS) 1993 Laboratory Data and Notes; Thompson, Manitoba, U.S. Geological Survey Open File Report

Figure 1: Overview map of Thompson, Manitoba

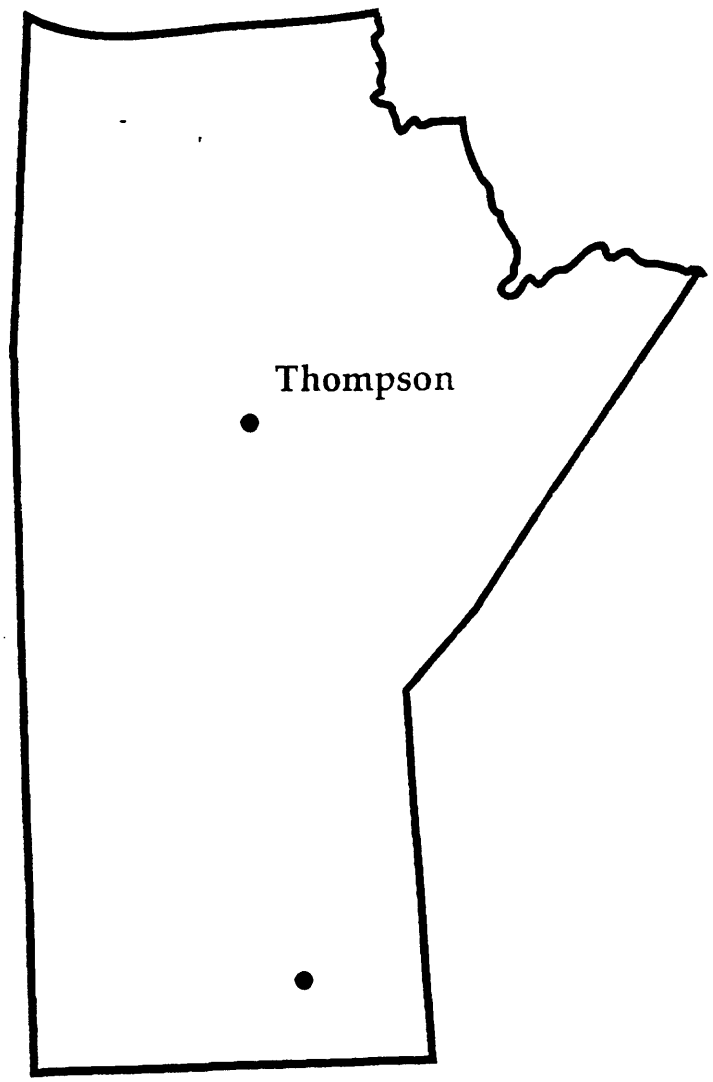

Figure 2: Northern Study Area Supersite map. 'X' represents a tower location.

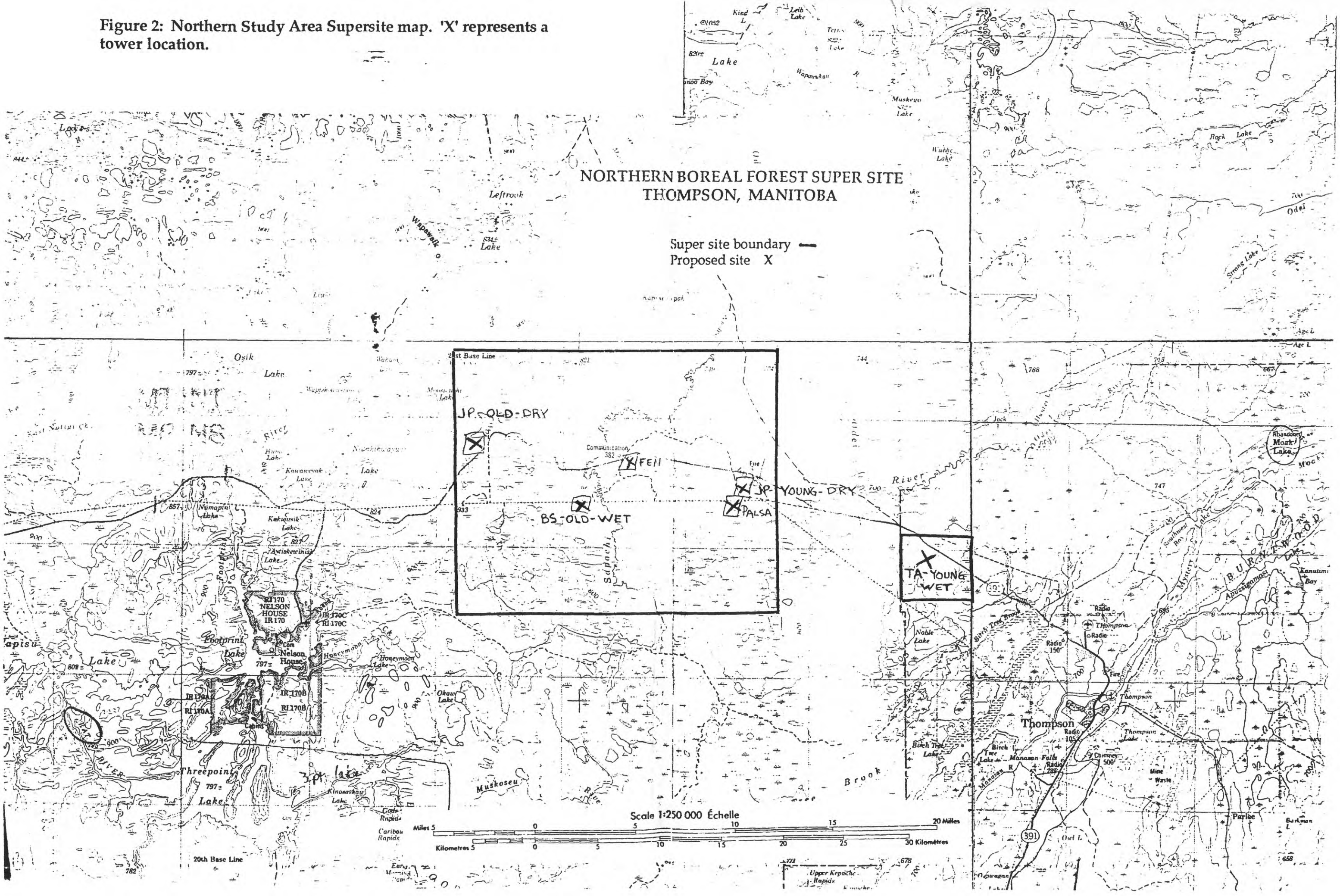

Table 1: Fire Sites and Air Photo Numbers

The fire sequence sampled during the 1993 field season was located by comparing air photos to a series of maps showing fires in the Thompson area for the last 50 years. The fire map was produced by Forestry Canada and can be obtained by contacting the Winnipeg office of Forestry Canada (Glenn Peterson) or the BOREAS information system (Jim MacManus of NASA-Goddard). Air photos showing the fire scars are listed below and can be obtained throughthe Manitoba Department of Natural Resources Surveys and Mapping Branch, 1007 Century Street, Winnipeg, Manitoba R3H OW4 Phone: (204) 945-6669; FAX (204) 945-1365.

