Field and Laboratory Data from an Earthquake History Study of the Toe Jam Hill Fault, Bainbridge Island, Washington

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Data Tables 3 and 4
(11x17-inch paper format)

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This text file contains data tables numbered with “3” of additional descriptive data for stratigraphic units in each of the five trenches, and Table 4 of fossil data and paleoenvironmental interpretations. See the Introduction in the other text file (Introduction and Data Tables 1 and 2) for a description of Tables 3 and 4 and how they relate to Plates 1 and 2 and Tables 1 and 2.

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Table CL3. Additional descriptive data for stratigraphic units in the Crane Lake trench[1]

UNIT NO.	MATRIX TEXTURE[2]	COARSE FRACTION[3]		MATRIX COLOR[4]		MOTTLES[5]		ORGANIC MATERIAL[6]	STRUCTURE(S)[7]		OTHER PROPERTIES AND COMMENTS[8]
		Pebbles	Cobbles	Primary	Secondary	Color	Percent area		Depositional structures and/or soil structure[9]	Tectonic deformation features	
1a	silty clay to loamy sand	0	0	5Y 4/1 to 7/3d	10YR 5/4 sandstone beds	7.5YR 5/6 stains; 5G 2/1 basaltic lenses	--	modern roots common	indistinct bedding; vf sand interbeds locally ripple laminated, 10-50 mm thick; m to f sandstone beds massive, 50-200 mm thick; possible Miocene root casts	highly faulted and fractured; many small shears not mapped	90% siltstone, 10% sandstone
1b	silty clay	0	0	5Y 5/2 to 6/3d	5YR 2/2 2.5Y 3/1 (organic laminations)	7.5YR 5/6 staining along fractures	few on fractures	modern roots none; organic-rich laminations parallel to bedding, 1-80 mm thick; rare flecks organic material	abrupt to gradational contacts between parallel bedding; beds as thick as 1m; unit weathered to saprolite near top	highly faulted and fractured; some beds vertical; abundant shearing within beds; fault gouge and breccia along faults; possible flexure slip faulting parallel to bedding	Mudstone
1c	loamy sand	0	0	10YR 5/4	10YR 2/2	7.5YR 5/6 to 6/7d	few on fractures	0	beds mostly lenticular, 1-300 mm thick; interfinger with mudstone beds; deeply weathered lenses of co, basaltic-mafic sand; weathered to sandy saprolite near top of unit	highly faulted and fractured; some beds vertical; shearing within beds; possible flexure slip faulting parallel to bedding	Sandstone, f-m
1d	clay to silty clay	0-30	0-20	5Y 5/2	0	7.5YR 5/6-6/8d	few on fractures	0	brecciated parts of unit have blocks to 0.4 m diameter; unit weathered to saprolite near top	some beds vertical; abundant shearing within beds; fault gouge and brecciated zones along faults	Mudstone
1e	silt loam	0	0	5Y 5/2	5YR 5/6	7.5YR 6/8 to 5Y 6/2d, co distinct	common, abundant at top of unit	modern roots 1f; darker color indicates upward increasing % of humified organic material	massive, waxy	offset by reverse and normal faults; fault bounded on north edge?	Clear irregular boundary; saprolitic texture
1fCB	silty clay loam to clay (23, 58, 19)	0	<1	5Y 6/3d 5Y 5/2	10YR 5/2	7.5YR 5/6 staining along fractures	few	modern roots 3f, 3vf, 1-3m, 2c; local zones with fragments of charcoal	massive to 2 f to co abk structure; hackly fracture	offset by young reverse faults	Weathered mudstone; abrupt to clear irregular boundary; lacks thick saprolite
1gBC	loam to silty clay loam (32, 52, 16) (19, 55, 25) (34, 46, 20)	0-10	<1	2.5Y 7/4d	10YR 5/4d	7.5YR 4/3	few	modern roots 3f, 3vf, 1-3m, 2c; local zones with fragments of charcoal; LOI=6.3-7.9	2 to 5 f to co sbk structure; 0 to 1 f clay films	offset by young reverse faults	Friable to very firm moist; gradual to clear wavy boundary; lacks thick saprolite
1gBt	silty clay loam	0	<1	10YR 5/4d	10YR 6/3d	7.5YR 4/3d	few	modern roots 3f, 3vf, 1-3m, 2c	3-4 f-m sbk structure; 2 f pf clay films	offset by young reverse faults	--
1hBC	silt loam	2	<1	2.5Y 7/4d	--	7.5YR 5/6d	few	modern roots 3f, 3vf, 1-3m, 2c	2-3 f sbk structure	no evidence of deformation	Sandy zones inherited from sandy beds in unit 1 and remnants of sandy drift; lacks thick saprolite
2a	silty clay loam	5	<1	5Y 5/6 2.5Y 7/4d	2.5Y 7/3d	7.5YR 5/6d distinct irregular blotches	common	modern roots 1vf, 1f	pebbles and cobbles in sandy subvertical zones; rnd basalt and granite clasts 20-150 mm dia,	parts of unit appear fractured; sandy sediment intrudes or fills fractures; fault bounded on north edge?	Contacts with adjacent units abrupt, wavy to irregular; fine sand intrusions on opposite wall suggest fractured unit was intruded by liquefied sand
2bBC	silty clay loam	2	<1	5Y 5/6	2.5Y 7/4d	7.5YR 5/6 distinct blotches	common	modern roots 1vf, 1f	pebbles and cobbles in sandy subvertical zones; rnd clasts 20-150 mm dia.; 2 f to m sbk structure	parts of unit appear fractured	Abrupt wavy boundary
3a	sandy clay	2	<1	7.5Y 7/2d	7.5Y 6/3d	10YR 5/4d	few	0	massive; clasts matrix supported; rnd clasts <70 mm dia; grussified granitic clasts	no evidence of deformation	Clasts of granitic, volcanic, mudstone lithologies; abrupt wavy boundary
3b	sandy loam to silt loam	3	2	10Y 7/2d	7.5Y 3/2d	7.5Y 5/6 when exposed	few	0	massive; clasts matrix supported; rnd clasts <50 mm dia; rare grussified granitic pebbles	no evidence of deformation	Clasts of granitic, volcanic, mudstone lithologies
3c	sand to clay	5	3	5Y 7/3d	5Y 6/3	2.5Y 6/6d	few	0	interbedded gravelly sandy silt and clay beds overlain by well sorted m sand; fine-grained facies partially laminated; sand beds with scour and fill structures, fine upward; clasts matrix supported; rnd clasts <150 mm dia; grussified granitic clasts	steeply folded and faulted at north end	Contacts with underlying unit are erosional channel contacts
4a	sand to sandy loam (70, 25, 6)	<1	0	2.5Y 6/4d 2.5Y 7/4d	10YR 6/4d	10YR 6/6 staining, irregular, blotches	abundant subvertical	modern roots 1m; black flecks in rare silty lenses are MnO; LOI=2.9	horizontal to low angle stratification, now obscured by weathering and mottling; secondary scour and fill channels; occasional f pebbly lenses and beds with ripple lamination; massive structure	channel margin steeply folded and faulted at north end	Sand is 70% quartz, 15% weathered feldspar, and 10% mafic minerals; wavy lower contact is erosional base of cut and fill channel; trace element geochemistry (TiO2, Rb/Sr, Cr/V, Zr, Ni, and V) indicates that unit has a Cordilleran/Cascades source suggesting that it is glacial-related sediment rather than alluvial sediment with a local source deposited during an interglacial period (J.B. Mahoney, written communication, 2000).

4aE	loamy sand (80, 17, 3)	<1	0	5Y 8/2d	0	10YR 5/6d	few	LOI=2.0	horizontal to low angle stratification, now obscured by weathering and mottling; secondary scour and fill channels	no evidence of deformation	Abrupt discontinuous boundary
4b	sandy loam	2	0	10YR 5/4	0	10YR 6/6	common	rare black flecks,probably MnO	unit is a rip-up clast of an older unit deposited in the base of a channel; basaltic and granitic clasts to 50 mm, some grussified	no evidence of deformation	Pebbles subang to rnd; abrupt discontinuous boundary
4c	sandy loam to silty clay	0	0	5Y 6/4 2.5Y 5/3d	10YR 3/2d to 4/3d	10YR 6/6 to 7.5YR 5/6 stained subang blotches	common, faint to distinct	modern roots 1vf, 1f	unit consists of sheared and brecciated sediment and clasts from units 4, 3c, and 1c; some structures resemble soft sediment deformation features; some organic-rich zones near top of unit may be blocks of soil horizons	abundant internal folds, shear planes; fault bounded on top and south; shears extend well into unit 1c	All contacts, including lower erosional contact, are abrupt; highly deformed shear zone; possibly intruded by liquefied sand
5B/E	sandy loam	20	<1	10YR 5/3d	5Y 7/2d	10YR 6/4 faint irregular blotches	common, faint	modern roots 2vf-f, 3m	f to vf sand; clasts basalt, intermediates, and granites; 2 to 3 vf to f sbk structure; 1 f po clay films	unit may have been downfaulted with unit 2a relative to unit 1	Friable moist; erosional lower contact abrupt, wavy to irregular
5E	loamy sand	20	<1	5Y 7/2	2.5Y 7/3d	0	0	modern roots 2vf-f, 3m	f to vf sand; clasts basalt, intermediates, and granites; massive to 2 f sbk structure	unit may have been downfaulted with unit 2a relative to unit 1	Very friable moist; abrupt, wavy boundary
6a	sandy loam	2	0	5Y 7/2	5Y 3/2	7.5YR 5/6 faint staining	few faint	abundant modern roots1vf, 1f, 1m; abundant fragments of charcoal concentrated in blotchy zones	weakly cemented; lithologically uniform; massive structure; sand is vf; clasts <40 mm dia of basalt, intermediates, and granites	probably faulted on north end	Abrupt to gradual wavy boundary; possible Bw(x) horizon
6bA	sandy loam	<1	0	10YR 5/3d	10YR 2/2d	7.5YR 5/6d	common faint	modern roots1vf, 1f, 1m; humified organic material in matrix; common fragments of charcoal concentrated in blotchy zones	lithologically uniform; massive structure; sand is vf	probably faulted on north end	Shape and organic-rich lithology suggest a root cast origin
6c	sandy loam	<1	0	10YR 6/3d	10YR 3/2d	7.5YR 5/6d	common faint	common fragments of charcoal concentrated in blotchy zones	very weakly cemented; lithologically uniform; massive structure; sand is vf	no evidence of deformation	Shape and faint humified organic-rich sediment suggest a-throw crater origin
6dE	loamy sand	<1	0	10YR 7/2d	10YR 6/4d	10YR 5/4d	Few faint	modern roots 1f	massive to v1 m sbk structure	no evidence of deformation	--
6eBw		<1	0	10YR 5/4d		7.5YR 5/6d	few faint	abundant modern roots1vf, 1f, 1m;	1 m sbk structure	no evidence of deformation	--
7A	silty clay	0	0	10YR 4/2d	10YR 5/3d	7.5YR 4/6d	few faint	humified organic material throughout; few charcoal fragments concentrated in lenses	4 m ang structure	faulted and sheared multiple times	Fragments of the A horizon
8a	silty clay to silty clay loam	2	0	10YR 5/2d	10YR 2/2d	--	--	modern roots 1f, 1m;	5 f-m sbk structure	faulted and sheared multiple times	Abrupt boundary
8b	clay loam to sandy loam	10	0	10YR 6/2d	10YR 5/3d	0	0	modern roots 1f, 1m; common fragments of charcoal and charred wood	5 f-m sbk structure	indistinct lens within unit are folded; lower contact deformed; faulted and sheared multiple times	Friable moist; subrnd to rnd pebbles to 4 cm; abrupt boundary
8c	silty clay loam to sandy loam	5	0	10YR 5/2d	10YR 3/2d	7.5YR 5/6d	few faint	modern roots 1f, 1m; common fragments of charcoal and charred wood	4 f-m sbk structure	faulted and sheared multiple times	Friable moist; subrnd to rnd pebbles to 4 cm; indistinct boundary
9A	silty clay loam	0	0	10YR 4/2d 10YR 2/1	10YR 5/3d	7.5YR 4/6d	few faint	humified organic material throughout; many large charcoal fragments in 2-20-mm-thick lenses	4 m ang structure	faulted and sheared	Fragments of the A horizon of inceptisol developed on unit 1
10	silty clay loam	10	0	10YR 5/2d	10YR 6/2d 2.5Y 3/2d	0	0	modern roots v, vf; common flecks of charcoal, all <40 mm	3 f-m sbk structure	faulted near north end; folded lens of pebbles	Very friable moist; subrnd to rnd pebbles to 6 cm
11aA	sandy loam	<1	0	10YR 3/2	10YR2/1	0	0	abundant modern roots; dark with much humified organic material	massive to 2 f sbk structure	no evidence of deformation	Very friable; clear discontinuous boundary; fills deep root casts

