

APPENDIX A

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A.1. LABORATORY PROCEDURES

Physical Properties

- *particle size analysis* — organic matter removed from A and Ap horizons by H₂O₂; clay (<2 μm) determined by pipette method; sands determined by sieving in the following size fractions — very coarse (2 mm - 1 mm), coarse (1 mm - 0.5 mm), medium (0.5 mm - 0.25 mm), fine (0.25 mm - 0.1 mm), very fine (0.1 mm - 0.05 mm); silt determined by difference
- *specific surface area* — SSA determined by ethylene glycol monoethyl ether method with saturated CaCl₂
- *bulk density* — determined by clod method of National Cooperative Soil Survey; three clods per horizon, averaged to obtain bulk density for horizon
- *coefficient of linear extensibility* — COLE determined by clod method in which bulk density of clod at field capacity (DB_{fc}) and oven-dry (DB_{od}) is used to estimate COLE by the following equation: $COLE = (DB_{od}/DB_{fc})^{1/3} - 1$
- *% 1/3 bar water, % 15 bar water, available water* — ceramic pressure plate apparatus, water percentages calculated as gravimetric water content

Chemical Properties

- *pH* — 1:2 soil:water ratio
- *CEC* — cation exchange capacity; sum of bases NH₄OAc (pH 7) method plus extractable acidity from BaCl₂-TEA (pH 8.2) method; $CEC = \sum(Ca^{2+}, Mg^{2+}, K^+, H^+)$
- *ECEC* — effective cation exchange capacity; sum of bases NH₄OAc (pH 7) method plus exchangeable aluminum from KCl (pH 7) method; $ECEC = \sum(Ca^{2+}, Mg^{2+}, K^+, Al^{+++})$
- *B.S.* — percent base saturation; $B.S. = \sum(Ca^{2+}, Mg^{2+}, K^+) / CEC * 100$
- *E.B.S.* — percent effective base saturation; $B.S. = \sum(Ca^{2+}, Mg^{2+}, K^+) / ECEC * 100$

Engineering Properties

- *Atterberg limits* — liquid limit, plastic limit, and plasticity index determined by ASTM method D-4318 on % passing 40-mesh sieve fraction
- *potential volume change* — PVC determined by method of Lambe, sampled equilibrated for 2 hours or until maximum volume change was obtained (1 to 8 hours)
- *percent passing 40, 200 sieves* — estimated from sand particle size fractions (#18, 35, 60, 140, and 325 mesh sizes); plotted % sand in each fraction against mesh size and estimating % passing 40 and 200 sieves by extrapolating from graph (see Figure A1)

Mineralogical Properties

- *clay separations* — Fe removed by dithionate-citrate-bicarbonate (DCB) method; sand separated from clay-silt fractions by sieving through 270-mesh sieve; clay separated from silt by centrifugation; clays flocculated by decreasing pH; silt and sand fractions saved for future analysis
- *tile preparation* — 250 mg of clay was pipetted on ceramic tile using suction; 2 tiles prepared for each horizon — KCl-saturated, MgCl₂-glycercol solvated
- *randomly-oriented powder mounts* — ground sand and silt fractions with mortar and pestel and prepared powder mounts for x-ray analysis
- *x-ray analysis* — clay mineral species determined by x-ray diffraction using a Scintag® XDS 2000 diffractometer with Cu-K α radiation, 1.54 nm, from 2 to 32 degrees 2 θ at a step size of 0.075 for 30.66 minutes
- *quantification* — clay mineral suites were estimated from peak areas as determined with peak finder program within Scintag using kaolinite as estimated from DSC (described below) as an internal standard
- *differential scanning calorimetry* — kaolinite was estimated from DSC endothermic peak

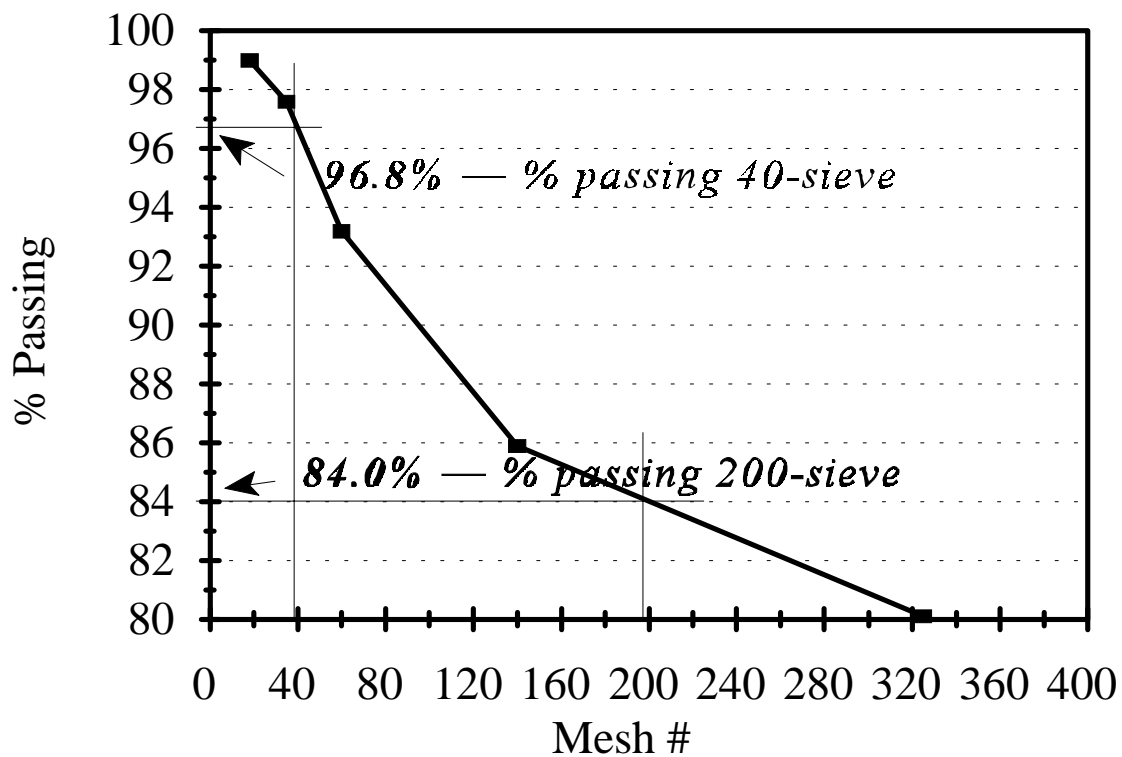


Figure A.1. Extrapolation of % passing 40- and 200-sieve from sand fraction data for Profile 25-2, Btss2 horizon.