Fire Year	Photo Year	Flightline/Photo number	NTS Map
1956	1965	A19241/222,223	63-O
1964	1970	A21881/ 89,90,91	63-P
1989	1991	MB91026/ 238,239,240	63-O

IV. Tower Site Detailed Soil Pit Notes

Young Jack Pine
Old Jack Pine
Old Black Spruce (1 and 2)

At three of the BOREAS tower sites (YJP, OJP, and OBS), soil pits were described in detail and sampled for both moisture content and chemistry. Particle size, soil structure, color (Munsell color chart), pH, root size and content, and consistency were recorded for each soil horizon. Sample names, dimensions, and types are also included on the field sheets. Tower sites were instrumented with gas and TDR probes and thermistors. Where possible, probes were installed within distinct horizon boundaries. Instrument type and depth is recorded on the field sheets.

Young Jack Pine #1 (YJP1)

Described and sampled by J.Harden,M.Bentley; probes installed by G.Winston, S.Trumbore,P.Crill
Directions: 40m beyond hut, 100 m to west
GPS location, preliminary, uncorrected: 55 deg. 53'42.8"N, 98 deg.17'12.7"W
Site is well drained, sandy soil under 2-3 m tall jack pine about .5 m apart; reindeer moss, cranberry, some feathermoss

Depth (cm) top of moss=0	General Description	Moist color	Field pH (LaMotte kit)	Very fine roots < 0.75 mm. diam.	Fine roots 1-2 mm. diam.	Aggregation (soil structure)
0-2	Reindeer moss, cranberry, litter	N/A	N/A	N/A	N/A	N/A
2-4	Decomposed organics von Post 3 (Oi or LFH horizon)	Brownish black (10YR 3/1)	5.4	>14 per sq.in.	4-14 per sq.in.	Distinct(moderate) 2-5 cm granules
4-8	Leached sand (E horizon)	Light grey (10YR 7/1)	4.5	4-14 per sq.in.	4-14 per sq.in.	Weak 2-5 cm subangular blocks
8-17	Transition: some iron oxides (Bs1)	Dull yellowish brown (7.5YR 5/3)	5.6	>14 per sq.in.	< 4 per sq.in.	Weak 2-5 cm subangular blocks
17-36	Sandy subsoil rich in iron oxides (Bs2)	Bright yellowish red (10YR6/6 and 7/4)	5.6	4-14 per sq.in.	4-14 per. sq.in.	Very weak 2-5 cm subangular blocks
36-53	Sandy, oxidized subsoil (BC1 horizon)	Bright yellowish brown (10YR6/6 and 7/3)	6-6.2	4-14 per sq.in.		Loose
53-65	Sandy, oxidized subsoil (BC2 horizon)	Dull yellow orange (10YR7/4)	6.4	4-14 per sq.in.		Loose
65-80	Sandy, slightly oxidized subsoil (C1 horizon)	Dull yellow orange (10YR7/3)	6.4	<4 per sq.in.		Loose
80-100	Sandy, slightly oxidized subsoil (C2 horizon)	Dull yellowish brown (10YR to 2.5Y 5/4)	6.6			Loose

Depth (cm) top of moss=0	Particle Size USDA class	Wet Consistence	Soil samples (cm) = discrete depth			Probes			
			Bulk Density	Areal	Channel	1/8"	1/4"stainless	TDR	Thermistor
0-2	N/A	N/A		YJP1.litter 22.86 cm chimney		at (2)			
2-4	Sand	Nonsticky nonplastic		YJPBD.4 10X40cm rectangle					
4-8	MD	MD	YJP1BD.8 (5) 5 cm of 4.7 cm ring		YJP1.8	at(6.5)	at(6.5)	at(5.5)	at(6.0)
8-17	Gravelly sand (est. 10% grav.)	Nonsticky nonplastic	YJP1BD.17 (12) 5 cm of 4.7 cm ring		YJP1.17				
17-36	Gravelly sand (est.10-20 %)	Nonsticky nonplastic	YJP1BD.36 (25) 5 cm of 4.7 cm ring		YJP1.36	at(21)	at(21)	at(21.5)	at(22)
36-53	Gravelly sand (est. 20-30%)	Nonsticky nonplastic	YJP1BD.53 (40) 5 cm of 4.7 cm ring		YJP1.53	at(37)	at(36)	at(34)	
53-65	Gravelly sand (est. 30%)	Nonsticky nonplastic			YJP1.65	at(53)	at(52)	at(51)	at(50)
65-80	Gravelly sand (est. 30%)	Nonsticky nonplastic	YJP1BD.80 (75) 5 cm of 4.7 cm ring		YJP1.80				
80-100	Gravelly sand (est. 40%)	Nonsticky nonplastic	YJP1BD.100 (85) 5 cm of 4.7 cm ring		YJP1.100	at(92)	at(93)	at(89.5)	at(89)

Old Jack Pine 1 (OJP1

Described and Sampled by: J. Harden, M. Bentley (8/21/93)
Location: W of tower; from tower, follow pathway to west, bear south to Crill's pit
This site is well drained, well oxidized soil with very mature Jack Pine forest;
charcoal at 1-3 cm indicates fire history; very similar to OJP2

Depth (cm) Top of moss = 0	General Description	Dry Color	Moist color	Field pH	Very fine roots < 0.75 mm. diam.	Fine roots 1- 2 mm. diam.	Medium roots 2-5 mm. diam.
0-1	Old jack pine, reindeer moss, cranberry, blueberry	N/A	N/A	N/A	N/A	N/A	N/A
1-3	Decomposed organics charcoal (Von Post2)	Brownish black (10YR3/2)	Black (10YR2/1)	5	0	4-14per sq. in.	0
3-20	Leached sand (E horizon)	Greyish yellow brown (10YR5/2)	Brownish grey (10YR6/1)	5	0	<4per sq.in.	<4 per sq. m
20-32	Sand with iron oxides (Bs1)	Brown (10YR4/6)	Strong brown (10YR 3/6)	5.7	<4 per sq.in.	4-14 per sq. in.	<4 per sq. m
32-52	Sand with iron oxides (Bs2)	Bright yellowish brown (10YR6/6, 6/5)	Yellowish brown (10YR5/6, 4/6)	6.4	<4 per sq.in.	0	0
52-60	Sand with iron oxides (Bs3)	Dull yellowish brown (10YR5/4)	Dull yellowish orange (10YR6/3)	6.4	<4 per sq.in.	0	0
60-80	Oxidized sand	Dull yellowish brown (10YR5/4)	Brown (10YR4/4)	6.4	0	0	0
80-100	Oxidized sand	Dull yellowish brown (10YR5/4)	Brown (10YR4/3)	6.4	0	0	0

					Soil samples (cm) = discrete depth			Gas tubes (cm) = discreet depth		
Depth (cm) Top of moss = 0	Aggregation (soil structure)	Particle Size USDA class	Consistence Moist	Wet	Bulk Density	Areal	Channel	1/8" poly.	1/8"stainless	1/4"stainless
0-1	N/A	N/A	N/A	N/A		OJP1.litter chimney				
1-3	N/A	N/A	N/A	N/A		OJP1.3 chimney				
3-20	Single grained	Gravelly sand	Loose	Nonsticky nonplastic		OJP1.20 27cmX25cm				
20-32	Single grained	Gravelly sand	Loose	Nonsticky nonplastic		OJP1.32 27cmX25cm				
32-52	Single grained	Sand	Loose	Nonsticky nonplastic	6cm of BD core at 43 cm		OJP1.52			
52-60	Single grained	Sand	Loose	Nonsticky nonplastic	6cm of BD core at 52 cm		OJP1.60			
60-80	Single grained	Sand	Loose	Nonsticky nonplastic	6cm of BD core at 68 cm		OJP1.80			
80-100	Single grained	Sand	Loose	Nonsticky nonplastic	6 cm of BD core at 82 cm		OJP1.100			