11b	sandy loam (63, 28, 9)	<1	0	2.5Y 7/4d	--	10YR 5/6d	few faint	LOI=5.0	massive to 2 f sbk structure	no evidence of deformation	Clear discontinuous boundary; partly fills root casts
11bA	loam (64, 31, 5)	2	0	10YR 3/2d	--	--	--	LOI=25.8	1-2 f platy to sbk structure	no evidence of deformation	Very friable moist; abrupt wavy boundary
11bBw	sandy loam (64, 28, 10)	2	0	10YR 5/5d	--	7.5YR 5/6	few	LOI=5.6	2 f-m sbk structure; v1 f clay films	possibly faulted at north end	Gradual wavy boundary; irregular and highly variable Bw horizon development
12	silt loam to silty clay (20, 60, 20)	<5	0	10YR 5/2d	10YR 4/1	7.5YR 5/3d	few	modern roots 2f, 2vf, 1c, 1m; common fragments of charcoal and charred wood (<60 mm); LOI=5.5	loose peds with 2 to 3 f to m sbk structure; 2 f clay films	upper half of unit on main log is fractured and tilted block of unit 1gBC	Friable to very friable moist; subrnd to rnd pebbles to 4 cm; clear wavy boundary
13aAB	silt loam	2	0	10YR 3/2d	10YR 5/4d	7.5YR 3/4d	few	modern roots 2f, 2vf	--	no evidence of deformation	Clear wavy boundary
13aBA	silty clay to clay	2	0	10YR 5/2d	10YR 6/3d	7.5YR 5/4d	few	modern roots 2f, 2vf, 1c	5 3 sbk structure; 2 d po clay films	no evidence of deformation	Very firm to extrememly firm moist
13aBw	silt loam (18, 55, 27)	2	<1	7.5YR 4/4d	10YR 6/3d	--	--	modern roots 2f, 2vf, 1c; LOI=8..3	3 f to m sbk structure; 2 f po clay films	no evidence of deformation	Gradual wavy boundary
13aBt	silty clay loam			10YR 5/3d	2.5Y 6/2d	--	few	modern roots 2f 1m	5 f to m sbk; 3 f-d pf po clay films	no evidence of deformation	--
13aBt/E	silty clay loam mixed with sand (17, 60, 23)	25	0	10YR 5/3d 2.5Y 7/2d	10YR 5/4d	0	0	modern roots 2f 1m; LOI=6.9	5 f to m sbk to massive; 0 to 3 f pf clay films	no evidence of deformation	Clear wavy boundary
13bA	silty clay loam to loam (13, 62, 25) (28, 55, 17)	2-10	0	10YR 2/3d 10YR 3/2d	10YR 4/2d	2.5Y 4/3	on root channels	modern roots 2f; LOI=11.4-23.6	2 to 3 vf to f sbk structure	no evidence of deformation	Abrupt to clear wavy boundary
13bAB	silt loam (22, 52, 26)	5	0	7.5YR 3/3d	10YR 2/2	7.5YR 4/3	few	LOI=11.6	3 m sbk structure; 1 f po clay films	may fill slide headscarp fissure	Clear wavy boundary
13cBA	silty clay loam to loam	2	0	7.5YR 3/2d	--	7.5YR 4/3	few	modern roots 2f, 2vf, 1c	3-4 m sbk structure	colluvium from most recent faulting event; no evidence of deformation	Clear wavy boundary
13dBt	silty clay loam	2	0	7.5YR 3/2d	--	7.5YR 5/6d	few faint	modern roots 2f, 2vf, 1c	4 f-m sbk structure; 2 f pf po clay films	no evidence of deformation	--
13eBw	silt loam to silty clay loam (18, 55, 27)	2	<1	7.5YR 4/4d	10YR 5/4d	--	--	modern roots 2f, 3vf, 1m; LOI=8..3	2-3 f to m sbk structure; 1 f po clay films	faulted, tilted, and slid downslope	Friable moist; gradual wavy boundary
14a	clay loam to silty clay loam to loam	2	0	10YR 3/1d	10YR 5/2d 7.5YR 4/4d	0	0	modern roots 1f, 1m; abundant large pieces of charcoal and charred wood (<60 mm)	loose peds with 3 to 5 m sbk structure; v1 f po clay films	fissure created by local oblique slip at base of scarp	Very friable moist; fissure filled with material eroded from A and B horizons upslope; abrupt wavy to irregular boundary
14bAB	clay loam to silty clay loam	2	0	10YR 4/2d	10YR 2/2d	--	--	modern roots 2f, 3vf	2 f sbk structure	no evidence of deformation	Friable moist; abrupt wavy to irregular boundary
14cBA	clay loam to silty clay loam	2	<1	7.5YR 4/4d	10YR 6/3d	--	--	modern roots 2f, 2vf, 1c	loose peds with 3 f to m sbk structure; 2 f po clay films	no evidence of deformation	Friable moist; abrupt wavy to irregular boundary
14d	silty clay loam	3	<1	10YR 6/2d	10YR 4/1	0	0	modern roots 2f, 2vf, 1c	massive	fissure created by faulting and slumping	Loose dry; very friable moist; clear wavy boundary

[1]Units shown on the trench log (Plate 1) are designated by number based on lithology, stratigraphic position, inferred genesis, and inferred age, approximately from oldest to youngest. Lithology, genesis, and age of units are listed in brief unit descriptions on Plate 1. Units are divided into subunits (marked by lowercase letters) on the basis of lithologic differences, major differences in soil development, and inferred correlations with similar units in other parts of the trench. Labels for subunits that correspond with A, B, or E soil horizons include the appropriate soil horizon designation (Soil Survey Staff, 1993 and Birkeland, 1999). Not all properties were described for each unit and different investigators working in different trenches led to some inconsistencies in descriptive terminology. Zero indicates that a property is absent; dash indicates that a property was not described. Information shown on trench logs, notes to logs, or other tables is not repeated here. Contributing investigators included: Sam Johnson (coordinator), Rick Koehler, Jonathan Cox, Brian Sherrod, Ray Wells , Lee-Ann Bradley, Alan Nelson, Harvey Kelsey, Ralph Haugerud, Mark Molinari, and Silvio Pezzopane,

[2]Texture terms follow Soil Survey Staff (1993). Numbers separated by commas are sand, silt, and clay percentages for samples of units analyzed for grain-size distribution using a Malvern particle size analyzer (Buurman et al., 1997). Many units are lithologically heterogeneous and so grain-size and field texture data may be representative of different locations within a single unit.

[3]Estimate of area covered by clasts using size charts. Most clasts were subangular to subrounded and concentrated in clusters or lenses rather than being evenly dispersed. Exceptions are noted in Comments column.

[4]Primary color is dominant Munsell color of matrix, taken moist unless otherwise indicated with a “d” for dry color.

[5]Dominant Munsell color of mottles listed first. Percent area is estimate of percentage of sediment stained a brighter hue or chroma or darker value than the matrix.

[6]Type of organic material present and estimate of percent area of material within sediment. Root terms follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). LOI is percent organic matter estimated by loss on ignition (method of Storer, 1984).

[7]Terms for soil horizon properties follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Data for described soil profiles and explanation of abreviations is in Table BT2; only soil horizon boundaries that coincide with unit contacts are shown on trench log.

[8]Many terms for contacts and soil consistence use soil horizon terminology following Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Additional information about stratigraphic units can be found in Tables BT1 and BT2 and in the notes accompanying the trench log.

Table BT3. Additional descriptive data for stratigraphic units in the Blacktail trench[1]

UNIT NO.	MATRIX TEXTURE[2]	COARSE FRACTION[3]		MATRIX COLOR[4]		MOTTLES[5]		ORGANIC MATERIAL[6]	STRUCTURE(S)[7]		OTHER PROPERTIES AND COMMENTS[8]
		Pebbles	**Cobbles**	Primary	Secondary	**Color**	**Percent area**		**Depositional structures and/or soil structure**[9]	**Tectonic deformation features**	
1a	sandy clay loam	7-10	< 3; <1 boulders	2.5Y 4/2	2.5Y 5/3	2.5Y 3/1 faint streaks; 10-7.5YR 5/6 distinct spots	7-10 streaks, <10 spots	modern roots, 1 ≤ 2 mm dia., 3 to 3 2-5 mm dia., 1 to 2 ≤ 7 mm	massive to weakly stratified with interbedded clay, silt and sand; poorly to very poorly sorted; channeled(?); clasts matrix supported	in places folded and sheared(?); upper contact of diamicton in opposite wall may be vertically offset 3-3.5 m by fault	Moist consistence friable to very firm; m to vf sand is mostly quartz with feldspar and lithic fragments; ang to subrnd; pebbles and cobbles of predominantly quartzo-feldspathic metamorphic, plutonic and volcanic rock compositions, subrnd to rnd
1b	sand to sandy loam	< 1 < 3 in lenses	<1 in lenses	2.5Y 4/1 2.5Y 5/3	2.5Y 6/2	2.5Y 3/1 faint streaks; 10-7.5YR 5/6 distinct spots	2-5 streaks; <1-5 spots	modern roots, 1 ≤ 2 mm dia., 2 to 3 2-5 mm dia., 1 to 2 ≤ 7 mm	thinly bedded; weak planar stratification; sand poorly to well sorted; weak imbrication, flat oblate clasts commonly tilt southward	faulted south side down approx. 3 cm (14.7, 1.0) along fault	Moist consistence friable to very firm; m to vf sand, ang to subrnd, mostly quartz with much feldspar (20±10%) and lithics (10±5%); pebbles and cobbles of predominately quartzo-feldspathic metamorphic, plutonic and volcanic rocks, subrnd to rnd; varies from pebbly diamicton to moderate to very well sorted sand; lower contact very abrupt to clear, smooth to wavy, probably erosional
2a	silt to silty clay loam, with sand and silt interbeds	< 2 clay clasts near base	0	10YR 4/4	2.5Y 5/3	distinct 7.5YR 4/2 spots near base; 5YR 4/6 root stains	<1	modern roots, 1 ≤ 2 mm dia., 2 to 3 2-5 mm dia., 1 to 2 ≤ 7 mm	laminated f to vf sand and co silt fining upwards into thinly bedded sandy silt to clayey silt; <5 mm dia. clay clasts fine upwards; lower part channel cross-bedded and moderately sorted; upper part planar cross-bedded and well sorted	faulted south side down approx. 3 cm (14.7, 1.0) along fault; folded across paleo-channel and thins or is absent south of station 13	Moist consistence soft; lower contact abrupt to clear, wavy and discontinuous across paleochannel (12-16, 0-2)
2b	sandy loam	<10	<10-15	10YR 4/4-4/6	10YR 4/3	2.5Y 6/1-7/1 <1-cm-dia. root haloes; faint 10YR 4/3 streaks and tubes	<5-7 haloes; <10-20 bands	modern roots, 1 ≤ 2 mm dia., 2 to 3 2-5 mm dia., 1 to 2 ≤ 7 mm; roots and root casts commonly tilt southward 20°±10°	ang to rnd gravel	faulted south side down approx. 3 cm (14.7, 1.0) along fault; folded across paleo-channel and thins or is absent south of station 13; more strongly deformed than unit 2a	Moist consistence soft and friable; same as unit 2a except deformed or reworked from unit 2a, possibly as slump or channel facies; very ang to subrnd sands with subrnd to rnd granules and pebbles; lower contact abrupt to clear, wavy and discontinuous (12-16, 0-2)
3	clay loam to silty clay loam	< 2, grading to < 5 near (12-16, 0-2)	0	7.5YR 4/4	10YR 4/4	2.5Y 6/2 root haloes; distinct 7.5YR 5/6-5/8 bands and spots	<3 haloes; <80 spots	modern roots, 1 ≤ 2 mm dia., 2 to 3 2-5 mm dia., 1 to 2 ≤ 7 mm; root orientation more random than unit 1a; scattered decayed plant fragments	parallel thinly to very thinly bedded f sandy mud; planar crossbeds, coarsening toward channel wall with pebbles < 1 cm dia. in lens < 7 cm thick	folded between stations 11-18; lenses and small stratified block (13.6-14.1, 0.6-0.9) broken, slumped into paleochannel; sandy dewatering dikes thicken upward and continue into units 5-7	Similar to unit 2a, except slightly finer grained and more planar bedding; very ang to subrnd sands with subrnd to rnd granules and pebbles; lower contact abrupt to clear, smooth to wavy; discontinuous across paleochannel (12-16, 0-2)
4a	sandy loam to sandy clay loam	30	20-30	10YR 4/3-4/4	2.5Y 4/3	2.5Y 6/2 root haloes; distinct 7.5YR 5/6-5/8 bands and spots	<3 haloes; <80 spots	0	nearly a clast supported gravel; rnd to well rnd; poorly to very poorly sorted	faulted south side down about 3 cm (14.7, 1.0) along fault	Moist consistence very friable to firm; subang to well rnd sand; rnd predominately quartzo-feldspathic metamorphic, plutonic and volcanic clastsl
4b	loam to silty clay loam	5	0	10YR 2/1-1/1	2.5Y 4/3	2.5Y 6/2 root haloes; distinct 7.5YR 5/6-5/8 bands and spots	<3 haloes; <80 spots	Black color from humified organic material; charcoal fragments common; 2 carbonized twigs	sandy to pebbly heterogeneous discontinuous lens of greater and lesser organic content; fragments mixed with underlying unit	no evidence of deformation	Moist consistence friable to firm; subrnd to rnd granitic and metamorphic pebbles; lower contact abrupt to clear, irregular to discontinuous
5a	clay to silty clay to sandy clay	0	0	2.5Y 4/3-5/4 10YR 7/3-1	5Y 6/2	faint 7.5YR 5/6-5/8 bands and spots	< 3-10	modern roots, 2 ≤ 1 mm dia., 1 ≤ 2 mm dia., 2 1-5 mm dia., 1 to 2 ≤ 7 mm, roots and root casts commonly tilt southward 20°±10°	very thinly laminated to very thinly bedded clay and sandy silt; parallel planar bedding, possibly varved; laminations can be traced laterally as much as 8 m; contains dispersed white quartz sand like that in unit 9, moderately to well sorted; unit fills channel cut in underlying units	broadly folded; abundant clastic dewatering dikes and diapirs 1-5 cm wide tilt 20°-25° south and locally disrupt laminae; in places discontinuous laminae offlap and overlap diapirs; *Equisetum* sp. root casts and dikes dip south; striated shear planes (16.4-16.6, 2.65) extend into unit 5c	Moist consistence friable to firm; waxy in channel; dikes and diapirs may indicate compaction dewatering, subglacial over-pressuring, or earthquake-induced liquefaction; shear planes are oriented subparallel to bedding planes, and striae plunge downslope in direction normal to the monoclinal fold axis; lower contact abrupt to clear, smooth to wavy, possibly sheared or deformed due to soft-sediment loading
5b	clay to silty clay	0	0	2.5Y 5/3	5Y 6/2	distinct 7.5YR 5/6-5/8 bands and spots; 5YR 3/3-3/1 $FeMnO^2$ masses, nodules, and tubes 1-5 mm dia.	15	modern roots, 2 ≤ 1 mm dia., 1 ≤ 2 mm dia., 2 1-5 mm dia., 1 to 2 ≤ 7 mm, roots and root casts commonly tilt southward. 20°±10°	same as unit 5a, except laminations and bedding are indistinct and discontinuous, with clasts of unit 5a	folded concordantly with unit 5a; cross-cut by unit-8 dikes	Dry consistence firm and hard; nodules and tubes increase in abundance in uppermost 5 cm; lower contact clear, smooth; intraformational breccia derived from unit 5a