**A.2. SOIL AND SITE DESCRIPTIONS
PHYSICAL, CHEMICAL, MINERALOGICAL DATA**

Soil type: **25-1 Carbo (Endcav)**
Date: 7 August 1996
Location: Rockingham County, VA
Described by: P.J. Thomas, P.R. Cobb, W.T. Price, P. D. Schroeder
Physiography: Valley and Ridge
Landscape position: Sideslope
Vegetation: Pasture
Parent material: Colluvium over limestone residuum
Slope gradient: 8%
Drainage class: Moderately well drained
Additional notes: Slickenside orientation is from NE-SW

Profile Description

Ap-0 to 12 cm, dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular and weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and medium roots; few coarse continuous tubular pores; few prominent black (10YR 2/1) iron and manganese coatings on faces of peds; 10 percent subrounded gravel 1 cm in diameter; moderately acid; clear smooth boundary.

Btss1--12 to 52 cm, strong brown (7.5YR 5/6) silty clay; common coarse distinct light brownish gray (10YR 6/2) iron depletions; weak medium and coarse subangular blocky structure; firm, sticky, plastic; few fine roots along ped faces; common fine and coarse continuous tubular pores; common distinct clay films on faces of peds; common distinct slickensides 3 cm in length and 3 cm in width; many prominent black (10YR 2/1) iron and manganese concretions; 5 percent subrounded gravel 1 cm in diameter; very strongly acid; gradual smooth boundary.

2Btss2--52 to 92 cm, reddish yellow (7.5YR 6/8) clay; few fine prominent pale brown (10YR 6/3) soft masses of iron; weak coarse subangular blocky structure; friable, sticky, plastic; few fine roots in pores; few coarse continuous tubular pores; common distinct clay films on faces of peds; common distinct slickensides 20 cm in length and 10 cm in width; common prominent black (10YR 2/1) iron and manganese concretions; strongly acid; gradual smooth boundary.

2Btss3--92 to 115 cm, brownish yellow (10YR 6/8) clay; common coarse prominent yellowish red (5YR 5/6) soft masses of iron and light brownish gray (10YR 6/2) iron depletions; weak coarse prismatic structure; firm, very sticky, very plastic; few coarse continuous tubular pores; common distinct clay films on faces of peds; common distinct slickensides 5 cm in length and 3 cm in width; many prominent black (10YR 2/1) iron and manganese concretions; slightly acid; clear smooth boundary.

2Btss4--115 to 135+ cm, strong brown (7.5YR 5/8) clay; common medium prominent light brownish gray (10YR 6/2) iron depletions and pale brown (10YR 6/3) soft masses of iron; moderate coarse prismatic parting to weak medium subangular blocky structure; firm, very sticky, very

plastic; few coarse continuous tubular pores; many prominent clay films on faces of pedes; common distinct slickensides 25 cm in length and 12 cm in width; slightly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-12	5.5	4.9	3.3	2.7	3.8	20.2	68.6	11.2
Btss1	12-52	2.4	2.0	1.1	0.8	2.5	8.8	48.4	42.8
2Btss2	52-92	0.1	0.4	0.3	0.3	1.2	2.3	26.4	71.3
2Btss3	92-115	0	0	0.1	0.2	2.6	2.9	26.1	71.0
2Btss4	115-135	0	0	0.3	0.5	2.6	3.4	29.5	67.1

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-12	5.74	6.32	2.35	0.13	1.60	0.20	10.40	9.00	84.62	97.78
Btss1	12-52	4.94	7.27	0.79	0.23	10.00	3.60	18.29	11.89	45.33	69.72
2Btss2	52-92	5.15	28.75	0.61	0.23	6.60	4.60	36.19	34.19	81.76	86.55
2Btss3	92-115	6.11	11.75	1.21	0.24	3.60	0.30	16.80	13.50	78.57	97.78
2Btss4	115-135	6.38	13.20	1.26	0.25	2.40	0.80	17.11	15.51	85.97	94.84

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-12	41	30	11	352	89.0	82.2
Btss1	12-52	45	32	13	1449	95.4	92.9
2Btss2	52-92	85	46	39	4501	99.5	98.5
2Btss3	92-115	69	41	28	3919	99.9	98.9
2Btss4	115-135	69	38	31	3128	99.9	98.3

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-12	1.36	0.03	48.68	28	11	17
Btss1	12-52	1.47	0.03	44.53	32	17	15
2Btss2	52-92	1.35	0.07	49.06	56	18	38
2Btss3	92-115	1.38	0.07	47.92	43	25	18
2Btss4	115-135	1.37	0.08	48.30	37	24	13

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
2Btss2	52-92	7	32	4	4	--	25	--
		----- % of clay -----						
		10	45	5	5	--	35	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **25-2 Carbo (Edom)**
Date: 8 August 1996
Location: Rockingham County, VA
Described by: P.J. Thomas, P.R. Cobb, W.T. Price, P. D. Schroeder
Physiography: Valley and Ridge
Landscape position: Ridgetop
Vegetation: Row crops (corn)
Parent material: Siltstone residuum
Slope gradient: 3%
Drainage class: Moderately well drained
Additional notes: Slickenside orientation is from NE-SW

Profile Description

Ap--0 to 17 cm, yellowish brown (10YR 5/4) and yellowish red (5YR 5/8) silty clay; weak coarse subangular blocky structure; friable, sticky, plastic; common fine and medium roots along ped faces and in pores; common fine continuous tubular pores; few distinct black (10YR 2/1) iron and manganese coatings on faces of peds; moderately acid; abrupt wavy boundary.