Old Black Spruce #1 (OBS1)
Described, sampled by J.Harden, S.Trumbore,T.Black (8/26/93)
Location: Old Black Spruce Tower Site
Directions: bear E on catwalk, S on first spur for trace gases; to east about 5m
Site is very wet, seasonally if not perenially somewhat frozen,
with Sphagnum moss and mature black spruce

Depth (cm) top of moss=0	General Description	Moist color	Field pH (LaMotte kit)	Very fine roots < 0.75 mm diam	Fine roots 1- 2 mm diam	Medium roots 2-5 mm diam
0-4	Green Sphagnum moss	Green	N/A	N/A	N/A	N/A
4-8	Brown Sphagnum (von Post 2) Oi horizon	(10YR3/2)	4	>14 per sq.in.	<4 per sq.in.	N/A
8-18	Slightly decomposed organics (von Post 3) Oe horizon	(10YR2/2)	3.8	>14 per sq.in.	4-14 per sq.in	4-14 per sq.m
18-21	Burned topsoil O/A horizon	(10YR3+/2)	6	>14 per sq.in.	<4 per sq.in.	
21-27	Darkened mineral topsoil A Horizon	(10YR3/2)	6.4	>14 per sq.in.	<4 per sq.in.	
27-44	Weakly drained subsoil, with clay coatings on aggregates Bt horizon	(10YR 4+/2)	6.4	4-14 per sq.in.	<4 per sq.in.	
44-64	Well aggregated subsoil "shotty" aggregation BC horizon	(10YR3/2)	6.8	>14 per sq.in.	0	
64-85	Well aggregated subsoil "shotty" aggregation BC horizon	(10YR4+/2)	6.8	MD	MD	MD
85-92	Frozen, defrosting subsoil	MD	MD	MD	MD	

Depth (cm) top of moss=0	Particle Size USDA class	Wet Consistence	Soil samples (cm) = discrete depth			Probes			
			Bulk Density	Areal	Channel	1/8"	1/4"stainless	TDR	Thermistor
0-2	N/A	N/A		YJP1.litter 22.86 cm chimney		at (2)			
2-4	Sand	Nonsticky nonplastic		YJPBD.4 10X40cm rectangle					
4-8	MD	MD	YJP1BD.8 (5) 5 cm of 4.7 cm ring		YJP1.8	at(6.5)	at(6.5)	at(5.5)	at(6.0)
8-17	Gravelly sand (est. 10% grav.)	Nonsticky nonplastic	YJP1BD.17 (12) 5 cm of 4.7 cm ring		YJP1.17				
17-36	Gravelly sand (est.10-20 %)	Nonsticky nonplastic	YJP1BD.36 (25) 5 cm of 4.7 cm ring		YJP1.36	at(21)	at(21)	at(21.5)	at(22)
36-53	Gravelly sand (est. 20-30%)	Nonsticky nonplastic	YJP1BD.53 (40) 5 cm of 4.7 cm ring		YJP1.53	at(37)	at(36)	at(34)	
53-65	Gravelly sand (est. 30%)	Nonsticky nonplastic			YJP1.65	at(53)	at(52)	at(51)	at(50)
65-80	Gravelly sand (est. 30%)	Nonsticky nonplastic	YJP1BD.80 (75) 5 cm of 4.7 cm ring		YJP1.80				
80-100	Gravelly sand (est. 40%)	Nonsticky nonplastic	YJP1BD.100 (85) 5 cm of 4.7 cm ring		YJP1.100	at(92)	at(93)	at(89.5)	at(89)

Old Black Spruce #2 (OBS2)
Location: Old Black Spruce Tower Site; approx.2 m from OBS1
Includes only horizon boundaries

Depth (cm) Top of moss=0	General Description	Gas tubes (cm) = discrete depth			
		1/8"	1/4"stainless	TDR	Temperature
0-4	Green Sphagnum	at(3)			
4-8	Brown, slightly decomposed Sphagnum (Oi horizon)				
8-14	Decomposed organics (Oe horizon)	at(10)	at(12)	at(12)	
14-17	Mixed organics,mineral (O/A horizon)				
17-22	Mineral topsoil (A horizon)	at(22)	at(22)	at(22)	
22-33	Aggregated clay subsoil, with clay films on aggregates (Bt horizon)	at(32)	at(33)	at(31)	
33-48	Granular clay subsoil (BC1 horizon)	at(48)	at(48)	at(42)	
48-64	Granular clay subsoil (BC2 horizon)	at(60)	at(59)	at(58)	

Depth (cm) top of moss=0	Aggregation (soil structure)	Particle Size USDA class	Moist Consistence	Wet Consistence	Soil Samples (cm) = discrete depth		
					Bulk Density	Areal	Channel
0-4	N/A	N/A	N/A	N/A		OBS1.litter 22.86 cm chimney	
4-8	N/A	N/A	N/A	N/A		OBS1.8 22.86 cm chimney	
8-18	Burned zone Brittle feel	N/A	N/A	N/A		OBS1.18 22.86 cm chimney (8-19)	OBS1.18
18-21	Ashy/charcoal	N/A	N/A	N/A	OBS1BD.21 10 cm of 4.7cm diam core (18)		OBS1.21
21-27	Distinct, 1-2mm granules	Clay	Friable	MD	OBS1BD.27 10 cm of 4.7cm diam core (25)		OBS1.27
27-44	Weak, 2-5 cm angular blocks	Clay, with thin clay films coating aggregates	Friable	Sticky very plastic	OBS1BD.44 10 cm of 4.7cm diam core (40)		OBS1.44
44-64	Very distinct (strong) 1-2 mm granules	Clay	Friable	Sticky very plastic	OBS1BD.64 10 cm of 4.7cm diam core (60)		OBS1.64
64-85	Very distinct (strong) 1-2 mm granules	Clay	Friable	Sticky very plastic	OBS1BD.85 3 cm of 4.7cm diam core (82)		OBS1.82
85-92		Clay	Friable	Sticky very plastic	-		OBS1.Frozen

V. Fire Sequence Detailed Pit Field Notes

1956 Soab River Burn (SOAB)
1964 Gilliam Road Burn (GR)
- GR1
- GR2
- GR3
- GR4
- GR5

1989 Footprint River Burn (FF1)

SOAB 1

Succession Of Aspen-pine to Black spruce

Location: South of Thompson on 391/6 just north of Soab River on right side of road.

Site is moderately drained, clay soil on 1956 burn site; apparently more intense part of fire

Vegetation is pine (10m tall), aspen (5-10m), and dense black spruce (1+m); feather moss and 'fern' feather moss

Depth (cm) Top of moss = 0	General Description	Moist color	Field pH (LaMotte kit)	Very fine roots 1- 2 mm diam	Fine roots 2-5 mm diam	Aggregation (soil structure)
0-6 (no green moss)	Slightly decomposed organics von Post 1-2 (Oi horizon)	(10YR2/2)	F 6.8 L 4.8	>14 per sq.in.	4-14 per sq.in.	N/A
6-10	Decomposed, charred organics von Post 3 charcoal	Black (2.5Y2/0)	F 5.4 L 5.2	>14 per sq.in.	<4 per sq.in.	N/A
10-20	Darkened topsoil (A horizon)	Dark greyish brown (2.5Y4/2)	F 6.2 L 6.4	>14 per sq.in.	4-14 per sq.in.	Very distrinct (strong), 2-5 mm granules
20-33	Aggregated subsoil may be Bt	Dark brown (10YR3/3)	F 6.8 L 6.6	>14 per sq.in.	<4 per sq.in.	Very distrinct (strong), 2-5 mm granules
33-50	Aggregated subsoil	Dark brown (10YR5/3, 7.5YR7/3)	F 7.8 L 7.1	>14 per sq.in.	<4 per sq.in.	Distinct (moderate), 2-5 mm granules
50-85	Clay subsoil wet	Greyish brown (10YR5/2, 7.5YR7/3)	F 8 L 7.2	4-14 per sq.in.		Weak, 2-5 mm granules
85-100	Clay subsoil water table	Greyish brown (2.5Y5/2)	L 7.5			