5c	clay to sandy clay	0	0	2.5Y 5/3	5Y 6/2	many distinct 7.5YR 5/6-5/8 bands and spots; 5YR 3/3-3/1 $FeMnO^2$ masses, nodules, and tubes, equant to very irregular, 1-15 mm dia.	15	modern roots, 3 ≤ 1 mm dia., 1 ≤ 2 mm dia., 2 2-5 mm dia., 1 to 2 ≤ 7 mm, roots and root casts commonly tilt southward 20°±10°; black $FeMnO^2$ masses give weak to moderately strong reaction in hydrogen peroxide	same as unit 5a, except laminations and bedding are indistinct and discontinuous, with clasts of unit 5a	folded concordantly with unit 5a; cross-cut by unit-8 dikes	Black masses are probably ferromanganese oxide nodules; south of 10.0 unit maintains 5-cm thickness with 1-3 masses per cubic cm; between 14.0-16.0 unit thins, boundaries are more diffuse, and masses decrease in abundance and size; northward of 16.0 unit is more diffuse, masses are rare and much smaller; lower contact clear to gradual, smooth; grain flow and intraformational breccia
5d	clay to clay loam, similar to coarsest laminae in unit 5a	0	0	2.5Y 4/4	2.5Y 5/1-6/1	distinct 7.5 YR 5/6-5/8 irregular bands and patches ≤ 8-10 cm dia.; 2.5 Y 6/1-7/1 root aureoles; fewer $FeMnO^2$ masses than 5b	20-40	modern *Equiscetum* sp. roots, 2 to 3 ≤ 1 mm dia., 2 1-5 mm dia., 1 ≥ 5 mm dia., oriented vertical to random	same as unit 5a, except laminations and bedding are indistinct and discontinuous, with clasts of unit 5a	cross-cut by dikes of units 3 and 8; may have been folded concordantly with underlying units	Similar to unit 5b, but many fewer ferromanganese masses; dry consistence firm and hard; lower contact clear to gradual, smooth; intraformational breccia
6a	clay loam to silty clay loam	0	0	2.5Y 5/2	5Y 5/2	same as unit 5d, except distinct to prominent 7.5 YR 5/8 irregular bands and patches	20-50	modern *Equiscetum* sp. roots, 2 to 3 ≤ 1 mm dia., 2 1-5 mm dia., 3 ≤ 2 mm dia., 1 ≥ 5 mm dia., oriented vertical to random; light gray root casts <3 cm dia.	massive; dispersed quartz f sand grains; many fewer $FeMnO^2$ masses than in units 5d or 5c, more than in unit 6b	cross-cut by dikes of units 3 and 8; may have been folded concordantly with underlying units	Moist consistence soft to firm; lower contact clear to gradual, smooth; contacts difficult to trace near unit-9 liquefaction diapir (11.0-14.0); subaqueous slump and/or grainflow deposit
6b	clay loam to silty clay loam, more clay on hanging wall	0	0	2.5Y 5/2	5Y 5/2	same as unit 5d, except distinct to prominent 7.5 YR 5/8 irregular bands and patches	20-50	modern *Equiscetum* sp. roots, 2 to 3 ≤ 1 mm dia., 2 1-5 mm dia., 3 ≤ 2 mm dia., 1 ≥ 5 mm dia., oriented vert to rand; light gray root casts <3 cm dia.	massive; dispersed quartz f sand grains; many fewer $FeMnO^2$ masses than in units 5d or 5c; fewer $FeMnO^2$ masses on hanging wall	cross-cut by dikes of units 3 and 8; may have been folded concordantly with underlying units	Consistence firm yet softer, less plastic, and more easily deformable than unit 7; lower contact clear to gradual, smooth; contacts difficult to trace near unit-9 liquefaction diapir (11.0-14.0); subaqueous slump and/or grainflow deposit
7a	clay	≤ 1 sand granules	0	2.5Y 5/3	10YR 5/6	distinct 10 YR 5/6 to 7.5 YR 5/8 irregular bands and spots	≤ 7-10 bands; ≤ 3 spots	modern *Equiscetum* sp. roots, 2 to 3 ≤ 1 mm dia., 2 1-5 mm dia., 3 ≤ 2 mm dia., 1 ≥ 5 mm dia., most oriented vert; light gray root casts <3 cm dia.	massive; dispersed white quartz or pumaceous sand granules, ≤ 5 mm dia; unweathered	cross-cut by dikes of units 3 and 8; may have been folded concordantly with underlying units; *Equisetum* sp. roots oriented vertical; discontinuous subhorizontal shear planes	Moist consistence very firm; stiff waxy; shear planes (15.0-17.0, 2.7-3.2) may be related to tectonic buckling, lateral spread, or downslope creep; lower contact gradual, smooth
7bBC	clay, with slightly more silt and sand than 7a	0	0	2.5Y 5/3	10YR 4/6	10 YR 5/2–4/3 stains, possibly humic-rich; distinct 10 YR 5/6 spots and streaks	10-30 stains; ≤ 5 streaks	modern *Equiscetum* sp. roots, 2 to 3 ≤ 1 mm dia., 2 1-5 mm dia., 3 ≤ 2 mm dia., 1 ≥ 5 mm dia., most oriented vert; light gray root casts <3 cm dia.; humic-rich stains	massive; dispersed white quartz or pumaceous sand granules, ≤ 5 mm dia; unweathered; may be root-stirred and has 2 abk B horizon structure; slightly weathered	cross-cut by dikes of units 3 and 8; may have been folded concordantly with underlying units; *Equisetum* sp. roots oriented vertical; discontinuous subhorizontal shear planes	Moist consistence very firm; stiff waxy; shear planes (15.0-17.0, 2.7-3.2) may be related to tectonic buckling, lateral spread, or downslope creep; lower contact continuous, gradual to diffuse, wavy to irregular; more deeply (1 m) weathered than unit 7a, especially beneath the upper scarp (1.5 m); intruded by unit-8
7cA	silty clay to silty clay loam	0	0	10YR 4/3-2/2	2.5Y 2.5/1 7.5YR 3/1	faint to distinct 7.5YR 5/6 – 5YR 4/6 spots	≤ 1-3	abundant ang to subrnd detrital charcoal, 2 to 3 ≤ 1 mm dia., 1 to 2 1- 5 mm dia., 1 ≥ 5 mm dia., dispersed and in lens <3 cm thick; modern roots, 3 to abundant ≤ 1 mm dia., 3 1-2 mm dia., 2 ≥ 2 mm dia., oriented horiz	organic-rich A and O horizons of wetland soil on hanging wall; root-stirred by roots; massive to co sbk structure; aggregates of clay to silty clay, f white subang quartz or feldspar granules, and dark lithic grains	cross-cut, intruded, and locally arched by unit-9 liquefaction dikes and diapirs; may have been folded concordantly with underlying units; eroded between 12.3 and 14.4; deformation probably associated with discontinuous, subhorizontal shear planes (15.0-17.0, 2.7-3.2) and soil creep	Moist consistence firm; lower contact abrupt to clear, smooth to irregular; wetland A and O horizons of hanging wall and footwall thicken beneath scarp toe-slope to form a colluvial wedge of predominantly A and O horizon sediment
7dA	silty clay to silt loam	0	0	10YR 4/2-3/2	2.5Y 4/3	faint 10YR 5/3-5/4 coatings; distinct 5YR 5/6 bands and spots	≤ 3 coatings; ≤ 15 bands	same as unit 7dA, except charcoal mostly in upper 2 cm; roots, 1 ≤ 2 mm dia.; 3 ≤ 0.7 mm dia., 2 1-2 mm, 2 to 3 2-10 mm dia.	same as unit 7dA, except thicker organic-rich A and O horizons of wetland soil on footwall; more co pl structure than unit 7dA; grades into modern wetland soil in south third of trench	same as unit 7dA; except much thicker and more root-stirred beneath toe- of scarp; small liquefaction sand diapirs (7.5-10.5, 1.2-1.7) intruded upwards into unit, perhaps thinning it	Moist consistence friable to firm; wetland A and O horizons of hanging wall and footwall thicken beneath scarp toe to form a root-stirred colluvial wedge of predominantly A and O horizon sediment with weak cumulative soil structure; lower contact abrupt to gradual, wavy to irregular, locally discontinuous and eroded beneath footslope of scarp

8a	sand to sandy clay	≤ 1 pebbles; ≤ 5 granules	0	10YR 4/6-5/6	2.5Y 6/2, f to vf sand filling dikes and diapirs	faint to distinct 7.5 YR 5/6 irregular iron-oxide streaks, bands, and tongues	≤ 50	modern roots, 2 ≤ 1 mm dia., 2 to 3 1-2 mm dia., 2 to 3 2-5 mm dia.	f sand in near vertical dikes and smaller diapiric tongues mixed with irregular lenses, blocks, and aggregates of sandy clay to clay (host rock) to form a diapiric sill; sill has flat upper and lower contacts that follow those of the units it intrudes	dikes and sills: cross-cut, intrude, locally arch, and deform units 3 through 7; commonly thicken upwards and dip 20°-25° southward; tilt may indicate differential uplift or folding during or subsequent to unit 8 emplacement; probably related to liquefaction and/or dewatering of saturated sand in units 1, 2, and 3	Moist consistence friable to very firm; sand contains equal proportions of light-colored quartzo-feldspathic and dark-colored, fine-grained, volcanic and metamorphic rocks, predominantly f to vf sand to co silt, well to moderately sorted, ang to rnd; m to co sand to pebbles predominantly quartz, subang to subrnd, similar to those in units 5, 6, and 7; contacts variable, discontinuous, very abrupt to gradual; many irregular and discontinuous second-order intrastratal contacts separate sandy tongues and irregular clay bodies; diapiric plug and dikes observed on opposite wall and bench (about 3-4 m to east) are of similar composition, size, shape, and stratigraphic position
8b	clay loam to sandy clay loam	0	0	2.5Y 5/3 clay, 10YR 5/6-5/1 sandy zones	2.5Y 7/1-6/2	faint to distinct 7.5YR 5/6 iron-oxide streaks	≤ 5; 5-15 in lenses	modern roots, 2 ≤ 1 mm dia., 2 1-2 mm dia., 2 2-5 mm dia.	same as unit 8a, except fewer sand dikes, more clay-rich blocks and zones, sand finer grained and better sorted; locally weakly iron-oxide cemented	dikes and sills: cross-cut, intrude, locally arch, and deform units 3 through 7; commonly thicken upwards and dip 20°-25° southward	Same as unit 8a, except dry consistence firm to hard; less mixing of sand; clay-rich zones and blocks float between sand-rich bodies of unit 9a and 9c; contacts abrupt to clear, irregular to discontinuous
8c	loamy f sand to sand	0	0	7.5YR 7/1	5YR 7/1	faint 7.5YR 7/2 stains	5-10	few roots	same as unit 8a, except mostly whitish lithic (10-20%) quartz-rich (80-90%) well to very well sorted, ang to rnd sand with much less clay than 8a and 8b; contacts diffuse, irregular, discontinuous	dikes and sills: deform units 3 through 7; sand in dome-shaped diapirs, and small sill-like lens and blebs, commonly near the base of unit 7; locally intrudes and arches unit 7	Dry consistence loose, friable to firm; same as unit 8a; possibly is previously liquefied sand that flowed upward into unit 7 deforming it and possibly venting through it as a sand blow
9aAE	humus-rich loam to silt loam, ranging to vf loamy sand to silty clay	0	0	2.5Y 4/4	2.5Y 4/2 10YR 4/3	distinct 7.5YR 5/6 coatings; 7.5-5YR 3/2 stains	≤ 7 coatings; ≤ 3 stains	v ang to subrnd dispersed flakes and chunks of detrital charcoal, 2 ≤ 2 mm dia., most near top of unit; modern roots, 2 ≤ 0.5 mm dia., abundant 0.5-1 mm dia., 2 to 3 1-5 mm dia., 3 5-8 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits and root-stirred blocks; 2 EB-Bt-horizon development	at least the lower parts of units 9aAE and 9bB/E may correlate stratigraphically; if so, units may have been folded concordantly with underlying units	Dry consistence friable to firm; lower contact abrupt to clear, smooth to wavy, unit conformable with unit 7
9bB/E	silt loam to silty clay loam	< 1 granules	0	10YR 3/2	2.5Y 4/2 10YR 4/3	distinct 7.5YR 3/2-2.5/2 coatings; faint 2.5 Y 4/2 stains	≤ 40 coatings; ≤ 10 stains	same as unit 9aAE, except more humus and detrital charcoal and fewer modern roots; roots: 1 ≤ 0.5 mm dia., 2 0.5- 2 mm dia., 1 ≥ 2 mm dia.	7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits and root-stirred blocks; more humus-rich, weakly cemented, and oxidized than 9aAE; 1 pl EB-Bt-horizon structure	at least the lower parts of units 9aAE and 9bB/E may correlate stratigraphically; if so, units may have been folded concordantly with underlying units	Dry consistence friable to firm; same as unit 9aAE, except more of a mixture of units 9aAE, 7a, and 7bBC with a weakly developed cumulative soil profile; lower contact clear, smooth to wavy, in places indistinct
10a	silt loam	0	0	10YR 4/3-4/4	7.5YR 3/2	distinct 7.5YR 5/6 7.5YR 4/3 coatings and stains	≤ 20	similar to unit 9aAE, except more and larger roots, finer and rarer detrital charcoal, and much moderately decomposed and partially burned woody plant debris, tree branches, twigs, and bark; most ≤ 2 cm, 2 ≤ 10 cm charcoal: 1 to 2 < 5mm dia.; modern roots: 2 ≤ 0.5 mm dia., 3 0.5-5 mm dia., 1 5-30 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits, root-stirred blocks and large pockets of sand and woody debris; 2 pl EB-Bt-horizon soil structure parallel to slope	no evidence of deformation	Dry consistence friable to firm; similar to units 9aAE and 9bB/E; lower contact clear, smooth to wavy, indistinct near units 9bB/Eand 10b; wedge-shaped body of colluvium, slope wash, and woody debris eroded from scarp
10b	silt loam to clay loam	< 1-5 granule-sized nodules of sand	0	7.5-10YR 3/2	10YR 4/3	faint 7.5YR 4/2 with faint 5YR 4/2-4/4 coatings and stains	≤ 10	similar to unit 9bB/E, except richer in detrital charcoal and burned roots; mostly modern roots: abundant ≤ 0.5 mm dia., 2 to abundant 0.5-2 mm dia., 2 ≥ 2 mm dia.	7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits and root-stirred blocks; more humus-rich, weakly cemented, and oxidized than 9aAE; more detrital organic material and sand than 9bB/E; 1 pl EB-Bt-horizon structure	no evidence of deformation	Dry consistence friable to firm; similar to unit 9bB/E; lower contact abrupt to clear, smooth, indistinct near units 9bB/E and 11b; unit 10b was derived from unit 9aAE, and perhaps unit 11aB/E; buries reddish, more oxidized (burned?) zones in unit 10a
11aB/E	sandy loam to clay loam	< 1 granule-sized nodules of sand	0	7.5YR 3/2 10YR 4/2	10YR 3/2 7.5YR 6/1 7.5YR 3/2	faint 10YR5/3 zones and bands; distinct 7.5YR 5/4 patches	≤ 10? zones; ≤ 1 patches	modern to slightly decomposed or burned, tree and plant roots, twigs, bark, forest litter, duff; charcoal: 1 to 2 < 2 mm dia.; modern roots: 2 ≤ 1 mm dia., 3 1-5 mm dia., 1 5-50 mm dia., 1 50-150 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits, blocks and large pockets of sand and woody debris; 2 pl AE- to E- to EB-horizon soil structure parallel to slope; highly root-stirred	no evidence of deformation; unit was not recognized below scarp	Dry consistence friable to slightly hard; lower contact clear, smooth to irregular, thickness variable; may be source of sediment in units 10c-d and 11b