Btss1--17 to 34 cm, strong brown (7.5YR 5/8) and yellowish red (5YR 5/8) silty clay loam; few fine distinct brownish yellow (10YR 6/8) and pale brown (10YR 6/3) soft masses of iron; weak medium and coarse prismatic parting to weak medium subangular blocky structure; firm, very sticky, very plastic; common fine roots along ped faces and in pores; common fine and few coarse continuous tubular pores; common distinct clay films on faces of peds; common distinct slickensides 3 cm in length and 3 cm in width; very strongly acid; clear wavy boundary.

Btss2--34 to 74 cm, strong brown (7.5YR 5/6) clay; common coarse distinct yellowish red (5YR 4/6) and pale brown (10YR 6/3) soft masses of iron and white (10YR 8/1) iron depletions; weak medium prismatic parting to weak medium subangular blocky structure; firm, very sticky, very plastic; few fine medium roots along ped faces and in pores; common fine continuous tubular pores; many prominent clay films on faces of peds; common distinct slickensides 5 cm in length and 3 cm in width; few distinct black (10YR 2/1) iron and manganese concentrations; very strongly acid; diffuse smooth boundary.

Ct1--74 to 118 cm, yellowish red (10YR 4/6), strong brown (7.5YR 5/6), and yellow (10YR 7/8) flaggy silty clay; common fine prominent light gray (10YR 7/1) iron depletions; massive, rock controlled structure; friable, sticky, plastic; few coarse discontinuous tubular pores; many prominent red (2.5YR 4/6) clay films along rock fractures; common distinct black (10YR 2/1) iron and manganese concentrations; 30 percent highly weathered siltstone fragments; very strongly acid; diffuse smooth boundary.

Ct2--118 to 150 cm, strong brown (7.5YR 5/6) very flaggy silty clay; common fine distinct yellow

(10YR 7/8) weathered siltstone fragments; massive, rock controlled structure; friable, sticky, plastic; few fine discontinuous tubular pores; many prominent red (2.5YR 4/6) clay films along rock fractures; common distinct black (10YR 2/1) iron and manganese coatings on fractures; 50 percent highly weathered siltstone fragments; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-17	2.2	2.0	1.4	1.3	1.6	8.5	50.7	40.8
Btss1	17-34	0.1	0.3	0.4	0.5	0.9	2.2	64.1	33.7
Btss2	34-74	1.0	1.4	4.4	7.3	5.8	19.9	9.7	70.4
Ct1	74-118	1.4	1.5	1.0	0.9	1.3	6.1	39.7	54.2
Ct2	118-150	0.4	1.1	0.9	1.1	2.8	6.3	42.5	51.2

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-17	5.63	8.96	3.85	0.21	15.60	0.60	28.62	13.62	45.49	95.59
Btss1	17-34	4.96	9.02	1.92	0.27	19.40	10.30	30.61	21.51	36.62	52.15
Btss2	34-74	4.77	1.30	1.68	0.26	20.34	14.50	23.58	17.74	13.74	18.26
Ct1	74-118	4.82	9.27	1.01	0.15	14.40	7.00	24.86	17.46	42.08	59.91
Ct2	118-150	4.81	11.25	1.27	0.17	10.60	0.40	23.29	14.09	54.49	90.06

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-17	53	32	21	1005	95.5	92.6
Btss1	17-34	74	52	22	2587	99.5	98.4
Btss2	34-74	73	56	17	5334	96.8	84.0
Ct1	74-118	62	48	14	2876	96.9	94.7
Ct2	118-150	66	40	26	2420	98.3	95.6

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-17	1.31	0.07	50.57	41	22	19
Btss1	17-34	1.22	0.07	53.96	47	31	16
Btss2	34-74	1.25	0.04	52.83	64	14	50
Ct1	74-118	1.08	0.05	59.25	50	35	15
Ct2	118-150	1.11	0.06	58.11	46	24	22

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss2	34-74	18	35	4	4	--	11	--
		----- % of clay -----						
		25	50	5	5	--	15	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **25-3 Carbo**
 Date: 22 August 1996
 Location: Smyth County, VA
 Described by: P.J. Thomas, R. K. Conner, J.R. Thomas, M. A. Saluta
 Physiography: Valley and Ridge
 Landscape position: Side slope
 Vegetation: Pasture
 Parent material: Limestone residuum
 Slope gradient: 13%
 Drainage class: Moderately well drained
 Additional notes: Slickenside orientation is from NE-SW

Profile Description

Ap--0 to 16 cm, brown (10YR 4/3) silt loam; moderate fine and coarse granular structure; friable, sticky, slightly plastic; many very fine and fine roots; common very fine continuous tubular pores; strongly acid; abrupt wavy boundary.

Btss1--16 to 43 cm, dark yellowish brown (10YR 4/4) clay; few medium distinct dark gray (10YR 4/1) iron depletions; weak coarse prismatic parting to moderate medium and coarse subangular blocky structure; firm, very sticky, very plastic; common very fine roots; many very fine coarse continuous tubular pores; few faint clay films on faces of peds; few distinct slickensides 10 cm in length and 3cm in width; strongly acid; clear wavy boundary.

Btss2--43 to 95 cm, brown (7.5YR 5/4) clay; common medium distinct gray (7.5YR 5/1) iron depletions and common medium faint yellowish brown (10YR 5/6) soft masses of iron; moderate fine and medium subangular blocky structure; firm, very sticky, very plastic; few very fine roots; common fine and medium continuous tubular pores; common distinct clay films on faces of peds; few distinct slickensides 15 cm in length and 10 cm in width; moderately acid; abrupt irregular boundary.