F = Field; L = Lab

Depth (cm) Top of moss = 0	Particle Size USDA class	Moist Consistence	Wet Consistence	Soil samples (cm) = discrete depth Bulk Density	Areal	Channel
0-6 (no green moss)	N/A	N/A	N/A		SOAB1.litter 22.86 cm chimney	
6-10	N/A	N/A	N/A			SOAB1.10
10-20	Clay	Friable	Sticky, plastic	SOAB1BD.20 4.8 cm core		SOAB1.20
20-33	Clay	Friable	Sticky very plastic	SOAB1BD.33 4.8 cm core (23)		SOAB1.33
33-50	Clay	Friable	Sticky very plastic	SOAB1BD.50 4.8 cm core (65)		SOAB1.50
50-85	Clay	Friable	Sticky very plastic	SOAB1BD.85 4.8 cm core (70)		SOAB1.85
85-100	Clay	Friable	Sticky very plastic	SOAB1BD.100 (2) 4.8 cm cores(90)		SOAB1.100

Gillam Road #1 (GR1)

Described and sampled by J.Harden; M. Bentley.
Directions: East of Agriculture Canada's temperature-probe trail, on north side of Gillam Road, to east of cabin
Location: Preliminary, uncorrected GPS location (8/27/93). 5 m SE of (SO82715C) 55 54 19.8 by 97 42 31.4
Site is recovering from 1964 burn, with 3m tall Jack Pine interspersed with 1 to 2 m tall Black Spruce; feathermoss, reindeer moss, laborador tea are common ground covers; overall soil is well drained, strongly aggregated clay

Depth (cm) Top of moss=0	General Description	Dry Color	Moist color	Field pH (Lamotte)	Very fine roots 1- 2 mm diam.	Fine roots 1-2 mm diam	Medium roots 2 -5 mm diam.
0 -0.2 cm	Lichen, moss, recent litterfall	N/A	N/A	N/A	N/A	N/A	N/A
0.2 - 2.0 cm	Slightly decomposed litter and root horizon (Oi or LFH horizon)	Greyish yellow brown (10YR4/2)	Dry brownish black (10YR 3/1)	5.6	> 14 per sq.inch	4-14 per sq.in.	0
2-11 cm	Topsoil (A horizon)	Dull yellowish brown (10YR5/3)	Dark brown (10YR 3/3)	5.3	>14 per sq.in.	4-14 per sq.in.	4-14 per sq.m
11 -20	Well aggregated subsoil with pedogenic clay (Bt1 horizon)	Too wet	Dull yellowish brown (10YR 4/3)	6	<4 per sq.in.	<4 per sq.in.	4-14 per sq.m
20-40	Well aggregated subsoil with pedogenic clay (Bt2 horizon)	Too wet	Dark brown (10YR 3/3)	7.1	<4 per sq.in.	<4 per sq.in.	4-14 per sq.m
40-60	Well aggregated subsoil	Too wet	Dark brown (10YR3/3)	7.4	<4 per sq.in.	<4 per sq.in.	
60-80	Well aggregated subsoil	Too wet	Dark brown (10YR3/3)	7.8	<4 per sq.in.	<4 per sq.in.	
80-100	Well aggregated subsoil	Too wet	Dark brown (10YR3/3)	7.8	<4 per sq.in.	<4 per sq.in.	

Blank = Not applicable; MD = missing data

Depth (cm) Top of moss=0	Aggregation (soil structure)	Particle Size USDA class	Consistence Moist	Wet	Soil Samples (cm) = discreet depth Bulk Density	Areal	Channel
0 -0.2 cm	N/A	N/A	N/A	N/A		Litter GR1.0.2 chimney sampler	
0.2 - 2.0 cm	N/A	N/A	N/A	N/A		GR1.2 Chimney sampler (22.86 cm)	
2-11 cm	Very distinct (strong) 1-2mm (fine) granules	Clay	Friable	Slightly sticky plastic	GR1BD.11 9 cm X 5.08 cm diam core		GR1.11
11 -20	Very distinct (strong) 20-50 mm (coarse) subangular blocks	Clay, with common thin clay films coating aggregates	Firm	Sticky, very plastic	GR1BD.20 6cm X 5.08 cm diam core		GR1.20
20-40	Same as above, breaking to distinct 10-20 mm (fine) blocks	Clay, with common (25%) thin clay films coating aggregates	Firm	Sticky, plastic	GR1BD.40 6cm X 5.08 cm diam core (35)		GR1.40
40-60	Moderately strong 20-50mm subangular blocks and 10-20mm granules	Clay, glossy but no clay films	Friable	Sticky, plastic	GR1BD.60 6cm X 5.08 cm diam core (54)		GR1.60
60-80	Moderately strong 20-50mm subangular blocks and 10-20mm granules	Clay, glossy but no clay films	Friable	Sticky, plastic	GR1BD.80 6cm X 5.08 cm diam core (78)		GR1.80
80-100	Moderately strong 20-50mm subangular blocks and 10-20mm granules	Clay, glossy but no clay films	Friable	Sticky, plastic	GR1BD.100 3cm X 5.08 cm diam core (88)		GR1.100

Gillam Road # 2 (GR2)

Described and sampled by J.Harden, S. Trumbore (8-22-93)

Directions: NE along highway 280, 17 km from turnoff,about 0.2 km NE of cabin, in toward north from orange paint on tree;

GPS location: Preliminary, uncorrectedSO82715A 54 deg. 54' 29.5" by 97 deg. 42' 01.1" This site used as unburned, well drained black spruce control near vegetation of Black Spruce and feathermoss with laborador tea, blueberry, reindeer moss, rose

Depth (cm) Top of moss=0	General Description	Color	Field pH (LaMotte)	Very fine roots < 0.75 mm diam	Fine roots 1 - 2mm diam	Medium roots 2 - 5 mm diam.	Aggregation (soil structure)
0-4	Green feathermoss with litterfall intermixed	N/A	N/A	N/A	N/A	N/A	N/A
4-6	Blackened moss; litter mixed in	N/A	N/A	N/A	N/A	N/A	N/A
6-11	Brown moss with very fine roots	N/A	N/A	N/A	N/A	N/A	N/A
11-13	Fungus,roots	N/A	4.2	>14 per sq. in.	>14 per sq. in.	0	N/A
13-13 1/2	Fine root mat	N/A	4.2	>14 per sq. in.	>14 per sq. in.	> 14 per sq. m	N/A
13 1/2 -21	Darkened mineral soil (A horizon)	Dull yellowish brown (10YR 5/3) - Moist Greyish yellow brown (10YR 5/2) - Dry	4.4 - 4.6	>14 per sq. in.	4-14 per sq. in.	4-14 per sq. m	Very distinct (strong) <20 mm (fine) subangular blocks AND Very distinct (strong) 2-5 mm (medium) granules
21 - 45	Well aggregated subsoil with pedogenic clay (Bt1 horizon)	Dull yellowish brown (10YR 4/3)	5.6	<4 per sq. in	<4 per sq. in	4-14 per sq. m	Distinct (moderate) coarse prismatic with secondary very distinct (strong) 20 - 50 mm (coarse) angular blocks
45 - 60	Well aggregated "shotty" clay (Bt2)	Dull yellowish brown (10YR 4/3)	6.4	>14 per sq. in.	<4 per sq. in	<4 per sq. m	Very distinct (strong) 1-2mm (fine) granules
60-80	Well aggregated "shotty" clay (BC2)	Dull yellowish brown (10YR 4/3)	7.4	>14 per sq. in.	<1 per sq. in.		Distinct (moderate) 1-2 mm (fine) granules
80-100	Well aggregated "shotty" clay (BC3)	Dull yellowish brown (10YR 4/3 and 5/3)	7.6	<1 per sq. in.	<1 per sq. in.		Distinct (moderate) 1-2 mm (fine) granules