11bAB/E	sandy loam to silt loam	< 1-3 charred granule-sized nodules of sand	0	10YR 4/2-3/2	7.5YR 3/2 5YR 3/1	distinct 7.5YR 5/6 patches and zones; faint 7.5YR 6/2 7.5YR 5/3 coatings	≤ 10-20 patches; ≤ 1-5 coatings	same as unit 11aB/E, except more burned and fewer decomposed roots and woody debris, and charcoal; modern roots: abundant ≤ 1 mm dia., 3 1-5 mm dia., 2 5-50 mm dia., 1 50-150 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 pebble-sized nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits, blocks and large pockets of sand and woody debris; 2 pl AE- to E- to EB-horizon soil structure parallel to slope; highly root-stirred	no evidence of deformation	Dry consistence friable to slightly hard; lower contact clear to gradual, smooth, thickness uniform; similar to and derived from unit 11aB/E; buries reddish, more oxidized (burned?) zones in unit 10b
11cA	mostly organic; sandy loam to silt loam	<< 1 pebbles, <≤ 1 granule-sized nodules of sand	0	10YR 5/2-3/3	10Y 4/2 7.5YR 6/2	0	0	fresh duff and woody debris grades downwards into burned and humified organics mixed with detrital peaty soil; charcoal: 3 < 1 mm dia., 3 1-5 mm dia., 2 5-50 mm largest dia. chunks and in situ tree roots; modern roots: abundant ≤ 1 mm dia., 3 1-5 mm dia., 3 5-15 mm dia., 2 50-150 mm dia., 1 ≥ 150 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits and blocks; Oa-horizon grading downward into locally variable OA- to AE- to A/E-horizons; highly root-stirred	no evidence of deformation	Moist consistence loose to friable; modern forest soil of moderately humified organic matter over peaty mineral soil; lower contact clear, smooth to irregular, thickness variable
11dA	mostly organic; sandy loam to silt loam	<< 1 pebbles, <≤ 1 granule-sized nodules of sand	0	10YR 6/2-4/3	10Y 4/2 7.5YR 6/2	0	0	duff and woody debris grades downwards into much burned soil and humified organics mixed with detrital peaty soil; charcoal: common < 1 mm dia., common 1-5 mm dia., 2 5-50 mm largest dia. chunks and in situ tree roots; modern roots: 3 ≤ 1 mm dia., 3 1-5 mm dia., 3 5-15 mm dia., 2 50-150 mm dia., 1 ≥ 150 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits and blocks; 2 to 3, granular to sbk structure; thin O- to Op-horizon over OA- to A/E-horizons; highly root-stirred	no evidence of deformation	Moist consistence loose to friable; similar to unit 11cA, but less organic material; modern forest soil of moderately humified organic matter over peaty mineral soil
11eA	mostly organic; sandy loam to silt loam	<< 1 pebbles, <≤ 1 granule-sized nodules of sand	0	10YR 4/2-2/3	10Y 4/2 7.5YR 6/2	0	0	fresh duff and woody debris grades downwards into burned and humified organics mixed with detrital peaty soil; charcoal: 3 < 1 mm dia., 3 1-5 mm dia., 2 5-50 mm largest dia. chunks and in situ tree roots; modern roots: abundant ≤ 1 mm dia., abundant 1-5 mm dia., 3 5-15 mm dia., 3 50-150 mm dia., 2 ≥ 150 mm dia.	dispersed quartz sand grains and 7.5YR 7/3-4 to 10YR 7/3-4 nodules of cemented vf sand; lenticular to tongue-shaped contacts mark interfingering subunits and blocks; 2-3 gr to sbk structure; thin O- to Op-horizon over OA- to A/E-horizons; highly root-stirred	no evidence of deformation	Moist consistence loose to friable; modern wetland forest-edge soil of fresh to slightly humified peaty organic material

[1]Units shown on the trench log (Plate 2) are designated by number based on lithology, stratigraphic position, inferred genesis, and inferred age, approximately from oldest to youngest. Lithology, genesis, and age of units are listed in brief unit descriptions on Plate 2. Units are divided into subunits (marked by lowercase letters) on the basis of lithologic differences, major differences in soil development, and inferred correlations with similar units in other parts of the trench. Labels for subunits that correspond with A, B, or E soil horizons include the appropriate soil horizon designation (Soil Survey Staff, 1993 and Birkeland, 1999). Not all properties were described for each unit and different investigators working in different trenches led to some inconsistencies in descriptive terminology. Zero indicates that a property is absent; dash indicates that a property was not described. Information shown on trench logs, notes to logs, or other tables is not repeated here. Contributing investigators included: Ray Wells (coordinator), Silvio Pezzopane, Brian Sherrod, Rick Koehler, Sam Johnson, Lee-Ann Bradley, and Harvey Kelsey.

[2]Texture terms follow Soil Survey Staff (1993). Numbers separated by commas are sand, silt, and clay percentages for samples of units analyzed for grain-size distribution using a Malvern particle size analyzer (Buurman et al., 1997). Many units are lithologically heterogeneous and so grain-size and field texture data may be representative of different locations within a single unit.

[3]Estimate of area covered by clasts using size charts. Most clasts were subangular to subrounded and concentrated in clusters or lenses rather than being evenly dispersed. Exceptions are noted in Comments column.

[4]Primary color is dominant Munsell color of matrix, taken moist unless otherwise indicated with a “d” for dry color.

[5]Dominant Munsell color of mottles listed first. Percent area is estimate of percentage of sediment stained a brighter hue or chroma or darker value than the matrix.

[6]Type of organic material present and estimate of percent area of material within sediment. Root terms follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). LOI is percent organic matter estimated by loss on ignition (method of Storer, 1984).

[7]Terms for soil horizon properties follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Data for described soil profiles and explanation of abreviations is in Table BT2; only soil horizon boundaries that coincide with unit contacts are shown on trench log.

[8]Many terms for contacts and soil consistence use soil horizon terminology following Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Additional information about stratigraphic units can be found in Tables BT1 and BT2 and in the notes accompanying the trench log.

Table BL3. Additional descriptive data for stratigraphic units in the Bear's Lair trench[1]

UNIT NO.	MATRIX TEXTURE[2]	COARSE FRACTION[3]		MATRIX COLOR[4]		MOTTLES[5]		ORGANIC MATERIAL[6]	STRUCTURE(S)[7]		OTHER PROPERTIES AND COMMENTS[8]
		Pebbles	Cobbles	Primary	Secondary	Color	Percent area		Depositional structures and/or soil structure[9]	Tectonic deformation features	
1a	clay loam (42, 50, 8)	0	0	5Y 4/2	2.5Y 5/3	--	--	modern roots, 1 < 5 mm dia., pale brown	massive; occasional gritty sandstone stringers 5-10 cm thick; weakly stratified	faulted; hackley fracture; weak striations; most joints conjugate, with steep dips; bedding at st. 10.4 dips north, unless overturned.	Moderately indurated; in places deeply weathered; internal contacts and structures gradational and indistinct
1b	clay loam	0	0	2.5Y 5/2	2.5Y 5/3	--	--	modern roots, 1 < 5 mm dia., pale brown	0	faulted; displaced by fissure	Moderately indurated; in places deeply weathered; internal contacts and structures gradational and indistinct; slightly sandier with more pervasive hackley fracture and jointing than unit 1a
1c	clay to sandy clay loam (14, 58, 28)	0	0	5Y 5/2	5Y 6/3	10YR 5/8 faint streaks and fractures; 5YR 3/4 root channels	< 5	modern roots, 1 < 5 mm dia., pale brown; older roots stained 7.5-10 YR 6/8; organic flakes 10 YR 2/3	unstratified; no fabric	possible fault dips north; weak hackley fracture; forms plastic core of fold crests; displaced by fissure	Firm to compact, grades downwards into breccia or intensely fractured mudstone; lithics include rnd to subang quartzitic, feldspathic, and volcanic clasts; lower contact abrupt to gradual, wavy to irregular
2a	sandy clay loam	≤ 40	15	5Y 5/3	10YR 5/1	5YR 5/8 distinct; 2.5YR 3/6 to 10R 3/1 coatings	30	modern roots, 1 < 5 mm dia., pale brown; older roots stained 7.5-10 YR 6/8; organic debris < 5 mm dia; 7.5YR 5/8 vertical streaks	moderately stratified; weakly imbricated; poorly to moderately sorted	faulted and folded probably two or more times; intruded by diapir of unit 1c; displaced by fissure	Contains ang to subrnd coarse to medium sand with subrnd to rnd feldspathic, quartzitic, basaltic(?), and tuffacious(?)pebbles and predominately metamorphic, volcanic, and lignitic cobbles; manganese coatings on clast and some ped faces; lower contact abrupt to clear, smooth, erosional
2b	sandy clay loam	≤ 2; ≤ 5 in places	≤ 1	5Y 6/3	2.5Y 5/2	similar to unit 2a with some 7.5YR 6/8	5; 15 in places	modern roots, 1 < 5 mm dia., pale brown; older roots stained 7.5-10 YR 6/8; organic debris < 5 mm dia; 7.5YR 5/8 vertical streaks	weakly stratified; poorly sorted	same as unit 2a; pebbly sand intrusions common near diapir; weak hackley fracture; displaced by fissure	Similar to clay lenses within unit 2a; lower contact conformable with unit 2a, abrupt to clear, smooth to wavy
3a	very fine sandy loam to silty clay loam	≤ 1	≤ 1	2.5Y 6/1 2.5YR 4/3	7.5YR 5/6	--	--	modern roots, 1 < 5 mm dia., pale brown; older roots stained 7.5-10 YR 6/8; organic debris < 5 mm dia; 7.5YR 5/8 vertical streaks	Interbedded very fine sand, silt, and clay, well laminated in beds 1-10 mm thick; < 3 cm dia rnd to subrnd dropstones ≤ 1%	broadly folded; vertical veins of pale gray fine sand, intrude along fractures near fold crests; displaced by fissure	Many beds can be traced along most of trench; barren of diatoms or macrofossils; 1-m-long block of same unit floats within unit 5 in east wall of trench; lower contact abrupt to gradual, smooth to wavy, erosional
3b	clay loam to sandy clay loam	0	0	2.5Y 5/1 2.5Y 4/3	rip-up clasts stained 7.5YR 6/8	faint 5YR 5/8	5	contains pebbles of lignite	thins from 6 to 0 cm thick against north fold limb	either deposited against slight fold or folded and then eroded	Contains subang to subrnd rip-up clasts of underlying unit 3; lower contact abrupt, smooth, erosional
4a (st. 5-8)	sandy clay loam	≤ 60	10	2.5Y 6/2	2.5Y 5/3 2.5Y 4/2	7.5YR 5/8 distinct; 2.5YR 3/6 to 10R 3/1 coatings; sand veins 2.5Y 7/2	15	modern roots, 1 < 5 mm dia., pale brown; contains lignite boulder	massive; unit fines upward; distinct imbrication dips N	deposited against slight fold or folded and then eroded; displaced by fissure	Pebbles and cobbles dominantly quartzo-feldspathic metamorphic, plutonic and volcanic, some lignite and tuff(?); lower contact abrupt, smooth, erosional
4a (st. 8-13)	sandy loam to clay loam	≤ 25	≤ 20	2.5Y 5/1		10YR 6/8 faint	5	modern roots, 1 ≤ 1 cm dia., abundant ≤ 5 mm dia.	massive; unstratified; weakly imbricated; cobbles ang to subrnd, pebbles subang to rnd	deposited against slight fold or folded and then eroded; displaced by fissure	Pebbles and cobbles dominantly quartzo-feldspathic metamorphic, plutonic and volcanic, some lignite and tuff(?)
4b	sandy clay loam	≤ 15	0	2.5Y 5/3	2.5Y 4/3	10YR 6/8 faint	15	modern roots, 1 ≤ 3 cm dia., 2 ≤ 5 mm dia	massive; unit fines upward--pebbly sand to silty clay sand; discontinuous, deformed interbedded silt and clay laminae that dip S	deposited against slight fold or folded and then eroded; displaced by fissure	Firmer than unit 5a; pebbles and cobbles dominantly quartzo-feldspathic metamorphic, plutonic and volcanic, some lignite(?) or basalt(?) and tuff(?); lower contact abrupt, smooth
4c	sand (67, 23, 9)	0	0	2.5Y 7/2	2.5Y 8/1	--	--	modern roots, 1 ≤ 3 cm dia., 2 ≤ 5 mm dia	Planar bedded; wavy flame-type structures, possibly related to dewatering	folded; displaced by fissure	Friable; medium to fine sand rnd to subang, fine to very fine subang to ang; predominantly quartz and feldspar with minor hornblende, epidote, sphene, zircon, and etched pyroxenes (written communication, A.M. Sarna-Wojcicki, 1998); lower contact abrupt, smooth
4d	sandy clay loam (46, 33, 21) (30, 50, 20)	5-10	3	2.5Y 6/2	10YR 6/2	10YR 6/6 faint	≤ 5	modern roots, 1 ≤ 3 cm dia.; 4 ≤ 5 mm dia.; 4 ≤ 1 mm dia	unstratified; unit fines upwards	folded; displaced by fissure	Similar to unit 4b, but sandier, especially above and south of fold hinge; lower contact abrupt and wavy
4eBt	loam to sandy loam (29, 42, 30)	≤ 1, 2-10 in places	0, ≤ 1 in places near base	2.5Y 5/3	2.5Y 6/3	10YR 6/4	10	modern roots 1 ≤ 3 cm dia., 2 ≤ 5 mm dia	weakly stratified; discontinuous pebbly lens; weak imbrication; weak Bt soil horizon development; 2 f po pf	displaced by fissure	Lower contact irregular, gradual to clear, in places abrupt; lithology suggests it is a coarse sandy facies of unit 4
4 (st. 0, 0.8)	sandy clay loam	≤ 15?	25	2.5Y 5/3	2.5Y 5/3, 2.5Y 4/2	10YR 6/8 faint	15?	modern roots, 1 ≤ 3 cm dia.; 4 ≤ 5 mm dia.; 4 ≤ 1 mm dia; some twig, and leaf debris; organic debris, possibly infiltrated from younger units	weak stratification; weak fining upward	folded	Unit 4 undifferentiated in south half of trench, description from near station 0.0, 0.8; similar to unit 4b; boulders and cobbles common at base; lower contact abrupt, smooth, probably erosional