R--95+cm, hard limestone bedrock.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-16	5.8	9.5	5.7	4.5	2.2	27.7	54.8	17.5
Btss1	16-43	0.1	0.4	0.5	1.0	0.6	2.6	33.2	64.2
Btss2	43-95	0	0	0.1	0.3	0.4	0.8	33.0	66.2

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-16	5.50	7.11	0.93	0.26	9.50	0.80	17.80	9.10	46.63	91.21
Btss1	16-43	5.52	12.02	0.79	0.32	8.40	0.40	21.53	13.53	60.98	97.04
Btss2	43-95	5.80	1.91	0.70	0.18	0.40	0.30	3.19	3.09	87.46	90.29

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-16	50	41	9	200	83.7	73.8
Btss1	16-43	66	46	20	2309	99.4	97.8
Btss2	43-95	81	52	29	2823	99.9	99.5

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>			----- % -----		
Ap	0-16	1.82	0.01	31.32	35	25	10
Btss1	16-43	1.32	0.07	50.19	47	34	13
Btss2	43-95	1.49	0.03	43.77	64	24	40

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss2	43-95	13	40	3	3	--	7	--
		----- % of clay -----						
		20	60	5	5	--	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **56-1 Cecil**
Date: 7 June 1993
Location: Appomattox County, VA
Described by: P.J. Thomas, J.C. Baker, W.F. Kitchel, H.T. Saxton, M.H. Stolt
Physiography: Piedmont upland
Landscape position: Summit
Vegetation: Pasture
Parent material: Granite gneiss residuum
Slope gradient: 4%
Drainage class: Well drained
Additional notes:

Profile Description

Ap--0 to 15 cm, dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; friable, slightly sticky, slightly plastic; common fine roots; few coarse and common medium tubular pores; few fine mica flakes; clear smooth boundary.

Bt1--15 to 40 cm, yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; friable, sticky, plastic; common fine roots; few coarse and common medium tubular pores; few faint clay films on faces of peds; few fine mica flakes; very strongly acid; clear smooth boundary.

Bt2--40 to 138 cm, red (2.5YR 4/6) clay; strong medium subangular blocky parting to weak fine and medium subangular blocky structure; friable, sticky, plastic; few fine roots; few coarse tubular pores; many prominent clay films on faces of peds; common fine mica flakes; gradual smooth boundary.

BCt--138 to 162 cm, yellowish red (5YR 4/6) sandy clay loam; weak medium subangular blocky structure; friable, sticky, plastic; few fine roots; few coarse tubular pores; few faint clay films on faces of peds; common fine mica flakes; gradual smooth boundary.

C--162 to 180+ cm, reddish yellow (5YR 6/8) and pinkish white (7.5YR 8/2) sandy loam; massive; friable, slightly sticky, nonplastic; few medium tubular pores; few fine mica flakes.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Bt2	40-138	1.4	1.5	4.2	10.1	4.7	21.9	21.3	56.9

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Bt2	40-138	4.95	3.56	1.29	0.17	12.96	6.60	17.98	11.62	27.92	43.20

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Bt2	40-138	65	49	16	1448	96.2	81.1

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Bt2	40-138	1.36	0.02	48.68	25	16	9

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	40-138	42	3	--	6	3	3	tr
		----- % of clay -----						
		74	5	--	10	5	5	1

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite; tr=trace.

Soil type: **56-2 Cecil**
Date: 14 October 1996
Location: Prince Edward County, VA
Described by: P.J. Thomas, J.F. Conta, S.M. Nagle, R.S. Alls
Physiography: Piedmont upland
Landscape position: Summit
Vegetation: Hardwoods (red maple, red oak, Virginia pine, dogwood)
Parent material: Granite residuum
Slope gradient: 1%
Drainage class: Well drained
Additional notes:

Profile Description

Oe--3 to 0 cm, partially decomposed leaves and twigs.

E--0 to 15 cm, brownish yellow (10YR 6/6) fine sandy loam; moderately medium granular and weak fine subangular blocky structure; very friable, nonsticky, nonplastic; few coarse and very coarse and many fine and medium roots; common fine and medium tubular pores; 5 percent angular quartz 5 cm in diameter; moderately acid; clear wavy boundary.

Bt1--15 to 29 cm, red (2.5YR 4/6) clay; weak medium and coarse subangular blocky structure; friable, sticky, plastic; few coarse and very coarse and many fine and medium roots; few coarse and common medium tubular pores; few distinct clay films on faces of peds; common very fine mica flakes; very strongly acid; clear wavy boundary.

Bt2--29 to 73 cm, red (2.5YR 4/8) clay; few medium prominent yellow (10YR 7/8) parent material mottles; moderate coarse subangular blocky parting to weak fine and medium subangular blocky structure; friable, sticky, plastic; few medium and coarse roots; few coarse tubular pores; common prominent dusky red (2.5YR 4/4) clay films on faces of peds; common fine and many very fine mica flakes; strongly acid; diffuse smooth boundary.

Bt3--73 to 114 cm, red (2.5YR 4/8) clay; moderate coarse subangular blocky parting to moderate fine and medium subangular blocky structure; friable, sticky, plastic; few medium roots; few coarse tubular pores; many prominent dusky red (2.5YR 4/4) clay films on faces of peds; many very fine mica flakes; strongly acid; gradual wavy boundary.

BCt--114 to 130 cm, yellowish red (5YR 5/8) clay loam; common coarse prominent pale brown (10YR 6/3) parent material mottles; weak fine subangular blocky structure; friable, sticky, slightly plastic; few medium tubular pores; common distinct red (10R 4/6) clay films on faces of peds; common fine mica flakes; strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
E	0-15	2.1	4.9	11.9	27.7	9.4	56.0	32.4	11.6
Bt1	15-29	1.2	1.4	4.2	10.0	4.0	20.8	20.9	58.3
Bt2	29-73	1.3	1.3	2.4	5.1	3.4	13.5	18.8	67.7
Bt3	73-114	0.9	1.8	3.4	8.6	6.0	20.7	29.0	50.3
BCt	114-130	0.2	1.7	5.9	13.8	10.4	32.0	28.2	39.8

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
E	0-15	5.73	0.03	0.03	0.09	10.60	1.70	10.75	1.85	1.40	8.11
Bt1	15-29	4.85	0.04	0.56	0.15	8.60	4.00	9.35	4.75	8.02	15.79
Bt2	29-73	5.25	18.15	1.39	0.29	6.00	3.90	25.83	23.73	76.77	83.57
Bt3	73-114	5.15	8.68	18.80	0.22	8.40	3.10	36.10	30.80	76.73	89.94
BCt	114-130	5.37	0.02	0.19	0.08	12.60	3.20	12.89	3.49	2.25	8.31

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
E	0-15	--	--	NP**	--	90.5	51.0
Bt1	15-29	63	46	17	727	96.4	81.9
Bt2	29-73	71	53	18	1976	96.9	88.8
Bt3	73-114	62	49	13	1879	96.5	83.4
BCt	114-130	59	39	20	478	96.5	75.0

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
E	0-15	1.54	0.04	41.89	22	4	18
Bt1	15-29	1.34	0.03	49.43	42	27	15
Bt2	29-73	1.29	0.02	51.32	44	35	9
Bt3	73-114	1.31	0.02	50.57	37	29	8
BCt	114-130	1.25	0.03	52.83	38	22	16

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	29-73	41	3	3	3	10	7	tr
		----- % of clay -----						
		60	5	5	5	15	10	tr

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite; tr=trace.