Soil Samples

Depth (cm) Top of moss=0	Particle Size USDA class	Moist Consistence	Wet Consistence	Bulk Density	Areal	Channel
0-4	N/A	N/A	N/A		Litter GR2.4 22.86 cm chimney	
4-6	N/A	N/A	N/A		GR2.6 with litter 22.86 cm chimney	
6-11	N/A	N/A	N/A		GR2.11 22.86 cm chimney	
11-13	N/A	N/A	N/A		GR2.13 22.86 cm chimney	
13-13 1/2	N/A	N/A	N/A		Combined into GR2.13	
13 1/2 -21	Clay	Firm	Slightly sticky plastic	GR2BD.21 6cm of 5.08 cm core		GR2.21
21 - 45	Clay, with common thin clay films coating aggregates	Firm	Slightly sticky plastic	GR2BD.45 4 cm of 5.08 cm core		GR2.45
45 - 60	Clay	Very friable	Slightly sticky plastic	GR2BD.60 4 cm of 5.08 cm core		GR2.60
60-80	Clay	Very friable	Slightly sticky plastic	GR2BD.80 4 cm of 5.08 cm core		GR2.80
80-100	Clay	Very friable	Slightly sticky plastic	GR2BD.100 4 cm of 5.08 cm core		GR2.100

Gillam Road # 3 (GR3)

Described, sampled by J.Harden, S.Trumbore (8-23-93)
Directions: 17 km from turnoff on 280; North of road, down Ag.Can. trail to wet,open area of 1964 burn;
GPS location: Preliminary, uncorrected SO82715B 55 54 21.7 by 97 42 35.1
This site is wet, Sphagnum rich area within 1964 burn; dead standing trees nearby but not here
Vegetation is small black spruce (1m tall), some pine (1-2m tall), Sphagnum tussocks, laborador tea, blueberries
Raining during sampling

Depth (cm) Top of moss=0	General Description	Moist color	Field pH (LaMotte kit)	Very fine roots 1- 2 mm diam	Fine roots 2-5 mm diam	Medium roots	Aggregation (soil structure)	Particle Size USDA class
0-2	Living Sphagnum	MD	MD	N/A	N/A	N/A	N/A	N/A
2-18	Brown moss	MD	MD	0	2-14 per sq. in.	4-14 per sq. m	N/A	N/A
18-26	Brown/black moss	MD	MD	MD	MD	MD	N/A	N/A
26-35	Black, slightly decomposed moss	MD	MD	>14 per sq. in.	>14 per sq. in.	4-14 per sq. m	N/A	N/A
35-42	Decomposed moss	MD	MD	4-14 per sq. in.	<4 per sq. in.	0	N/A	N/A
42-58	Blocky clay	MD	MD	4-14 per sq. in.	<4 per sq. in.	0	Very distinct (strong) 20 -50 mm (coarse) subangular blocks	Clay
58-69	Granular, "shotty" clay	MD	MD	<4 per sq. in.	<4 per sq. in.		Very distinct (strong) 1-2 mm (fine) granules	Clay
69-80	Dense, wet clay	MD	MD	<4 per sq. in.				Clay

Blank = Not applicable; MD = missing data

Depth (cm) Top of moss=0	Wet Consistence	Soil Samples (cm) = discrete depth Bulk Density	Areal	Channel
0-2	N/A		GR3.20 cut 20X20X10 (0-20 cm depth)	
2-18	N/A	GR3BD.18 cut 15X15X15 (0-15 depth)	see above	
18-26	N/A	GR3BD.26 cut 12X10X7	GR3.40 ut 20X20X9 (20-40)	
26-35	N/A	GR3BD.35 cut 10X15X5	See above	
35-42	N/A	GR3BD.42 cut 9.7X10X4	See above	GR3.42
42-58	Sticky plastic			GR3.58
58-69	Sticky plastic	Use data from GR3.80		GR3.69
69-80	Sticky plastic	GR3.80 of 8.26 cm diam core (69-80cm)		

Gillam Road #4 (GR4)

Described and sampled by J.Harden and S.Trumbore (8/23/93)
GPS location: preliminary, uncorrected 55 deg. 54'14.9"N, 97 deg.42'22.8"W
Directions: across highway 280 from cabin, up trail about 70 m and to left
Site is in 'unburned' edge of 1964 fire in wet Sphagnum and black spruce area.
Used as relatively unburned wet control site for '64 fire
Note: Both brown and green mosses comprise hummock

Depth (cm) top of moss=0	General Description	Moist color	Field pH (LaMotte kit)	Very fine roots < 0.75 mm diam	Fine roots 1 - 2 mm diam	Medium roots 2 - 5 mm diam
0-2	Living green Sphagnum	N/A	N/A	N/A	N/A	N/A
2-22	Brown Sphagnum (von Post 2) (O Horizon)	(7.5YR5/4)	MD	<4 per sq.in.	<4 per sq.in	0
22-25	Charred, dark Sphagnum, needles (von Post 3) (O Horizon)	(10YR2/2)	MD	Live and dead	0	0
25-34	Brown Sphagnum, fibrous, no needles (von Post 2) (O Horizon)	(10 YR 4/6)	MD	MD	MD	MD
34-38	Root mat, curly roots and clay (von Post 9) (O Horizon)	(10YR3/2)	5.8	Many dead	MD	MD
38-60	Aggregated clay subsoil (B Horizon)	(2.5Y5/2)	6	4-14 per sq.in	4-14 per sq.in	
60-81	Granular clay subsoil (B Horizon)	(10YR4/4)	6	MD	MD	MD

Depth (cm) top of moss=0	Aggregation (soil structure)	Particle Size USDA class	Notes	Soil samples (cm) = discrete depth Bulk Density	Areal	Channel
0-2	N/A	N/A			GR4.26 cut to 26	
2-22	N/A	N/A		GR4.BD22 22.86 cm chimney	GR4.26 cut to 26	
22-25	N/A	N/A	Brittle Sphagnum pieces		GR4.25 22.86 cm chimney	
25-34	N/A	N/A	Discontinuous boundary		GR4.34 22.86 cm chimney	
34-38	N/A	N/A	Sedge pieces		GR4.38 22.86 cm chimney sampler	
38-60	Distinct (moderate) >5cm (coarse) subangular blocky	Clay		GR4BD.60(54) 4cm of 5.08cm core		GR4.60
60-81	Very distinct (strong) 1-2mm (fine) granules	Clay		GR4.81 17 cm of 8.89 cm core		

Gillam Road # 5 (GR5)

Described by J. Harden (8/25/93); sampled by T.Black (8/25/93); gas probes inserted by G. Winston and M. Bentley (8/25/93) Directions: Out 280 17km from turnoff; From highway 280, go north along Ag Canada trail west of cabin; turn west at flagging; site is about 10 m east of cleared area with teepee frame GPS location SO82715C 55 deg. 54' 19.8" by 97 deg. 42' 31.4"; Site is well-aggregated, well drained clay soil, with 10m jack pine and 1-2 m black spruce; recovering from 1964 burn Site is among earth hummocks, and upper soil horizons vary in thickness above A horizon (field sheet has drawing) Probe depths are from surface, noted as within a given horizon