4 (st. 1, 1.3)	loam	≤ 2	≤ 1?	2.5Y 5/3		10YR 5/8 faint	10	modern roots, 1 ≤ 3 cm dia.; 4 ≤ 5 mm dia.; 4 ≤ 1 mm dia	similar to unit 5d, except more organic-rich silt and clay; root-stirred	folded	Friable to firm; unit 4 undifferentiated in south half of trench, description from near station 1.0, 1.3; similar to unit 4d; upper part of unit 4 near here could be part of unit 5a; lower contact gradational and indistinct, erosional
4 (st. 3, 1.2)	clay loam (40, 42, 18	≤ 3 increasing to 10 to S	5	5Y 5/1	2.5Y 5/3	10YR 5/8 faint	5	modern roots, 1 ≤ 3 cm dia.; 4 ≤ 5 mm dia.; 4 ≤ 1 mm dia; some twig, and leaf debris; organic debris, possibly infiltrated	unstratified; cobbles weakly imbricated; appears root-stirred, especially upper part	folded	Unit 4 undifferentiated in south half of trench, description from near station 3.0, 1.2; similar to units 4b and 4d; friable to firm; lower contact gradational and indistinct, probably erosional
5a	silty clay loam (15, 62, 23) (29, 51, 20)	0	0	2.5Y 3/1	2.5Y 4/2	10YR 5/8 to faint 10YR 2/1 stains	10	modern roots, 2 ≤ 5 mm dia.; 2 ≤ 1 mm dia., 3 near top; LOI=4.0, 6.1	unstratified to weakly stratified; 3 to 4 pr structure in upper 10-30 cm	lower contact folded; peds tilted 30° S near north end of unit suggest folding	Diatom fragments in smear slides suggest wet environment; lower and upper contacts abrupt and wavy, probably erosional
5b	silty clay loam (15, 68, 17)	0	0	7.5YR 3/1		--	0	modern roots 1 ≤ 10 cm dia., 2 ≤ 3 cm dia., 3 ≤ 5 mm dia.; 3 ≤ 1 mm dia.; LOI=6.6	discontinuous lens and pods of irregular thickness; may be partially root-stirred	lower contact folded	Abundant diatom, charcoal, and other organic fragments in smear slides suggest wet environment; lower contact irregular, distinct to abrupt
5cA	clay loam (19, 59, 22) (15, 68, 17)	0	0	7.5YR 1.7/1	--	--	0	modern roots, 2 ≤ 5 mm dia.; 2 ≤ 1 mm dia., 3 near top	buried A horizon developed on unit 5a; 3 f abk to pl structure	folded?	Diatom, charcoal, and other organic fragments in smear slides suggest wet environment; lower contact abrupt, smooth
5d	clay loam to silty clay loam	≤ 3	1	2.5YR 5/3	7.5YR 6/6	10YR 6/8 streaks	5	modern roots, 2 ≤ 5 mm dia.; 2 ≤ 1 mm dia., 3 near top	many discontinous lenses; highly root-stirred	no evidence of deformation	Probably root-stirred and perhaps eroded, mixture of units 5a, 5b, and 8; lower contact abrupt to gradual, discontinuous
5eBt	silt loam to silty clay loam (31, 48, 21)	5	1	2.5Y 6/2 2.5Y 6/4	2.5Y 5/3 2.5Y 4/3	7.5YR 5/8 along roots; 5Y 3/2 stains	15-20	modern roots, 2 ≤ 5 mm dia.; 2 ≤ 1 mm dia	discontinuous pebbly lens and light and dark zones; moderate Bt soil structure; 2 f po	displaced by fissure	Mixture (root-stirred) of units 4d, 5a, and probably 5b; lower contact abrupt, wavy
6E	silt loam to loam (15, 70, 15) (18, 69, 13)	0	0	10YR 6/1 10YR 5/2-8/1d	2.5Y 6/2 10YR 6/2-8/2d	--		modern roots, 1 ≤ 3 cm dia., 2 ≤ 5 mm dia.; 3 ≤ 1 mm dia; much organic debris disseminated and in laminae	discontinuous lens, pockets, and pods; well to poorly sorted; massive to stratified; mixed with forest duff in upper 13 cm to form weak A, AE, weak Bw, and AC horizons; 0 to 3 sbk structure; highly root-stirred	displaced by fissure	Very hetergeneous unit dominated by sediment from a diatomite and E horizons and greatly mixed with widely varying proportions of adjacent units and forest floor litter; strongly bioturbated by roots, tree throw, and probably logging; lower contact highly variable, abrupt to gradual and smooth to discontinuous; appears to directly overlie unit 5 near stations 3.3 and 9.5
7	loam to sandy loam	≤ 1, 2-10 in places	0, ≤ 1 near base	2.5Y 5/3	2.5Y 6/3	--	0	modern roots, 2 ≤ 5 mm dia.; 2 ≤ 1 mm dia	weakly stratified; discontinuous pebbly lens; weak imbrication; weak Bt soil horizon development; highly root-stirred	no evidence of deformation	Similar to unit 4eBt but less coarse sand; in places mixed with unit 4d; lower contact very irregular, gradual to clear, in places abrupt
8	sandy clay loam	≤ 1	0	2.5YR 6/3	--	--	0	modern roots, 1 ≤ 3 cm dia., 2 ≤ 5 mm dia.; 3 ≤ 1 mm dia; much organic debris disseminated and in laminae	sandy lenses and cut and fill structures suggest stream erosion	no evidence of deformation	Probably stream and wetland deposits near base of scarp, partly root-stirred
9aA	silty clay loam (12, 78, 10)	≤ 1	0	10YR 5/2 2.5Y 6/3	2.5Y 5/1 2.5Y 4/2	light colored mottles due to mixing with unit 6E	0	modern roots, 1 ≤ 10 cm dia., 2 ≤ 3 cm dia., 3 ≤ 5 mm dia.; abundant ≤ 1 mm dia., much disseminated debris	unstratified to weakly to stratified; highly root-stirred; fills submodern root casts; lower part of unit below scarp is peatier than rest of unit	no evidence of deformation	Sediment of A-horizons and underlying units, highly bioturbated by roots, tree throw, and probably logging; lower contact clear and wavy
9bA	silty clay loam	0, ≤ 1 in places	0	2.5Y 5-6/3 10YR 6/3	2.5Y 4/2 10YR 3-6/1 7.5YR 7/4	light colored mottles due to mixing with unit 6E	0	modern roots, 1 ≤ 3 cm dia., 2 ≤ 5 mm dia.; 2 ≤ 1 mm dia; much disseminated debris	unstratified, sandy; highly root-stirred; fills submodern root casts and contains large blocks of unit 6E	fills fissure; upper ends of faults in fissure extend into unit	Mixture of A-horizon sediment, unit 6E, and deformed blocks of units 5dBt and 4d; contacts abrupt to clear and smooth to discontinuous
9cA	silt loam	0	0	7.5YR 1.7/1	--	--	0	roots, 3 <1 mm; decomposed plant fragments in peat	massive to 1 platy structure	occurs only as 1-to-5-cm blocks in middle and lower part of fissure	Humified blocks of forest AO horizon that fell into fissure when it opened
9dA	loam (49, 35, 16) (31, 54, 15)	0	0	10YR 3/2	--	--	--	modern roots, 2 ≤ 10 cm dia., 3 ≤ 3 cm dia., abundant ≤ 5 mm dia., abundant ≤ 1 mm dia; woody debris and peat in irregular lens and pockets, slightly-humified	unstratified; thins to a few cm on scarp face; modern O, OA, and upper parts of A horizons; largely undecomposed tree and plant debris	no evidence of deformation	Predominantly plant debris deposited on the forest floor in the initial stages of decomposition; lower portion grades downwards into unit 9aA and contains charred wood and charcoal; lower contact is gradual and smooth to wavy

[1]Units shown on the trench log (Plate 1) are designated by number based on lithology, stratigraphic position, inferred genesis, and inferred age, approximately from oldest to youngest. Lithology, genesis, and age of units are listed in brief unit descriptions on Plate 1. Units are divided into subunits (marked by lowercase letters) on the basis of lithologic differences, major differences in soil development, and inferred correlations with similar units in other parts of the trench. Labels for subunits that correspond with A, B, or E soil horizons include the appropriate soil horizon designation (Soil Survey Staff, 1993 and Birkeland, 1999). Units were described by several different investigators, at different times, using different data formats, which led to inconsistencies in descriptive terminology. Descriptions are incomplete for some units and a few were not described (units that appear on the trench log on Plate 2, but are not listed in this table). Zero indicates that a property is absent; a dash indicates that a property was not described. Information shown on trench logs, notes to logs, or other tables is not repeated here.
Contributing investigators included: Silvio Pezzopane (coordinator), Harvey Kelsey, Rick Koehler, Charles Narwold, Brian Sherrod, Bill Laprade, Alan Nelson, Ray Wells, Bob Bucknam, Sam Johnson, Ralph Hagerud, Derek Booth, and Kathy Troost.

[2]Field texture terms follow Soil Survey Staff (1993). Numbers separated by commas are sand, silt, and clay percentages for samples of units analyzed for grain-size distribution using a Malvern particle-size analyzer (Buurman et al., 1997). Many units are lithologically heterogeneous and so laboratory grain-size and field texture data may differ where samples were from different locations within a single unit.

[3]Estimate of area covered by clasts using size charts. Most clasts were subangular to subrounded and concentrated in clusters or lenses rather than being evenly dispersed. Exceptions are noted in Comments column.

[4]Primary color is dominant Munsell color of matrix, taken moist unless otherwise indicated with a “d:” for dry color.

[5]Dominant moist Munsell color of mottles listed first. Percent area is estimate of percentage of sediment stained a brighter hue or chroma than the matrix.

[6]Type of organic material present and estimate of distribution or percent area of material within sediment. Root terms follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). LOI is percent organic matter estimated by loss on ignition (method of Storer, 1984).

[7]Terms for soil horizon properties follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Data for described soil profiles and explanation of abreviations is in Table BL2; only soil horizon boundaries that coincide with unit contacts are shown on trench log.

[8]Many terms for contacts and soil consistence use soil horizon terminology following Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Additional information about stratigraphic units can be found in Tables BL1 and BL2 and in the notes to the trench log.