Soil type: **56-3 Cecil (Pacolet)**
Date: 14 October 1996
Location: Prince Edward County, VA
Described by: P.J. Thomas, J.F. Conta, S.M. Nagle, R.S. Alls
Physiography: Piedmont upland
Landscape position: Summit
Vegetation: Hardwoods (chestnut oak, red oak, red maple, dogwood)
Parent material: Granite residuum
Slope gradient: 9%
Drainage class: Well drained
Additional notes:

Profile Description

Oi/Oe--5 to 0 cm, slightly and partially decomposed leaves and twigs.

E--0 to 17 cm, brown (7.5YR 5/4) fine sandy loam; moderately fine granular and weak fine subangular blocky structure; friable, slightly sticky, nonplastic; few coarse and fine and many medium roots; common medium tubular pores; 10 percent subrounded quartz 5 cm in diameter; moderately acid; clear wavy boundary.

Bt--17 to 74 cm, red (2.5YR 4/8) clay; moderate medium subangular blocky structure; friable, sticky, plastic; few fine, many medium, and common coarse roots; few coarse and medium tubular pores; common distinct clay films on faces of ped; common fine mica flakes; 5 percent angular quartz 5 cm in diameter; very strongly acid; gradual irregular boundary.

BCt--74 to 108 cm, red (2.5YR 4/8) clay loam; common coarse reddish yellow (7.5YR 6/8) and few very fine pinkish white (7.5YR 8/2) parent material mottles; weak coarse subangular blocky parting to moderate medium subangular blocky structure; friable, sticky, plastic; few fine and coarse and common medium roots; few coarse and common medium tubular pores; common distinct clay films on faces of ped; many fine mica flakes; strongly acid; gradual irregular boundary.

C--108 to 150 cm, weak red (2.5YR 6/4) loam; common prominent brownish yellow (10YR 6/6) and few prominent black (10YR 2/1) and very pale brown (10YR 8/2) parent material mottles; massive; friable, slightly sticky, slightly plastic; few fine and medium roots; few coarse and common medium tubular pores; common distinct red (2.5YR 4/6) clay flows; common fine mica flakes; strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
E	0-17	1.8	4.7	13.1	31.1	10.2	60.9	27.9	11.2
Bt	17-74	1.1	1.9	5.4	13.4	5.0	26.8	22.6	50.6
BCt	74-108	0.3	1.4	7.1	23.8	11.7	44.3	26.4	29.3
C	108-150	0.5	1.1	4.3	24.8	16.2	46.9	32.4	20.7

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
E	0-17	5.77	0.05	0.07	0.14	9.80	2.80	10.06	3.06	2.58	8.50
Bt	17-74	4.91	0.05	0.67	0.27	8.00	3.10	8.99	4.09	11.01	24.21
BCt	74-108	5.36	0.08	0.39	0.24	12.40	2.60	13.11	3.31	5.42	21.45
C	108-150	5.06	0.02	0.23	0.21	9.40	4.50	9.86	4.96	4.67	9.27

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
E	0-17	--	--	NP**	--	90.5	46.0
Bt	17-74	57	37	20	1754	96.1	76.7
BCt	74-108	57	43	14	228	96.0	63.5
C	108-150	--	--	NP**	200	97.3	64.0

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
E	0-17	1.30	0.02	50.94	23	7	16
Bt	17-74	1.34	0.03	49.43	40	26	14
BCt	74-108	1.29	0.03	51.32	35	19	16
C	108-150	1.16	0.04	56.23	45	20	25

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt	17-74	25	3	10	8	3	3	--
		----- % of clay -----						
		50	5	20	15	5	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **83-1 Craven**
Date: 29 August 1996
Described by: P.J. Thomas
Location: Surry County, VA
Physiography: Coastal Plain upland
Landscape position: Rise
Vegetation: Red oak and loblolly pine
Parent material: Clayey fluvial/marine sediments
Slope gradient: 4%
Drainage class: Moderately well drained
Additional notes:

Profile Description

A--0 to 4 cm, brown (10YR 4/3) silt loam; weak fine granular structure; friable, nonsticky, nonplastic; many fine roots; common coarse continuous tubular pores; very strongly acid; clear wavy boundary.

E--4 to 18 cm, light yellowish brown (10YR 6/4) silt loam; single grain; very friable, slightly sticky, slightly plastic; common fine and medium roots; common coarse continuous tubular pores; very strongly acid; clear wavy boundary.

Bt1--18 to 43 cm, yellowish brown (10YR 5/8) clay loam; common fine distinct yellowish red (5YR 5/6) soft masses of iron; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common coarse continuous tubular pores; few prominent clay bridges between sand grains; very strongly acid; gradual smooth boundary.

Bt2--43 to 81 cm, yellowish brown (10YR 5/6) silty clay loam; common coarse distinct yellowish red (5YR 5/6) soft masses of iron and common medium prominent gray (10YR 6/1) iron depletions; weak medium and coarse prismatic parting to moderate fine and medium subangular blocky structure; friable, sticky, plastic; few medium roots; common coarse pores; common distinct clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3--81 to 133 cm, yellowish brown (10YR 5/6), yellowish red (5YR 4/6), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/6) clay loam; weak coarse prismatic parting to moderate fine and medium subangular blocky structure; friable, sticky, plastic; few coarse roots; common coarse pores; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