Depth, cm top of moss=0	General Description	Moist color	Field pH	Very fine roots < 0.75 mm diam	Fine roots 1 - 2 mm diam
0-4	Living feather moss, litter	N/A	N/A	N/A	N/A
4-7	Decomposed (von Post 2) organic matter (Oi horizon or LFH)	Brownish black (10YR 3/2)	4.8	>14 per sq. in.	0
7-11	Decomposed (von Post 3) organic matter (Oe horizon)	Brownish black (10YR 3/2)	4.8	>14 per sq.in.	0
11-16	Darkened mineral soil (A horizon)	Greyish yellow brown (10YR 5/2)	5.6	>14 per sq. in.	0
16-33	Well aggregated, clay subsoil (Bt horizon)	Dull yellowish brown (10 to 7.5 YR 5/3)	6.8	<4 per sq.in.	0
33-53	Well aggregated ('shotty') , clay subsoil which probably freezes annually (B2 horizon)	Greyish brown (7.5 YR 4/2)	6.8	<4 per sq.in.	<4 per sq.in.
53-66	Well aggregated ('shotty') , clay subsoil which probably freezes annually (B2 horizon)	Greyish brown (7.5 YR 4/2)	7.2	<4 per sq.in.	0
66-88	Massive clay subsoil, clay varves (depositional layering) deformed by frost heaving (BC horizon)	Greyish brown (7.5YR 4/2) Dull yellowish orange (10YR7/4)	7.3	0	<4 per sq.in.
88-100	massive clay subsoil, clay varves (depositional layering) deformed by frost heaving (BC horizon)	Brown (10YR 4/4) Dull yellowish orange (10YR7/3)	7.4	MD	MD

Depth, cm top of moss=0	Aggregation (soil structure)	Particle Size USDA class	... Consistence Moist	Wet	Soil samples (cm) = discrete depth Bulk Density	Areal	Channel
0-4	N/A	N/A	N/A	N/A		GR5.litter 22.86 cm chimney	
4-7	N/A	N/A	N/A	N/A		GR5.7 22.86 cm chimney	
7-11	N/A	N/A	N/A	N/A		GR5.11 22.86 cm chimney	
11-16	Very distinct (strong), 1-2 mm granules	Clay	Very friable	Slightly sticky plastic	GR5BD.16 (12) 8cm x 5.08 cm core		GR5.16
16-33	Very distinct (strong), 5cm (coarse) subangular blocks, breaking to distinct 2-5 cm blocks	Clay, with common (25%), thin clay films coating aggregates	Firm	Slightly sticky, plastic	GR5BD.33 (24) 6cm x 5.08cm.diam.core		GR5.33
33-53	Very distinct (strong), 1-2 mm granules	Clay, glossy but no clay films	Friable	Sticky very plastic	GR5BD.53 (40) 3cm x 5.08cm. diam core		GR5.53
53-66	Very distinct (strong), 1-2 mm granules	Clay	Friable	Sticky very plastic	GR5BD.66 (63) 4.7cm x 5.08cm diam core		GR5.66
66-88	Massive, breaking to weak 2 - 5 cm. subangular blocks	Clay	Friable	Sticky very plastic	GR5BD.88 (85) 4cm x 5.08cm diam core		GR5.88
88-100	Massive	Clay	Friable		GR5BD.100 12.5cm x 8.26 cm diam core		GR5.100

Depth, cm ... top of moss=0	Gas Tubes (cm) = discreet depth 1/8" poly.	1/8"stainless	1/4"stainless	TDR	thermistor
0-4		(2 from top)			
4-7					
7-11					
11-16		at (8.5)	at(10)	at (10)	at(12)
16-33		at (38)	at(38)	at(34)	at(21)
33-53		at(38)	at(38)	at(34)	at(21)
53-66					
66-88		at(69)	at(69)	at(65)	at(72)
88-100					

Footprint Fire # 1 (FF1)

Location: Site is in 1989 burn scar along Highway 391, approximately 0.2 km past the Footprint River Bridge.
Tim Moore et al have gas probes near here

Depth (cm) top of moss=0	General Description	Moist color	Field pH (LaMotte kit)	Very fine roots 1- 2 mm diam	Fine roots 2-5 mm diam	Medium roots	Aggregation (soil structure)
0-2	Living moss	N/A	N/A	N/A	N/A	N/A	N/A
2-5	Charred topsoil - is this mineral or organic horizon?	(2.5Y3/0)	MD	>14 per sq.in	>14 per sq.in.	0	N/A
5-20	Clay subsoil?	MD	MD	>14 per sq.in.	>14 per sq.in.	4-14per sq.m	Very distinct (strong) 1-2mm granules
20-37	Clay subsoil	(10YR5/2)	MD	4-14 per sq.in.	4-14 per sq.in	4-14 per sq.m.	Very distinct (strong) 1-2mm granules
37-60	Clay subsoil	MD	MD	<4per sq.in.	<4per sq.in.	0	Weak subangular blocky to distinct (moderate) 1-2mm granules
60-70	Clay subsoil	(5Y6/2, 5/2)	MD	0	4-14 per sq.in.	0	MD

		-------- Soil samples--------			---------- Gas tubes ----------		
Particle Size	Wet	Note ( ) if discrete depth			Note ( ) if discrete depth		
USDA class	Consistence	Bulk Density	Areal	Channel	1/8" poly.	1/8"stainless	1/4"stainless
N/A	N/A	None	None	none			
N/A	N/A		FF1.5 20X20cm			Tim Moore?	
Clay	Sticky	FF1BD.20 7 cm of 5.08 cm core (11)					
Clay	Very sticky	FF1BD.37 4cm of 5.08 cm core (38)					
Clay	Slightly sticky	FF1BD.60 4 cm of 5.08 cm core (54)					
Clay	MD	FF1BD.70 3cm of 5.08 cm core (65)					

VI. Fire Sequence Transect Notes

SOAB Transect
Gilliam Road Transect - Burned (Young)
Gilliam Road Transect - Unburned (Old)
Footprint River Fire Transect

A 500 meter transect was made across each of the three fire sequence sites. Every 50 meters, a small soil pit was dug down to the B horizon. Horizon thicknesses, surface vegetation, and observed hydrology (drainage, standing water, depth to permafrost, depth to water table) were noted and this information used to locate a representative sampling site for a more detailed soil pit.

In the description sheets that follow, each of the transect points represents a separate description location. The table is read from left to right, and is divided into subheadings of surface vegetation, moss/litter, organic material, and mineral soil horizons. For each of these categories, a basal depth and thickness is noted along with a brief qualitative description of the material. Because we were primarily concerned with materials above the B horizon and their thicknesses, formal horizon boundaries and names were not determined.

SOAB Transect

Described by M. Bentley, K. O'Neill (8/22/93)

Location: Site is in 1956 burn scar, south of Thompson on 391/6 on the north side of the Soab River. Transect begins on east side of road, approx. 400 m. in from first clearing N of river. Transect points are approx. 25 m apart trending south (parallel to road). Yellow flagging.