Table ML3. Additional descriptive data for stratigraphic units in the Mossy Lane trench[1]

UNIT NO.	MATRIX TEXTURE[2]	COARSE FRACTION[3]		MATRIX COLOR[4]		MOTTLES, STAINS[5]		ORGANIC MATERIAL[6]	STRUCTURE(S)[7]		OTHER PROPERTIES AND COMMENTS[8]
		Pebble	Cobbles	Primary	Secondary	Color	Percent area		Depositional structures and/or soil structure	Tectonic deformation features	
1a	sandy (f) siltstone (5, 67, 28)	<1	0	2.5Y 5/3	--	2.5YR 5/8	Fe stains on fractures	leaf fossils; (modern) roots at <1.5 m depth	massive (85%) to bedded (15%)	beds dip steeply, typically 283° 74°N; densely reverse faulted	80% of unit 1; pervasively weathered near surface; ubiquitous hackly fracture pattern; most severe fracturing and attenuation in hanging wall of low angle thrusts
1b	sandstone (m-f)	0?	0	5Y 2/2	--	2.5YR 5/8	Fe stains on fractures	(modern) roots at <1.5 m depth	massive (85%) to bedded (15%)	beds dip steeply, typically 283° 74°N; reverse faulted	20% of unit 1; pervasively weathered near surface; ubiquitous hackly fracture pattern; most severe fracturing and attenuation in hanging wall of low angle thrusts; some lens of pebble conglomerate
1c	pebbly sandstone	10	0	5Y 2/2	--	2.5YR 5/8	Fe stains on fractures	(modern) roots	massive (85%) to bedded (15%)	beds dip steeply, typically 283° 74°N; reverse faulted	< 1% of unit; occurs as lenses conformable with local bedding.
1d	silty clay (12, 59, 29)	<1	0	5Y 5/3	10YR 5/3	10YR 5/4	random, <10 mm	roots 1 f-m vert (80%); 1 f vert; 1 m-co vert	upper 0.1 m sbk; faint bedding in lower 80%	reverse faulted	Saprolite averages 0.5 m thick, but is much thinner on scarp and broken with large blocks within hanging wall colluvium; lower contact gradational (50-100 mm)
1e	clay	0	0	5Y 5/3	--	10YR 5/4	random, <10 mm	roots 1 f subvert (80%)	massive to 2 f-m sbk	fault gouge parallel to bedding, 5-15 cm thick	Faulting that produced gouge predates development of saprolite
1fA	clay to silty clay	1	1	10YR 3/1	--	7.5YR 5/8	25, irregular sharp	roots 1 f subvert (80%); 1 m-co vert	massive to 1 f-m sbk	deformed, possibly faulted	Organic-rich lens of silt with 1% m-co sand and well rnd pebbles; dark color due to fine-grained organic material; lower contact gradational (100 mm)
2AEB	silt loam (22, 57, 21)	<1	0	2.5Y 3/2	10YR 7/2 (E horizon)	7.5YR 5/8	10, subrnd <10 mm dia	(modern) roots 1 f vert LOI=5.1	2 f cr, lower 20% massive	sheared and faulted; lower block of soil rotated 45-60° clockwise	Block of soil containing remnants of A, E, and AB or B horizons; light-colored silt in upper 80% of block is probably remains of leached E horizon mixed by roots; lower contact clear to gradational (70 mm)
3	silty clay loam to silt loam	3-5	<1	2.5Y 5/3	2.5Y 5/4	10YR 5/6	20, blotches	(modern) roots 1-2 vf subvert, 1 m-co vert	2 f sbk to 2 m sbk	disaggregated due to collapse of hanging wall on reverse fault	Mixture of ang, subang, and rnd pebbles; reddish-orange sandy bed 10 cm above lower contact is derived from unit 1; unit bounded by scarp free face on north end; lower contact abrupt (2-5 mm)
4aAB	silty clay loam, and sand (f)	<1	0	7.5YR 4/2	10YR 7/2 to 5Y 5/2	7.5YR 5/4	2	(modern) roots 1 f vert, 1 m subvert	2 f-m sbk	sliver of soil isolated by reverse faulting	Sandy within 2 cm of lower contact; lower contact abrupt (5 mm)
4bAEB	silt loam to silty clay loam (28, 54, 18)	<5	0	10YR 3/2 to 7.5YR 3/1	10YR 7/2 (E horizon)	5-15 mm dia black charcoal	5	(modern) roots 1 f vert, 1 co vert; 5% of unit is charcoal; LOI=18.3	2 m sbk to 2 m cr	sheared and faulted; sliver of soil isolated by reverse faulting stretched between 10 and 12 m	Clasts are subrnd bedrock within silt loam; both sections of unit connected by 10-15-mm-thick stringer of unit; lower contact abrupt (1-10 mm)
4cAB	silty clay (15, 59, 26)	0	0	7.5YR 4/1	--	10YR 5/6	20, irregular blotches	(modern) roots 1 vf random, 1 vf subvert LOI=5.5	massive	sliver of soil isolated by reverse faulting	Maximum unit thickness is 60 mm; trace f-m highly weathered, chalky sand; lower contact clear (5-15 mm)
4dA	silt loam (30, 55, 15)	0	0	2.5YR 3/1	2.5YR 3/2	7.5YR 5/8	streaks in upper 10 cm	5-20% charcoal clasts, mostly in upper 8 cm; roots vf vert LOI=4.0	1 f c-cr	flame structures at upper contact show shearing of unit	Unit mostly derived from granitic, quartz-rich, unmapped Pleistocene sediment; flattened charcoal log at top of unit; concentration of charcoal and wood fragments at upper contact; unit buried by collapse of overlying unit 4dB; lower contact clear (30 mm), wavy; upper fault contact abrupt (<1 mm)
4dB	silty clay loam (47, 38, 16)	0	0	5 YR 3/2	10YR 7/2 to 10YR 3/3	5YR 5/8	40	none to 1 vf vert LOI=5.6	massive	unit folded slightly	Unit mostly derived from underlying saprolite and bedrock; elongate blobs of E horizon sediment (unit 4dE) at upper contact; upper fault-bounded contact very abrupt (<0.5 mm) ; lower contact gradational (30-120 mm)
4dE	silt loam	0	0	7.5 YR 5/1	10YR 7/2	0	0	roots 1 f vert to 1 f subvert	massive	unit partly fills tectonic fractures	Unit consists of light-colored lens of E horizon sediment that occurs as irregular blotches, blobs, and fracture fills as in overlying modern soil horizons; contacts abrupt (1-5 mm)
5a	silt loam to silty clay loam	<1	<1	2.5Y 4/3 to 2.5Y 5/3	10YR 7/2 (E horizon)	0	0	(modern) roots 1-2 vf-f vert, 1 f-m vert-horz	2 f sbk to 2 f-m sbk	disaggregated due to collapse of hanging wall on reverse fault	Lenses of light gray to rust colored sand (f-m) make up 15% of unit; lower contact abrupt to clear (5-15 mm), wavy
5b	silt loam to silty clay loam	<1	0	10YR 5/3	5Y 5/3	7.5YR 5/8	10, irregular blotches	roots 1 f-m subvert to horz	2 f-m abk-sbk	disaggregated due to collapse of hanging wall on reverse fault	Rnd to subrnd metamorphic and igneous clasts and <0.3-m-long clasts of unit 2; 0.2-m-long, 0.03-m-thick lens of E horizon sediment at 12.6, 3.8; lower contact clear (5-20 mm), wavy
5c	silty clay loam	<1	35 50 boulders	5YR 5/3	10R 3/2	0	0	(modern) roots 2 f-subvert, 1 co subvert to horz	2 abk-sbk-f-co	disaggregated due to collapse of hanging wall on reverse fault and deformation of underlying unit	Subang to subrnd siltstone cobbles – 35% of unit; irregular-shaped, boulder-sized blocks of saprolite to 1.5 m – 50% of unit; largest saprolite block is overturned
5d	clay	0	0	2.5Y 6/2	--	0	0	0	massive	intense shearing shown by slickensides; flame structures of unit 4 in unit 5d	Contains mostly comminuted bedrock; lower contact abrupt (<0.5 mm), irregular
6aBt	silt loam to silty clay loam to silty clay	0	0	10YR 3/2	7.5YR 3/2	--	--	humified, disseminated organic matter	2-3 f-m sbk	no evidence of deformation	--
6bAE	loam to silt loam	0	0	5Y 3/2	10YR 7/3	--	--	humified, disseminated organic matter	2 vf-f sbk	no evidence of deformation	--
6cA	clay to silty clay	1	1	10YR 3/1	--	10YR 5/4	25, irregular sharp	roots 1 f subvert (80%); 1 m-co vert	massive to 1 f-m sbk	no evidence of deformation	Dark color due to fine-grained organic material in tree-throw crater; lower contact gradational (50 mm)

[1]Units shown on the trench log (Plate 2) are designated by number based on lithology, stratigraphic position, inferred genesis, and inferred age, approximately from oldest to youngest. Lithology, genesis, and age of units are listed in brief unit descriptions on Plate 1. Units are divided into subunits (marked by lowercase letters) on the basis of lithologic differences, major differences in soil development, and inferred correlations with similar units in other parts of the trench. Labels for subunits that correspond with A, B, or E soil horizons include the appropriate soil horizon designation (Soil Survey Staff, 1993 and Birkeland, 1999). Not all properties were described for each unit and different investigators working in different trenches led to some inconsistencies in descriptive terminology. Zero indicates that a property is absent; a dash indicates that a property was not described. Information shown on trench logs, notes to logs, or other tables is not repeated here. Contributing investigators included: Harvey Kelsey (coordinator), Brian Sherrod, Ray Wells, Rick Koehler, Silvio Pezzopane, Sam Johnson, and Bill Laprade.

[2]Texture terms follow Soil Survey Staff (1993). Numbers separated by commas are sand, silt, and clay percentages for samples of units analyzed for grain-size distribution using a Malvern particle size analyzer (Buurman et al., 1997). Many units are lithologically heterogeneous and so grain-size and field texture data may be representative of different locations within a single unit.

[3]Estimate of area covered by clasts using size charts. Most clasts were subangular to subrounded and concentrated in clusters or lenses rather than being evenly dispersed. Exceptions are noted in Comments column.

[4]Primary color is dominant Munsell color of matrix, taken moist unless otherwise indicated with a “d” for dry color; dash = no secondary color.

[5]Dominant Munsell color of mottles listed first. Percent area is estimate of percentage of sediment stained a brighter hue or chroma or darker value than the matrix.

[6]Type of organic material present and estimate of percent area of material within sediment. Root terms follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). LOI is percent organic matter estimated by loss on ignition (method of Storer, 1984).

[7]Terms for soil horizon properties follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Data for described soil profiles and explanation of abreviations is in Table ML2; only soil horizon boundaries that coincide with unit contacts are shown on trench log.

[8]Many terms for contacts and soil consistence use soil horizon terminology following Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Additional information about stratigraphic units can be found in Tables ML1 and ML2 and the notes accompanying the trench log.

Table S3. Additional descriptive data for stratigraphic units in the Saddle trench[1]