BCt--133 to 150+ cm, yellowish brown (10YR 5/6) sandy clay loam; common coarse prominent light gray (10YR 7/1) iron depletions and yellowish red (5YR 5/6) soft masses of iron; weak coarse prismatic parting to weak medium subangular blocky structure; friable, sticky, slightly plastic; common coarse pores; few faint clay bridges between sand grains; strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
E	4-18	0	0.5	1.4	11.5	18.1	31.5	52.1	16.4
Bt1	18-43	0.1	0.1	0.7	10.1	14.8	25.8	41.4	32.8
Bt2	43-81	0	0.1	1.0	4.6	3.4	9.1	55.3	35.6
Bt3	81-133	0.1	0.1	0.6	10.5	15.9	27.2	37.5	35.3
BCt	133-150	0.3	0.4	5.5	33.6	13.2	53.0	20.1	26.9

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
E	4-18	4.89	0.01	0.02	0.06	6.40	3.20	6.49	3.29	1.39	2.74
Bt1	18-43	4.82	0.06	0.35	0.07	9.40	5.90	9.88	6.38	4.86	7.52
Bt2	43-81	5.14	0.52	1.10	0.32	10.00	6.80	11.94	8.74	16.25	22.20
Bt3	81-133	4.91	0.02	0.30	0.12	12.40	7.60	12.84	8.04	3.43	5.47
BCt	133-150	5.16	0.01	0.10	0.07	8.30	5.70	8.48	5.88	2.12	3.06

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
E	4-18	24	19	5	109	99.0	81.0
Bt1	18-43	43	31	12	339	99.7	84.1
Bt2	43-81	47	36	11	2143	99.7	93.2
Bt3	81-133	52	41	11	2157	99.7	83.4
BCt	133-150	39	27	12	228	98.0	56.5

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
E	4-18	--	--	--	21	12	9
Bt1	18-43	1.26	0.03	52.45	29	17	12
Bt2	43-81	1.56	0.02	41.13	46	19	27
Bt3	81-133	1.30	0.03	50.94	30	18	12
BCt	133-150	1.48	0.02	44.15	24	15	9

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	43-81	21	5	4	2	2	2	--
		----- % of clay -----						
		60	15	10	5	5	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **83-2 Craven**
Date: 30 August 1996
Described by: P.J. Thomas
Location: Surry County, VA
Physiography: Coastal Plain upland
Landscape position: Sideslope
Vegetation: Recent cutover
Parent material: Clayey fluvial/marine sediments
Slope gradient: 5%
Drainage class: Moderately well drained
Additional notes:

Profile Description

Ap--0 to 11 cm, brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; few medium and coarse and common fine roots; common coarse continuous tubular pores; strongly acid; clear wavy boundary.

E--11 to 29 cm, pale brown (10YR 6/3) fine sandy loam; single grain; loose, nonsticky, nonplastic; few fine and medium roots; common coarse continuous tubular pores; strongly acid; gradual wavy boundary.

BEt--29 to 48 cm, yellowish brown (10YR 5/4) loam; common medium distinct pale brown (10YR 6/3) and yellowish red (5YR 5/6) soft masses of iron; weak fine and medium subangular blocky structure; friable, slightly sticky, nonplastic; few fine, medium, and coarse roots; many coarse continuous tubular pores; few faint clay bridges between sand grains; very strongly acid; clear smooth boundary.

Bt1--48 to 76 cm, strong brown (7.5YR 5/6) clay; many coarse distinct yellowish red (5YR 5/6) and yellowish brown (10YR 5/6) soft masses of iron and common coarse prominent light brownish gray (10YR 6/2) iron depletions; weak medium and coarse prismatic parting to moderate fine and medium subangular blocky structure; firm, sticky, plastic; few fine, medium, and coarse roots; many coarse pores; common distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2--76 to 132 cm, strong brown (7.5YR 5/6), yellowish red (5YR 4/6), light gray (10YR 7/1), and yellowish brown (10YR 5/6) silty clay; weak coarse prismatic parting to moderate medium subangular blocky structure; firm, sticky, plastic; few fine and medium roots; many coarse pores; common distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

C--132 to 160+ cm, yellowish red (5YR 5/6) gravelly coarse sandy loam; many coarse prominent light gray (10YR 7/1) iron depletions and strong brown (7.5YR 5/6) soft masses of iron;

massive; friable, slightly sticky, slightly plastic; few medium and coarse roots; common coarse pores; 20 percent rounded quartz gravel; few faint clay bridges between sand grains; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-11	1.9	6.2	15.7	26.1	12.5	62.4	33.1	4.5
E	11-29	1.2	5.7	13.3	24.7	11.9	56.8	36.8	6.4
BEt	29-48	1.5	4.6	10.6	22.3	10.8	49.8	32.4	17.8
Bt1	48-76	0.9	2.0	4.6	13.3	13.1	33.9	25.3	40.8
Bt2	76-132	0.5	1.2	2.3	3.3	2.2	9.5	41.9	48.6
C	132-160	14.5	41.4	23.8	2.7	0.7	83.1	3.7	13.2

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-11	5.34	0.54	0.13	0.12	4.00	1.10	4.79	1.89	16.49	41.80
E	11-29	5.06	0.23	0.08	0.06	2.20	0.70	2.57	1.07	14.40	34.58
BEt	29-48	4.94	0.99	0.28	0.10	4.40	1.40	5.77	2.77	23.74	49.46
Bt1	48-76	4.90	0.67	1.34	0.13	11.40	6.80	13.54	8.94	15.81	23.94
Bt2	76-132	4.80	0.71	1.53	0.18	12.02	7.50	14.44	9.92	16.76	24.40
C	132-160	4.85	0.05	0.19	0.07	6.40	2.80	6.71	3.11	4.62	9.97

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-11	--	--	NP**	--	89.5	45.5
E	11-29	--	--	NP**	--	91.0	51.5
BEt	29-48	22	17	5	226	92.4	57.5
Bt1	48-76	48	36	12	1296	96.3	75.0
Bt2	76-132	59	42	17	2615	97.7	91.9
C	132-160	--	--	NP**	--	40.8	17.5

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-11	--	--	--	14	5	9
E	11-29	1.44	0.01	45.66	14	4	10
BEt	29-48	1.50	0.02	43.40	18	11	7
Bt1	48-76	1.44	0.02	45.66	31	19	12
Bt2	76-132	1.54	0.04	41.89	34	20	14
C	132-160	1.70	0.01	35.85	9	5	4

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	76-132	17	10	7	10	2	2	--
		----- % of clay -----						
		35	20	15	20	5	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **83-3 Craven**
Date: 30 August 1996
Described by: P.J. Thomas
Location: Surry County, VA
Physiography: Coastal Plain upland
Landscape position: Rise
Vegetation: Recent clearcut
Parent material: Clayey fluvial/marine sediments
Slope gradient: 3%
Drainage class: Moderately well drained
Additional notes:

Profile Description

A--0 to 4 cm, brown (10YR 4/3) silt loam; weak fine granular structure; friable, slightly sticky, nonplastic; many fine and medium and few coarse roots; common medium and coarse pores; very strongly acid; clear smooth boundary.