		Moss/Litter			Brown Moss		
	Surface vegetation	Type	Depth (cm)	Thickness (cm)	Character	Depth (cm)	Thickness (cm)
SOAB.1	Aspen leaves young black spruce	Deciduous leaves (Oi)	0-3 cm	3			
SOAB.2	Young black spruce aspen leaves	Deciduous leaves (Oi)	0-2 cm	2			
SOAB. 3	Young black spruce	Feathermoss	0-2 cm	2	von Post 2	2-13 cm	11
SOAB.4	Black spruce (< 6 ft.)	Feathermoss	0-1 cm	1			
SOAB.5	Young black spruce	Feathermoss deciduous leaves	0-1 cm	1			
SOAB.6	6-8 ft. black spruce	Feathermoss	0-10 cm	10	von Post 2	10-14 cm	4
SOAB.7	Young black spruce	Feathermoss	0-2 cm	2	von Post 2	2-8 cm	6
SOAB.8	Aspen	Feathermoss reindeer moss	0-4 cm	4	von Post 2	2-8 cm	6
SOAB.9	Aspen, birch, small spruce	Feathermoss,reindeer deciduous	0-1 cm	1			
SOAB.10	Y. black spruce	Feathertip(?) moss	0-6 cm	6	von Post 2	6-9 cm	3

Blank = N/A; MD = missing data

	Organic			Depth to Charcoal	Mineral Soil 1		
	Type	Depth	Thickness		Subsoil	Depth	Thickness
SOAB.1	(Oe)	3-8 cm	5	8	Loose gravelly sand (A/E)	8-12 cm	4
SOAB.2	(Oe)	2-7 cm	5		Moderate,fine granular clay	7-13 cm	6
SOAB. 3				13	Moderate, medium granular clay	13-19 cm	6
SOAB.4	Darker decomposed	1-8 cm	7	8	Moderate,fine granular clay	8-17 cm	9
SOAB.5	von Post 3	1-8 cm	7	8	Strong, fine granular clay	8-20 cm	12
SOAB.6	Darker decomposed	14-18 cm	4	18	Strong, fine granular clay	18-24 cm	6
SOAB.7				8	Moderate,fine granular clay	8-18 cm	10
SOAB.8				8	Strong,fine granular clay	8-16 cm	8
SOAB.9	von Post 1	1-10 cm	9	8	Strong, medium granular clay	10-18 cm	8
SOAB.10	Humic layer	9-12 cm	3		Strong,fine granular clay	12-18 cm	6

Mineral Soil 2

	Subsoil	Depth	Thickness	Comments
SOAB.1	Very gravelly sand (Bs)	12-38 cm	26	10-20% rock (A/E horizon)
SOAB.2	Moderate, medium angular blocky; secondary fine granular clay	13-32 cm	19	
SOAB. 3	Moderate, medium subangular blocky	19-34 cm	15	Atop decayed wood
SOAB.4	Moderate,fine subangular blocky	17-34 cm	17	Wetter site
SOAB.5	Strong,fine granular clay; secondary moderate medium subangular blocky	20-36 cm	16	Downslope, fallen trees
SOAB.6	Moderate, medium angular blocky	24-36 cm	12	von Post 4; darker
SOAB.7	Moderate,medium subangular blocky	18-32 cm	14	Large roots decaying moss
SOAB.8	Moderate,medium subangular blocky	16-36 cm	20	
SOAB.9	moderate medium subangular blocky clay	18-33 cm	15	Many fallen trees
SOAB.10	Moderate,medium granular clay; secondary fine granular clay	18-37	19	

Gillam Road Transect (GRTY)

Described by M. Bentley, K. O'Neill (8/19/93)

Location: Site is in 1964 burn scar along Gillam Road

		Moss/Litter			Brown Moss		
Transect Point	**Surface vegetation**	**Type**	**Depth**	**Thickness**	**von Post**	**Depth**	**Thickness**
GRTY.01	MD	Reindeer moss	0-4 cm	4	MD	4-7 cm	3
GRTY.02	Reindeer,blueberry, Deciduous	Moss deciduous leaves	0-4 cm	4	3	4-8 cm	4
GRTY.03	Aspen, jack pine	Deciduous leaves bark	0-2 cm	2	MD		
GRTY.04	MD	Living greens	0-1 cm	1	MD	1-13 cm	12
GRTY.05	MD	Feathermoss, labrador tea, grass	0-6 cm	6	MD	6-20 cm	14
GRTY.06	Small black spruce	Grasses labrador tea	0-4 cm	4	3	4-21 cm	17
GRTY.07	MD	*Sphagnum* feathermoss	0-10 cm	10	2	10-22 cm	12
GRTY.08	MD	*Sphagnum*	0-7 cm	7	MD	7-14 cm	7
GRTY.09	MD	Living - no moss	0-2 cm	2	MD	2-4 cm	2
GRTY.10	MD	Mixed mosses, herbs	0-2 cm	2			

Blank = N/A; MD = missing data

	Organic (cm)			Depth to Charcoal	Mineral Soil 1		
Transect Point	Type	Depth (cm)	Thickness (cm)		Subsoil	Depth	Thickness
GRTY.01				8	Strong, fine, granular clay	8-17 cm	9
GRTY.02					Strong, fine, granular clay	4-8 cm	4
GRTY.03	Forest floor	2-6 cm	4		Strong/moderate medium granular clay	6-15 cm	9
GRTY.04	Darker decomp	13-14 cm	1	14	Strong, fine, granular clay	14-24 cm	10
GRTY.05	Black organic rich	20-35 cm	15	35	Clay (grey-brown)	35-43 cm	8
GRTY.06	Darker decomposed	21- 33 cm	12		Strong, fine,granular clay	33-35 cm	2
GRTY.07	Darker decomposed	22-35 cm	12		Clay	35-46 cm	11
GRTY.08	Darker decomposed	14-18 cm	4		Clay	18-42 cm	24
GRTY.09				4	Strong, medium, granular clay	4-11 cm	7
GRTY.10	Forest floor/ partly decomp	2-5 cm	3		Medium fine,granular clay	5-15 cm	10

Mineral Soil 2

Transect Point	Subsoil	Depth	Thickness	Comments
GRTY.01	Moderate,medium subangular blocky	17-27 cm	10	
GRTY.02	Moderate, medium angular blocky	18-27	9	Subsoil 2 has a redder color
GRTY.03	Moderate,medium subangular blocky	15-23 cm	8	Distinctive - redder than other A's
GRTY.04	Weak,medium angular blocky	24-37 cm	13	
GRTY.05		20-36 cm	16	Large pieces of wood
GRTY.06				von Post darker - 4 Water table at 35 cm
GRTY.07	Dark clay	46- 60 cm	14	Fine and med. roots
GRTY.08				Darker decomposed von Post 3
GRTY.09	Moderate, coarse angular blocky clay	11-17 cm	6	Fungus on peat faces fine roots
GRTY.10	Clay	15-28 cm	13	Partly decomposed von Post 3

Gillam Road Transect - Old

Described by M. Bentley, K. O'Neill (8/20/93)

	Vegetation	Moss/Litter Type	Depth	Brown Moss Character	Brown Moss Depth	Organic Character	Organic Depth	Charcoal Depth
GRT.011		Feathermoss, sphagnum	0-4	Von Post 2	4 to 12	Darker decomposed	12 to 15	
GRT.012		Feathermoss, sphagnum	0-4	Von Post 2	4 to 34			
GRT.013	Aspen	Feathermoss, reindeer moss	0-5	Von Post 2	5 to 11			
GRT.014		Feathermoss, reindeer moss	0-5	Von Post 2 discontinuous	5 to 20			
GRT.015		Feathermoss, labrador tea	0-5	Von Post 2	5 to 19			19 discontinuous
GRT.016	Black spruce	Sphagnum, feathermoss, labrador tea	0-26			Black decomposed Von Post 3 Humic	26-35 36-43	
GRT.017	Birch (clearing)	Sphagnum	0-18					
GRT.018	Ferns, Aspen	Feathermoss	0-7	Von Post 3	7 to 19	blacker decomposed Von Post 4	19-28	
GRT.019	Standing dead black spruce burned spruce	Feathermoss, reindeer moss cranberry	0-5		5 to 14			14; 1 cm thick
GRT.020		Feathermoss, reindeer reindeer moss, tomitipton	0-2	Von Post 2	2 to 11			