UNIT NO.	MATRIX TEXTURE[1]	COARSE FRACTION[3]		MATRIX COLOR[4]		MOTTLES[5]		ORGANIC MATERIAL[6]	STRUCTURE(S)[7]		OTHER PROPERTIES AND COMMENTS[8]
		Pebbles	Cobbles	Primary	Secondary	Color	Percent area		Depositional structures and/or soil structure[1]	Tectonic deformation features	
1a	clay to sandy clay loam	<1	0	5Y 6/2	5Y 5/2	7.5 YR 5/8	along fractures and roots	leaf fragments	basal sand with pebbly nested channels 5-25 cm thick; fine-grained sandstone stringers, 5-10 cm thick	beds dip steeply north; fractured, jointed; clean, well sorted f sand fills some fractures;	Massive; deeply weathered; moderately indurated; contacts sharp at bottom and gradational or indistinct at top
1b	sandy clay to loam	0	0	5Y 6/2	5Y 5/2	7.5 YR 5/8-10YR 5/6	along fractures and roots	leaf fragments	fining upward beds	beds dip steeply north, slightly overturned	Sand is moderately well sorted, m to f; deeply weathered; in places, lithic to feldspathic, micaceous, tuffaceous, carbonaceous, and in fining upward sequences
1c	sandy clay loam to loam	2	0	5Y 6/2	5Y 5/2	7.5 YR 5/8-10YR 5/6	along fractures and roots	--	fining upward beds	beds dip steeply north, slightly overturned	Same as 1b, but higher percentage of pebbles and sand
1d	clay	0	0	5Y 6/3	2.5Y 5/3	7.5 YR 5/6	few	--	weathered to saprolite	unit truncated by fracturing of unit 1e	Saprolite developed on units 1a, 1b, 1c, and 1e; mudstone and sandstone completely weathered to clay; massive, structureless; highly gradational and irregular lower boundary
1dBt	clay	0	0	2.5Y 6/3	2.5Y 5/3 10YR 5/2	7.5 YR 5/8-10YR 5/6	--	--	weathered to saprolite; 4 co abk to pr structure	unit truncated by fracturing of unit 1e	Matrix completely weathered to clay; white sandy silt infiltrated between some ped faces
1e	clay to sandy clay loam (4, 64, 32)	<1	0	5Y 6/2	5Y 5/4	7.5 YR 6/8-10YR 5/6	along fractures and roots	--	--	beds are subvertical beneath fault L1 and overturned above it; sheared, broken with jagged and irregular contacts; bedforms broken/disturbed/sheared by distributed minor faults	Similar to 1a and 1b, but intensely fractured hackley fabric; shattered; dense and waxy with thin (<15 cm long) stringers of basaltic and feldspathic sands
1f	clay to sandy clay loam	<1	0	5Y 6/2	5Y 5/2	7.5 YR 5/8-10YR 5/6	along fractures and roots	--	--	beds are overturned above fault L1; offset by major thrust fault 3	Similar to 1a and 1b, but less highly fractured than 1e
1g	sandy clay to loam	--	0	5Y 6/2	5Y 5/3	7.5 YR 5/8-10YR 5/6	along fractures and roots	--	--	beds are overturned above fault L1; offset by major thrust fault 3	Similar to 1a and 1b, but less highly fractured than 1e
1h	clay to sandy clay loam	--	0	5Y 6/2	5Y 5/2	7.5 YR 5/8-10YR 5/6	along fractures and roots	--	--	beds are overturned above fault L1; offset by major thrust fault 3	Similar to 1a and 1b, but less highly fractured than 1e
1i	clay to sandy clay loam	0	0	5Y 6/2	5Y 5/3	7.5 YR 5/8-10YR 5/6	--	--	--	fault gouge	Narrow zone of sheared units 1f, 1g, 1h, and 2a along reverse fault 3; dense, waxy, highly sheared
2a	clay to sandy clay	1	<1	5Y 6/2	5Y 5/2	7.5 YR 5/8	irregular	none	--	sheared by landslide planes L3 and L4	Similar to unit 1a but mostly mudstone weathered to clay, little sandstone; clasts rnd to subrnd; sharp contacts with unit 2d
2b	sandy clay to loam	5	<1	2.5Y 6/3	2.5Y 5/3	7.5 YR 5/8-10YR 5/6	--	--	--	sheared by landslide planes L3 and L4	Sandy, pebbly lenses within unit 2a
2c	sandy clay loam to loam	10	<1?	2.5Y 6/3	2.5Y 5/3	7.5 YR 5/8	--	--	--	sheared by landslide planes L3 and L4	Pebbly, cobbly lenses within unit 2a
2d	sandy clay loam to loam	2	0	10YR 6/2	2.5Y 5/4	7.5 YR 6/8 10YR 5/6	pervasive	none	--	50-cm-thick bed is deformed into recumbent fold with internal fractures	Mixed beds of very f to m sand and silty clay; sharp contacts; clasts rnd to subrnd; sandy and clayey beds mixed by roots as well as tectonic deformation
3a	silty clay (41, 42, 17)	2	<1	2.5Y 5/3	2.5Y 5/4	7.5 YR 5/6	15	organic stains on fractures; rare f roots	irregular patches and clumps of 10YR sediment within 2.5YR matrix	abundant fractures, but through-going faults difficult to identify; deformed stringers and lenses	Clasts subrnd to rnd; irregular patches of different colors and textures could be due to mixing by roots, glaciers, downslope movement, or faulting
3aBt	silty clay loam	2	<1	2.5Y 5/2	2.5Y 6/3	7.5 YR 5/6	--	--	3 co abk structure	no evidence of deformation	Clasts subrnd to rnd; irregular patches of different colors and textures could be due to mixing by roots, glaciers, downslope movement, or faulting
3b	loam	10	<1	2.5Y 5/3	2.5Y 6/4	7.5 YR 5/8	--	--	--	deformed coarse lenses	Clasts subrnd to rnd; irregular patches of different colors and textures could be due to mixing by roots, glaciers, downslope movement, or faulting
3c	loam	5	<1	2.5Y 5/3	2.5Y 6/4	7.5 YR 5/8	--	--	--	deformed coarse lenses	Clasts subrnd to rnd; irregular patches of different colors and textures could be due to mixing by roots, glaciers, downslope movement, or faulting
4a	clay (28, 48, 24)	0	0	2.5Y 6/3	2.5 Y 4/3	7.5 YR 5/8	10	--	--	unit offset by major thrust fault 3	Many sand grains and granules weathered to light-colored clay; irregular blotches of sandy sediment probably due to mixing by roots
4b	silty clay loam	5-10	0	2.5 Y 6/3	2.5 Y 4/3	7.5 YR 5/8 10YR 5/6	15	--	--	unit offset by major thrust fault 3	Pebbles subrnd to rnd; irregular blotches of sandier sediment probably due to mixing by roots
4c	clay loam	<1	0	2.5 Y 6/3	2.5 Y 4/3	7.5 YR 5/8 10YR 5/6	10	f roots 1%; f black stains <<1%	--	unit offset by major thrust fault 3; contains small unmapped faults	Large, irregular blotches of much sandier sediment may be partly depositional
4d	clay (39, 37, 24)	<1	0	2.5 Y 5/3	2.5 Y 4/3	7.5 YR 6/8	30	f roots 2-5%	--	unit offset by major thrust fault 3	Pebbles subrnd; irregular blotches of sandy sediment probably due to mixing by roots; many granules weathered to light-colored clay
4e	silty clay loam	2	0	2.5 Y 6/3	2.5 Y 5/3	7.5 YR 6/8	--	--	common disaggregated clayey abk peds inherited from former soil	unit partly fills small graben in unit 4c; contains small unmapped faults	--

4f	sandy clay loam to silty clay loam	2-10	0-2	2.5 Y 5/3 10YR 6/3	2.5 Y 4/3 10YR 4/2	7.5 YR 5/8- 10YR 5/6	15	f roots 2-5%; f black stains <<1%	common disaggregated clayey abk peds inherited from former soil	parts of unit fill fissures and small graben in the upper part of unit 1e; contains small unmapped faults	Mixture of sediment like that in units 4e and 5e, including small clasts of unit 1e
5a	silty clay loam (42, 45, 13)	1	0	10YR 5/3	10YR 6/3	7.5 YR 5/6	10	f roots 1%; charcoal <<1%	1 m abk; more friable than lower units	unit offset by major thrust fault 3	Pebbles subang; irregular blotches of sandy sediment probably due to mixing by roots
5b	loam	10	0	10YR 5/3	10YR 6/4	7.5 YR 5/7	15	--	massive with zones of 2 m abk; clay films: 1, f, po br	no evidence of deformation	Presence of clay films on a few randomly oriented peds suggests root-stirring of older or overlying B horizon
5c	clay loam	15	0	10YR 6/4	10 YR 4/2	7.5 YR 5/6	5	--	massive with zones of 3 m abk; clay films: 1-2, d, po br	unit offset by major thrust fault 3	Presence of clay films on a few randomly oriented peds suggests root-stirring of older or overlying B horizon
5d	loam	5	0	10YR 4/2	10YR 4/3	7.5 YR 5/6- 7.5 YR 3/3	30	<1%	massive to 1 abk; friable; clay films: 1, f, br	no evidence of deformation	Irregular blotches of sandy sediment probably due to mixing by roots
5e	silty clay loam (27, 57, 16)	<1	0	10YR 5/3	7.5YR 3/4	7.5 YR 5/6	5	--	massive to 1 abk; friable; some chunks have clay films: 1, f-d, po br	unit partly fills small graben in unit 1e; contains small unmapped faults	Irregular blotches of sandy and clayey sediment probably due to mixing by roots
5fBt	silty clay (17, 58, 25)	3	0	7.5YR 4/3	--	7.5 YR 5/6	20	f roots 1% LOI=8.3	3 to strong coarse abk; hard consistence	no evidence of deformation	Pebbles subrnd; many sand grains and granules weathered to light-colored clay; isolated sand grains in matrix of clay; smear slides show no diatoms in unit, like those in Holocene lake beds in other trenches
6a	clay loam	1	0	10YR3/3	--	0	0	f roots 2%	massive to 1 sbk; friable; many soil pores but no clay films	no evidence of deformation	Pebbles subrnd to rnd
6b	clay loam (61, 29, 10)	3	0	10YR 6/2	10YR 5/3	7.5 YR 5/6- 7.5 YR 5/8	5	f roots 2%	massive to 1 sbk; friable; clay films: 1, f-d, br	unit probably offset by unmapped faults between stations 7-10	Some irregular blotches of sandy sediment probably due to mixing by roots, but less mixed and stained than 5e
6bBE	loam (19, 61, 20)	5	0	10YR 8/4	10YR 5/4	0	0	f roots 1% LOI=3.8	massive to 1 f sbk; loose to very friable; few soil pores, no clay films	unit offset by major thrust fault 3; unit probably offset by unmapped faults between stations 7-12	Pebbles subang to rnd
7aA	clay loam (45, 44, 12)	5	0	10YR3/3	--	0	0	f roots 2%	loose to friable	unit sheared by major thrust fault 3	Many soil pores
7bA	clay loam	2	0	10YR3/3	--	0	0	f roots 2%	2 abk; friable	unit offset by normal fault 1.2.2	Pebbles subang to rnd
8aAB	loam	5	0-2	10YR 2/3 10YR 5/3	--	0	0	f to m roots 5%	2 to 3 m to coarse sbk; rare clay films: 1, f, po	unit possibly offset by unmapped faults between stations 9-13	Pebbles subang to rnd;
8bBA	loam	5	1	10YR 2/3 10YR 4/3	--	--	--	f to m roots 5%	2 f sbk	no evidence of deformation	Pebbles subang to rnd
8cBA	loam	5	1	10YR 2/3	--	--	--	f to m roots 5%	2 to 3 f sbk	no evidence of deformation	Pebbles subang to rnd
8d BA	loam	5	0	10YR 2/3	7.5YR 4/6	5YR 4/6- 5YR 4/8	20	f to m roots 5%	2 to 3 f sbk	no evidence of deformation	Pebbles subang to rnd
8eA	loam to sandy loam	5	0	10YR2/2 10YR 4/3	--	--	--	f to m roots 5%	2 f sbk	no evidence of deformation	Pebbles subang to rnd

[1]Units shown on the trench log (Plate 2) are designated by number based on lithology, stratigraphic position, inferred genesis, and inferred age, approximately from oldest to youngest. Lithology, genesis, and age of units are listed in brief unit descriptions on Plate 2. Units are divided into subunits (marked by lowercase letters) on the basis of lithologic differences, major differences in soil development, and inferred correlations with similar units in other parts of the trench. Labels for subunits that correspond with A, B, or E soil horizons include the appropriate soil horizon designation (Soil Survey Staff, 1993 and Birkeland, 1999). Units were described by several different investigators, at different times, using different data formats, which led to inconsistencies in descriptive terminology. Descriptions are incomplete for some units and a few units were not described (units that appear on Plate 2, but that are not listed in this table). Zero indicates that a property is absent; a dash indicates that a property was not described. Information shown on trench logs, notes to logs, or other tables is not repeated here. Contributing investigators included: Alan Nelson (coordinator), Ray Wells, Bob Bucknam, Rick Koehler, Charles Narwold, Sam Johnson, Ralph Hagerud, Silvio Pezzopane, Bill Laprade, Brian Sherrod, Derek Booth, and Kathy Troost.

[2]Texture terms follow Soil Survey Staff (1993). Numbers separated by commas are sand, silt, and clay percentages for samples of units analyzed for grain-size distribution using a Malvern particle-size analyzer (Buurman et al., 1997). Many units are lithologically heterogeneous and so grain-size and field texture data may be representative of different locations within a single unit.

[3]Estimate of area covered by clasts using size charts. Most clasts were subangular to subrounded and concentrated in clusters or lenses rather than being evenly dispersed. Exceptions are noted in Comments column.

[4]Primary color is dominant Munsell color of matrix, taken moist unless otherwise indicated with a “d” for dry color.

[5]Dominant moist Munsell color of mottles listed first. Percent area is estimate of percentage of sediment stained a brighter hue or chroma or darker value than the matrix.

[6]Type of organic material present and estimate of distribution or percent area of material within sediment. Root terms follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). LOI is percent organic matter estimated by loss on ignition (method of Storer, 1984).

[7]Terms for soil horizon properties follow Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Data for described soil profiles and explanation of abreviations is in Table S2; only soil horizon boundaries that coincide with unit contacts are shown on trench log.

[8]Many terms for contacts and soil consistence use soil horizon terminology following Soil Survey Staff (1993) and Birkeland (1999, abbreviations in Appendix I). Additional information about stratigraphic units can be found in Tables S1 and S2 and in the notes to the trench log.

Table 4. Summary of fossil data and paleoecological interpretations for samples from the Toe Jam Hill fault trenches[1]