E--4 to 23 cm, brown (10YR 5/3) silt loam; weak fine granular structure; friable, slightly sticky, nonplastic; common fine and medium roots; common medium and coarse pores; very strongly acid; clear wavy boundary.

Bt1--23 to 41 cm, yellowish brown (10YR 5/6) silt loam; few medium distinct yellowish red (5YR 5/6) soft masses of iron; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; few fine roots; many medium and coarse pores; common distinct clay bridges between sand grains; very strongly acid; gradual wavy boundary.

Bt2--41 to 100 cm, strong brown (7.5YR 5/6) silty clay; many coarse distinct yellowish red (5YR 5/6) soft masses of iron and common coarse prominent gray (10YR 6/1) iron depletions; weak medium and coarse prismatic parting to moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; common medium and coarse pores; common prominent clay films on faces of peds; very strongly acid; diffuse smooth boundary.

Bt3--100 to 150+ cm, yellowish brown (10YR 5/6), yellowish red (5YR 4/6), gray (10YR 6/1), and strong brown (7.5YR 5/6) silty clay; weak medium prismatic parting to moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; common medium and coarse pores; common prominent clay films on faces of peds; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
A	0-4	0.5	1.9	3.1	9.8	14.1	29.4	66.0	4.6
E	4-23	0.4	0.5	1.6	7.1	11.5	21.1	69.6	9.3
Bt1	23-41	0.2	0.2	0.9	4.5	8.7	14.5	58.4	27.1
Bt2	41-100	0.1	0.1	0.6	3.5	7.5	11.8	46.4	41.8
Bt3	100-150	0.2	0.2	0.6	3.3	6.9	11.2	46.2	42.6

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
A	0-4	4.54	0.17	0.04	0.09	5.00	2.10	5.30	2.40	5.66	12.50
E	4-23	4.49	0.06	0.02	0.04	4.60	1.80	4.72	1.92	2.54	6.25
Bt1	23-41	4.89	0.12	0.22	0.07	11.40	4.00	11.81	4.41	3.47	9.30
Bt2	41-100	4.96	1.03	0.88	0.06	12.90	7.70	15.87	10.68	18.71	27.84
Bt3	100-150	5.00	0.16	0.71	0.09	14.60	8.30	15.56	9.26	6.17	10.37

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
A	0-4	--	--	NP**	--	97.0	80.0
E	4-23	--	--	NP**	--	98.9	86.7
Bt1	23-41	51	34	17	1869	99.4	91.3
Bt2	41-100	54	42	12	1718	99.8	93.2
Bt3	100-150	53	43	10	1602	99.4	93.4

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
A	0-4	--	--	--	20	8	12
E	4-23	1.04	0.02	60.75	22	9	13
Bt1	23-41	1.34	0.02	49.43	29	12	17
Bt2	41-100	1.53	0.03	42.26	32	23	9
Bt3	100-150	1.36	0.03	48.68	27	20	7

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	41-100	17	8	4	4	6	4	--
		----- % of clay -----						
		40	20	10	10	15	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **61-1 Creedmoor**
Date: 16 August 1995
Described by: P.J. Thomas, F.C. Smith, R.L. Mendenhall
Location: Chesterfield County, VA
Physiography: Richmond Triassic Basin
Landscape position: Upland rise
Vegetation: Loblolly pine (20 year old stand); understory: sweet gum, scrub oak, holly, tulip poplar
Parent material: Shale residuum
Slope gradient: 1%
Drainage class: Moderately well drained
Additional notes:

Profile Description

A--0 to 5 cm, gray (2.5Y 5/1) fine sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; common fine roots; 10 percent subrounded gravel; extremely acid; abrupt smooth boundary.

E--5 to 19 cm, light yellowish brown (10YR 6/4) fine sandy loam; single grain; very friable, nonsticky, nonplastic; few very coarse and common medium and coarse roots; 10 percent subrounded gravel; extremely acid; clear wavy boundary.

Btss--19 to 47 cm, strong brown (7.5YR 5/6), dark red (2.5YR 4/8) and light gray (10YR 7/2) clay loam; strong coarse prismatic parting to strong medium and coarse subangular blocky structure; firm, very sticky, very plastic; common medium and few fine and coarse roots; many coarse continuous tubular pores; many prominent strong brown (7.5YR 5/6) clay films on faces of peds; few distinct slickensides 10 cm in width and 20 cm in length; few fine and medium mica flakes; very strongly acid; gradual wavy boundary.

Bt--47 to 73 cm, dark red (2.5YR 4/8), light gray (10YR 7/1 and 5Y 7/1), yellowish red (5YR 5/6), strong brown (7.5YR 5/8), and white (2.5Y 8/1) clay loam; moderate coarse prismatic parting to moderate medium and coarse subangular blocky structure; firm, very sticky, very plastic; few fine and medium roots; many coarse tubular pores; common distinct gray (10YR 6/1) clay films on faces of peds; few fine, medium, and coarse mica flakes; very strongly acid; gradual wavy boundary.

BCt--73 to 99 cm, light gray (10YR 7/1 and 5Y 7/2), yellowish red (5YR 5/8), strong brown (7.5YR 5/8), white (2.5Y 8/1), and dark red (2.5YR 4/8) loam; weak medium and coarse subangular blocky structure; friable, sticky, plastic; few medium roots; few coarse tubular pores; few coarse and common fine and medium mica flakes; very strongly acid; clear wavy boundary.

C--99 to 126 cm, gray (2.5Y 6/1), reddish brown (5YR 4/4), and strong brown (7.5YR 5/8) silt

loam; few medium roots; few coarse and common fine and medium mica flakes; extremely acid; clear wavy boundary.