	Subsoil 1		Subsoil 2		
	Character	Depth	Character	Depth	Comments
GRT.011	Moderate fine granular clay	16-27	Strong medium sub-angular blocky Secondary moderate medium granular	27-39	Atop decomposed log, lots of wood
GRT.012	Moderate fine granular clay	34 -47	Strong medium granular clay	47 -60	Tussock
GRT.013	Strong fine granular clay	11 to 21	Moderate medium sub-angular blocky Secondary medium granular	21-44	Dry
GRT.014	Strong fine granular clay	20 to 27	Moderate medium sub-angular blocky	27-35	Large roots; deciduous
GRT.015	Strong medium granular clay	19-25	Moderate medium sub-angular blocky	25-45	Large roots
GRT.016	Moderate medium subangular blocky; Secondary fine granular	44-53	Permafrost	53+	Wet! Permafrost at 53 cm
GRT.017					Water Table at 18
GRT.018	Clay	28-41	Water Table at 31		Water Table a31; many large roots
GRT.019	Strong fine granular clay	15 - 26	Moderate medium sub-angular blocky Secondary fine granular	26-40	
GRT.020	Strong fine granular clay	11 to 19	Weak medium sub-angular blocky	19-34	

Footprint Fire Transect #1 (FFT1)

Described by S. Trumbore, K. O'Neill (8/24/93)

Location: Site is in 1989 burn scar along Highway 391, approximately 0.2 km past the Footprint River Bridge. Transect begins on the far side (away from Thompson) of a small fen close to, but not visible from, the road. Transect bearing S30W, sites approximately 25 m apart. Site is well-flagged.

		Moss/Litter			Brown Moss		
Transect Point	**Surface Vegetation**	**Moss/Litter**	**Depth (cm) Top of moss = 0**	**Thickness (cm)**	**Character**	**Depth**	**Thickness**
FFT.1	Sphagnum tussocks		0-2	2	2 layers seperated	2 to 37	35
		Charred layer			by 3 cm charred layer at 37-40	40 to 47	7
FFT.2	Hummocky herbaceous, labrador tea	Charred layer	.01-1	1			
FFT.3		Moss	0-1	1	Moss + roots von Post 4-5	1 to 9	8
FFT.4	Still hummocky more unburned area	Sphagnum	1 to 5	4	von Post 2	3 to 31	28
FFT.5	Fireweed & herbaceous plant near stand of felled, burned trees		0-2	2			
FFT.6	Black spruce Many fallen trees	Moss, leaf litter	0-2	2			
FFT.7	Black Spruce Many fallen trees	Moss	0-5	5			
FFT.8	Black Spruce Fallen trees	Moss	0-6	6			

	Organic Layer					Mineral Soil 1			Mineral Soil 2		
Transect Point	**Character**	**von Post**	**Depth (cm)**	**Thickness**	**Charred Layer**	**Character**	**Depth (cm)**	**Thickness (cm)**	**Character**	**Depth (cm)**	**Thickness (cm)**
FFT.1					37-40						
FFT.2	Decomposed Brown/ Black Humic	4 7 or 8	1 to 21 21 to 29	20 8		Granular clay	29+		Water Table 29 cm		
FFT.3	Humic	5 or 6	9 to 20	11	needles at 9??	Clay	20+		Water Table 20 cm		
FFT.4	Darker decomposed	3 or 4	31 to 38	7					Water Table 38 cm		
FFT.5	Dark decomposed		2 to 6	4		A mineral soil but high organic	6 to 10	4	Fine granular clay	10 to 28	18
FFT.6						Strong fine granular clay	2 to 20	18			
FFT.7						Strong fine granular clay	8 to 20				
FFT.8											

VII. Glossary of Soil Terms

Aggregation

See Structure

Bulk Density

Soil mass per unit volume (g/cm3). Measured by obtaining an air dry weight for soil sampled in a known volume.

Consistence

A measure of the ability of a soil to adhere or cohere or to resist deformation or rupture. This property varies with moisture content and is measured when dry , moist, and wet.

Dry

Loose - loose, noncoherent
Soft - weakly coherent, easily crushes to powder
Slightly hard - easily broken between the thumb and forefinger
Hard - can be broken in hand without difficulty but hard to break between thumb and forefinger
Very hard - can be broken in hand with difficulty

Moist

Loose - loose, noncoherent
Very friable - crushes under gentle pressure
Friable - crushes easily under moderate pressure
Firm - resists, but crushes between thumb and forefinger
Very firm - barely crushes between thumb and forefinger
Extremely firm - can't crush between thumb and forefinger

Wet

Non-sticky - almost no adherence when pressure released
Slightly sticky - after pressure, soil adheres to both thumb and finger but comes off one cleanly. Does not stretch
Sticky - after pressure soil adheres to both thumb and finger; tends to stretch somewhat before pulling apart
Very sticky - after pressure, soil adheres strongly to both fingers; is markedly stretched when separated

Particle size - Particle size descriptions are based on the USDA scale where:

Particle size	Grain diameter
Cobble	>80 mm
Gravel	2 to 80mm
Very coarse sand	1 to 2 mm
Coarse sand	0.5 to 1 mm
Medium sand	0.25 to 0.5 mm
Fine sand	0.1 to 0.25 mm
Very fine sand	0.05 to 0.1 mm
Silt	0.002 to 0.05 mm
Clay	<.002 mm

Plasticity

Plasticity is determined by rolling wet soil between the thumb and forefinger and observing whether or not a wire can be formed.

Non-plastic - no wire forms
Slightly plastic - wire forms but soil mass easily deformed
Plastic - wire forms, moderate pressure required to deform soil mass
Very plastic - wire forms, much pressure required to deform soil mass.

Root Sizes and Abundance

Size (root diameter)

Very fine - <.75 mm
Fine - 1-2 mm
Medium - 2 to 5 mm
Coarse - >5 mm

Abundance

Very few - less than 1*
Few - 1 to 3
Common 4-14
Many >14

* per square inch for fine and very fine
per square meter for medium and coarse

Structure

Structure is described by grade or distinctness, size, and type.

Size

	Diameter of granules	Diameter of blocks
Very fine	< 1mm	< 5mm
Fine	1 - 2 mm	5 - 10 mm
Medium	2 - 5 mm	10 - 20 mm
Coarse	5 - 10 mm	20 to 50 mm
Very coarse	> 10 mm	> 50 mm

Type

Granular - approximately spherical with no accommodation of faces surrounding peds; relatively nonporous peds

Prismatic - without rounded caps, vertical faces well defined and with angular vertices, vertical length relatively long with respect to horizontal dimensions; faces accommodate with those of adjacent peds

Angular blocky - block-like with all three dimensions of the same order of magnitude, faces flattened, most vertices sharply angular

Subangular blocky - similar to angular blocky but both rounded and flattened faces occur with many rounded vertices

Texture

Texture refers to the relative proportions of the various size groups of individual soil grains in a mass of soil. Specifically, it refers to the proportions of clay, silt, and sand below 2 mm. Particles larger than 2 mm. and smaller than 10 inches (gravel 2mm. to 3 inches, cobbles 3 to 10 inches) are recognized by modifiers of textural class names. Soils are gravelly or cobbly when they contain 17 to 50% gravel or cobbles by weight; very gravelly or very cobbly when they contain 50 to 90% gravel or cobbles; and the appropriate miscellaneous land type if they contain more than 90% gravel or cobbles.