Field No.	Unit	Station (m)[2] Horiz	Station (m)[2] Vert	Depth[3] (cm)	Pollen results[4]	Diatom or macrofossil results[5]	Paleoenvironmental interpretation
Crane Lake Trench							
CL-61	2c	10.1-10.4	1.7-1.85		Few pollen grains, not enough to work with	not examined	Insufficient fossils for environmental interpretation
CL-62	2b	5,95	1.05		Few pollen grains, not enough to work with	not examined	Insufficient fossils for environmental interpretation
CL-60	1d	22.95-23	7.15-7.65		Contains rich Miocene pollen assemblage of *Abies*, Juglandaceae, Betulaceae, *Picea*, *Tsuga*, *Ulmus* and monolete fern spores with verrucae.	Water mount examined - barren of diatoms	This sample may represent a Mioecene assemblage.
Blacktail Trench							
BT-24 monolith	12c-7a	5.7	1-2	4 cm	Contains a rich flora of *Alnus*, *Tsuga*, and fern spores.	not examined	Wetland soil
BT-24 monolith	12c-7a	5.7	1-2	10 cm	Contains a rich flora of *Alnus*, *Tsuga*, and fern spores.	Sample contains abundant *Pinnularia* fragments and phytoliths (poorly preserved assemblage). *Pinnularia* is common in many freshwater envionments, including bogs, wetlands, shallow ponds, and lakes.	Wetland soil
BT-24 monolith	12c-7a	5.7	1-2	17 cm	Contains a rich flora of *Alnus*, *Tsuga*, and fern spores.	Sample contains mostly silt with fragments of *Pinnularia* sp.; fragments are fairly abundant but not identifiable to species level. *Pinnularia* is common in many freshwater envionments, including bogs, wetlands, shallow ponds, and lakes.	Wetland soil
BT-24 monolith	12c-7a	5.7	1-2	24 cm	Contains a rich flora of *Alnus*, *Tsuga*, and fern spores.	not examined	Wetland soil
BT-25 monlith	12b-7b	7.5	1-2	5 cm	Contains a rich flora of *Tsuga*, *Abies*, *Alnus*, and Monolete fern spores.	Sample contains a poorly preserved assemblage, mainly fragments with few whole valves (*Pinnularia viridis* v. commutata). *Pinnularia viridis* var. commutata prefers cool water or low mineral content (Patrick and Reimer, 1966).	Wetland soil
BT-25 monlith	12b-7b	7.5	1-2	17 cm	Contains a rich flora of *Tsuga*, *Abies*, *Alnus*, and Monolete fern spores.	not examined	Wetland soil
BT-25 monlith	12b-7b	7.5	1-2	26 cm	Contains a rich flora of *Tsuga*, *Abies*, *Alnus*, and Monolete fern spores.	not examined	Wetland soil
BT-4	4b	28.8	3.1		few alder grains	not examined	Insufficient fossils for environmental interpretation
BT-46	9aAE	19.4	4.6		not examined	not examined for diatoms; charcoal fragments including herb charcoal; two decayed deciduous leaf fragments	Insufficient fossils for environmental interpretation
Bear's Lair Trench							
BL-57	9cA	9.6	2.2		Pollen is fairly abundant, moderately well-preserved, pale in color, and fresh-looking under magnification. Palynomorphs observed were *Alnus*, *Carya*-type, *Pseudotsuga*, *Ovoidites ligeolus*, *Hystix*-type, small CP3, and small fern spores.	Water mount examined - barren of diatoms	This pollen assemblage is not typical of the modern assemblage from this area. If the Carya is real, it is an Alder/fern assemblage of warm temperate nature and could be pre-Quaternary.
BL-73	5cA	3.5	1.8		Contains a monolete fern spore/*Alnus* association similar to that observed in BL-7(2 cm).	Water mount examined - barren of diatoms	This assemblage is not typical of the modern assemblage from this area. It could represent an Alder/fern assemblage of warm temperate nature or it could be pre-Quaternary.
BL-72	5b	2	1.4		Contains scant organics (charcoal chips) and only one spore.	Water mount examined - barren of diatoms	Insufficient fossils for environmental interpretation
BL-45	5b	-0.6	1.5		Contains *Pseudotsuga*, *Betula*, *Alnus*, graminae, Fern spores	Assemblage from base of sample is badly fragmented, not many whole valves. *Aulacoseira* sp. dominates, possibly *A. crenulata*; *Nitzschia* fragments abundant. *Aulacoseira* is a common taxon in littoral areas of small ponds or lakes.	Wetland/pond
BL-2	4	1	1.1		not examined	Contains a poorly preserved assemblage of wetland and aerophilous taxa. Only two whole *Eunotia* valves were observed. *Eunotia* is common in many freshwater habitats, including soft-water rivers and lakes, and bogs (in association with mosses).	Wetland/pond
BL-82a soil profile	5eBt	13.3	3.8	30-54 cm	not examined	Contains a poorly preserved assemblage, mostly freshwater benthic taxa but a few fragments of a centric diatom with large round aereolae in linear rows (*Thallasiosira* sp.?).	The centric diatom fragments could indicate a marine depositional environment for this deposit. Wetland/marine?
BL-82b soil profile	5eBt	13.3	3.8	30-54 cm	not examined	Fragments of *Pinnularia*, *Navicula*, and others. One whole valve of a diatom that looks like *Stephanopyxis turris*, plus fragments of diatoms with hexagonal aereolae, that look like marine diatoms (common to abundant, one of the more abundant types in the sample). Includes a partial valve of *Arachnoidiscus ehrenbergi*. *Arachnoidiscus ehrenbergii* often lives attached to marine macrophytic algae in nearshore marine environments.	Wetland/marine?
BL-82c soil profile	5eBt	13.3	3.8	30-54 cm	not examined	Contains a poorly preserved assemblage of wetland and aerophilous taxa (*Aulacoseira* and *Pinnularia* fragments).	Wetland
BL-1 monolith	3a	6.1	1.6	3.5 cm	Contains little pollen and organic matter. Polypod fern spores are the main palynomorphs present, with pollen grains of *Liquidambar*, *Alnus*, and *Carya* present as well.	not examined	With such a scant assemblage, it is difficult to assign a biostratigraphic correlation; the assemblage may represent reworking of old pollen grains.
BL-1 monolith	3a	6.1	1.6	9 cm	Contains scant oragnics; no pollen or spores observed.	not examined	Insufficient fossils for environmental interpretation

BL-1 monolith	3a	6.1	1.6	14 cm	Contains abundant hyphae presumably of algal origin but could also be fungal; scant organics present.	not examined	Insufficient fossils for environmental interpretation
BL-1 monolith	3a	6.1	1.5	20 cm	Contains palynomorphs of *Pinus*, *Acer*-type, polypod fern spores, monolete spores, *Picea*, and large P3 and P4 grains.	not examined	With such a scant assemblage, it is difficult to assign a biostratigraphic correlation; the assemblage may represent reworking of old pollen grains.
BL-1 monolith	2b	6.1	1.5	25.5 cm	Contains abundant hyphae presumably of algal origin but could also be fungal; scant organics present.	not examined	Insufficient fossils for environmental interpretation
BL-1 monolith	2b	6.1	1.4	29 cm	Contains little organic matter and few pollen grains. Observed pollen include *Fagus*, *Picea*, and *Osmunda* fern spores.	not examined	The observed assemblage does not resemble a Quaternary assemblage from the Pacific Northwest (could be Tertiary).
BL-7 monolith	6E/9aA	3.5	2.1	2 cm	Pollen is fairly abundant and is dominated by *Alnus*, *Sccirpus*, Graminae, *Pseudotsuga*, Acer, *Carya*-type, *Picea*, and monolete spores.	not examined	This assemblage is not typical of the modern assemblage from this area. If the *Carya* is real, it is an Alder/fern assemblage of warm temperate nature and could be pre-Quaternary.
BL-7 monolith	6E	3.5	2.1	3-5 cm 17-18 cm	not examined	The dominate diatoms in this sample are *Aulacoseira italica* (most abundant), *Gomphonema parvulu*m, *Gomphonema angustatum*, *Eunotia pectinalis*, and *Diploneis ovalis.* Subdominate diatoms include *Meridione circulare*, *Achnanthes lanceolata*, *Fragilaria capucina*, *Fragilaria virescens*, *Hanzschia amphioxis*, *Navicula pupula*, *Surirella* sp., *Pinnularia viridis*, and *Amphora ovalis.* Chrysophyte cysts were also common. Most taxa idetified are considered littoral or benthic freshwater species. *Aulacoseira italica* is a common taxon in littoral areas of small ponds or lakes (Hustedt, 1927). *Gomphonema parvulum* is best developed in nutrient-rich freshwater and *Gomphonema angustatum* prefers circumneutral or slightly alkaline freshwater (Patrick and Reimer, 1975). *Eunotia pectinalis* prefers water of low mineral content (Patrick and Reimer, 1966).	A simple interpretataion of the assemblage in this diatomite is a shallow, freshwater pond or lake environment.
BL-7 monolith	6a/7E	3.5	2	10 cm	Contains a moderately well-preserved pollen assemblage dominated by *Alnus*, *Abies*, and monolete spores. Other types observed include *Pterocarya*-type, cf. *Lewisia*, large tectate C3 grain, large rough C3 grain.	not examined	This sample has the same dominates as BL-17, and includes possible indicators of a late Tertiary age.
BL-7 monolith	6E/9aA	3.5	1.9	19 cm	Pollen and spores are very sparse. Monolete spores and *Ovoidites ligneolus* were observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	5cA	3.5	1.8	22.5 cm	Pollen and spores are very sparse. Monolete spores and Ovoidites ligneolus were observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	5cA	3.5	1.8	25 cm	Monolete spores observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	5cA	3.5	1.8	25 cm	Pollen is very rare in this sample, with various Tertiary grains present but difficult to assign names to. Pollen grain colors range form orange to red. A notable M-1 thick walled verrucate fern spore was observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	5a	3.5	1.7	30-32 cm	not examined	The diatom assemblage was poorly preserved (mostly fragments) and was dominated by *Auacolseira italica*. Other diatoms observed include *Eunotia pectinalis*, *Eunotia* cf. *camelus*, and *Gomphonema gracile*; Chrysophyte cysts were also abundant.	This diatom assemblage suggests a shallow freshwater lake, pond, or stream environment.
BL-7 monolith	5a	3.5	1.7	32.5 cm	Contains very little organics or pollen. Alnus pollen and monolete fern spores were observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	5a	3.5	1.7	38.5 cm	Contains no modern-looking pollen or spores; only monolete spores were observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	5a	3.5	1.7	44.5 cm	Pollen is scant but significant in having a number of Tertiary forms and no modern palynomorphs. *Nyssa*, *Malvaceae*, and *Pinus* pollen were observed. Other types observed include a large *Momipites* P3 chagrenate grain, a C5 chagrenate grain, a small CP3 grain, and a notable thick-walled verrucate fern spore.	not examined	This sample could represent a late Tertiary assemblage or reworked pollen grains.
BL-7 monolith	5a	3.5	1.6	50 cm	Pollen is rare but identifiable. Worn grains of *Pinus*, *Pseudotsuga*, *Carya*, monolete spores, and notable M1 thick-walled verrucate spores were observed.	not examined	This sample may represent a late Tertiary assemblage (Oligocene or younger).
BL-7 monolith	4	3.5	1.6	57 cm	Pollen is rare in this sample; only *Pinus* pollen was observed.	not examined	Insufficient fossils for environmental interpretation
BL-7 monolith	4	3.5	1.5	64 cm	Organics and pollen are rare. Pollen observed includes M1 thick-walled verrucate spore, C3-sm (oak-like grain), *Pseudotsuga* ?, *Pinus*, and monolete and trilete spores.	not examined	The identifiable pollen suggests a late Tertiary age; there is no evidence of the usual modern/Holocene assemblage. The pollen could also be reworked from an older deposit.
Mossy Lane Trench							
ML-53	4dE	12.0-13.5	2.8-2.9		not examined	not examined for diatoms; abundant charcoal, wood, bark, fecal pellets, plant debris	Probably A horizon sediment of former forest soil
ML-59	4dE	13.1-13.5	2.78-2.85		not examined	not examined for diatoms; charcoal, leaf fragments, wood, plant debris	Probably A horizon sediment of former forest soil
ML-55	4dE	14.0-15.2	2.68-2.83		not examined	not examined for diatoms; charcoal, bark, wood	Probably A horizon sediment of former forest soil
ML-56	4dE	14.0-15.2	2.6-2.88		not examined	not examined for diatoms; charcoal, wood, bark, leaves	Probably A horizon sediment of former forest soil
ML-49	4aAB	11.2-11.6	4.48-4.58		not examined	not examined for diatoms; abundant charcoal, leaf fragments	Probably A horizon sediment of former forest soil

ML-51	2AEB	10.0-10.8	4.2-4.5		not examined	not examined for diatoms; abraded plant fragments, abundant charcoal, shards	Probably A horizon sediment of former forest soil
ML-7	2AEB	10.55-10.68	4.38-4.40		not examined	not examined for diatoms; charcoal, including charcoal twig	Probably A horizon sediment of former forest soil
ML-16	2AEB	11.48-11.61	4.22-4.24		not examined	not examined for diatoms; abundant charcoal	Probably A horizon sediment of former forest soil
ML-46	2AEB	9.05-9.5	4.8-5.0		not examined	not examined for diatoms; charcoal, charcoal balls, fecal pellets, root	Probably A horizon sediment of former forest soil
ML-48	2AEB	9.1-9.5	4.6-4.9		not examined	not examined for diatoms; abundant charcoal, *Cornus sericea*? seed, fecal pellets	Probably A horizon sediment of former forest soil
ML-1	1fa	24.44	1.78		Barren of pollen; lots of organic debris	few diatom fragments, opal phytoliths, charcoal and lignite? fragments	Possible former wetland soil
Saddle Trench							
S-79	5d	15.4	3		No pollen grains were observed. Hyphal threads (fungal or algal) and a few small moss spores were observed.	Water mount examined - barren of diatoms; three tiny charcoal fragments	Insufficient fossils for environmental interpretation
S-77	3a	17.5	1.5		Pollen includes *Pterocarya*, M1 thick-walled verrucate spores, cf. *Fagus*, *Hystrix*, and moss spores. No modern/late Holocene pollen were observed.	Water mount examined - barren of diatoms; not sieved	Sheared colluvium and drift, probably intruded by roots; pollen probably reworked late Tertiary
S-78	3a	17.5	2.5		Contains small moss spores, hyphal threads (algal or fungal), and one *Juglans*-type pollen grain.	Water mount examined - barren of diatoms; few decayed fragments brown wood, small clasts of organic-rich sediment, rare charcoal fragments	Sheared colluvium and drift, probably intruded by roots

[1]Only samples containing pollen or diatoms, or samples with macrofossils in addition to wood charcoal fragments, are listed in this table and shown on Plates 1 and 2 (square symbols on logs; superscripts next to squares are the digits of the sample numbers listed in the first column. Many of the other 48 samples wet sieved on 2-mm, 1-mm, and 0.5-mm sieves contained rare to abundant fragments of charcoal and listed on Tables CL3, BT3, BL3, ML3, and S3. Sieved samples that were largely barren of microfossils or other organic material are not listed here or shown on Plates 1 and 2. Almost all sieved samples contained common to abundant modern to submodern roots and rootlets.

[2]Location (horizontal, vertical) on reference grid used to map trench walls.

[3]Depths of samples below top of monolith (vertical rectangular box cores about 7 cm wide and 5 cm deep) or ground surface (soil profile BL-1) at the listed station.

[4]Pollen samples prepared and examined by Estella Leopold following methods of (Faegri and Iverson, 1964).

[5]Diatom samples prepared and examined by Brian Sherrod following methods of (Abbott and Ernissee, 1983). Macrofossils picked from 2-mm, 1-mm, and 0.5-mm sieves following wet sieving; fossils identified with reference to standard taxonomic keys.