Cr--126 to 152+ cm, dark red (2.5YR 4/6) and light greenish gray (5GY 7/1) partially weathered shale bedrock; few coarse and common fine and medium mica flakes; extremely acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
A&E	0-19	3.3	7.8	17.3	28.7	17.4	74.5	19.9	5.6
Btss	19-47	2.6	5.4	9.9	14.8	10.4	43.1	20.1	36.8
Bt	47-73	2.2	4.1	6.7	12.4	17.7	43.1	22.0	34.9
BC	73-99	0.9	1.4	2.1	10.6	23.3	38.3	35.1	26.6
C	99-126	0.1	0.3	0.4	6.4	23.7	30.9	52.7	16.4
Cr	126-152	2.2	4.6	9.2	21.7	18.9	56.6	32.9	10.5

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
A&E	0-19	4.40	0.05	0.04	0.05	4.40	1.10	4.54	1.24	3.08	11.29
Btss	19-47	4.53	1.97	1.50	0.24	21.60	5.60	25.31	9.31	14.66	39.85
Bt	47-73	4.58	0.50	0.95	0.32	18.04	16.80	19.81	18.57	8.93	9.53
BC	73-99	4.65	1.27	2.24	0.33	27.40	10.10	31.24	13.94	12.29	27.55
C	99-126	4.44	1.08	2.09	0.28	27.00	10.00	30.45	13.45	11.33	25.65
Cr	126-152	4.37	1.19	1.66	0.17	14.60	6.30	17.62	9.32	17.14	32.40

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
A&E	0-19	--	--	NP**	--	86.5	37.5
Btss	19-47	51	34	17	1602	89.8	63.0
Bt	47-73	68	42	24	3128	92.5	68.0
BC	73-99	42	31	11	2531	97.0	77.0
C	99-126	39	34	5	1754	99.4	85.0
Cr	126-152	28	25	3	1116	91.5	56.0

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
A&E	0-19	--	--	--	8	3	5
Btss	19-47	1.54	0.03	41.89	28	17	11
Bt	47-73	1.47	0.05	44.43	27	17	10
BC	73-99	1.47	0.05	44.53	29	15	14
C	99-126	1.57	0.04	40.75	26	12	14
Cr	126-152	1.84	0.02	30.57	18	8	10

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt	47-73	9	17	--	3	2	3	--
		----- % of clay -----						
		25	50	--	10	5	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **61-2 Creedmoor**
Date: 15 August 1996
Described by: P.J. Thomas, J.F. Conta, S.M. Nagle, R.S. Alls
Location: Cumberland County, VA
Physiography: Farmville Triassic Basin
Landscape position: Upland sideslope
Vegetation: Mixed hardwoods and pines (red oak, sweetgum, dogwood, white oak, hickory, tulip poplar, Virginia pine)
Parent material: Colluvium over gritty sandstone residuum
Slope gradient: 2%
Drainage class: Moderately well drained
Additional notes:

Profile Description

Ap--0 to 14 cm, dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular and weak fine and medium subangular blocky structure; friable, nonsticky, nonplastic; few medium and common fine roots; few medium and coarse tubular pores; common distinct black (10YR 2/1) iron and manganese concentrations; strongly acid; clear smooth boundary.

Bt1--14 to 39 cm, brown (7.5YR 4/4) loam; common coarse distinct pale brown (10YR 6/3) iron depletions; weak medium and coarse subangular blocky structure; friable, slightly sticky, nonplastic; common fine and few medium roots; few medium and coarse tubular pores; few distinct clay films on faces of peds; common distinct black (10YR 2/1) iron and manganese concentrations; strongly acid; clear wavy boundary.

Bt2--39 to 62 cm, yellowish brown (10YR 5/8) fine sandy loam; common coarse distinct light yellowish brown (10YR 6/4) iron depletions and few medium distinct yellowish red (5YR 4/6) soft masses of iron; weak fine, medium, and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few coarse tubular pores and common coarse vesicular pores; few distinct clay films on faces of peds; many prominent black (10YR 2/1) iron and manganese coatings and concentrations; moderately acid; clear wavy boundary.

2Btss--62 to 96 cm, strong brown (7.5YR 5/8) clay; common fine distinct dark red (2.5YR 4/6) soft masses of iron with matrix and common medium prominent light gray (10YR 7/2) iron depletions along root channels; massive; firm, very sticky, very plastic; few fine roots; few coarse tubular pores; few faint clay films on faces of peds; few distinct slickensides 5 cm in width and 5 cm in length; few distinct black (10YR 2/1) iron and manganese concentrations; common fine mica flakes; strongly acid; gradual smooth boundary.

2C--96 to 130+ cm, strong brown (7.5YR 5/6) and pale brown (10YR 6/3) sandy clay loam; massive; friable, sticky, plastic; common prominent gray (10YR 6/1) clay flows along fractures; many fine mica flakes; strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-14	4.3	7.3	11.2	23.6	16.3	62.7	30.7	6.6
Bt1	14-39	8.7	6.5	7.5	16.0	13.5	52.2	28.5	19.3
Bt2	39-62	10.8	7.6	7.0	16.5	14.3	56.2	25.6	18.2
2Btss	62-96	0.6	1.3	5.3	12.8	11.6	31.6	23.9	44.5
2C	96-130	1.3	4.4	10.0	21.7	17.3	54.7	24.4	20.9

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-14	5.27	0.77	0.43	0.05	5.80	0.80	7.05	2.05	17.73	60.98
Bt1	14-39	5.22	1.24	1.61	0.07	8.80	5.60	11.72	8.52	24.91	34.27
Bt2	39-62	5.60	0.03	0.59	0.08	9.20	3.00	9.90	3.70	7.07	18.92
2Btss	62-96	5.22	3.03	6.95	0.28	20.20	11.60	30.46	21.86	33.68	46.94
2C	96-130	5.31	4.30	8.95	0.23	20.00	13.60	33.48	27.08	40.26	49.78

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft²</i>	-----%-----	
Ap	0-14	--	--	NP**	--	87.5	46.8
Bt1	14-39	27	20	7	61	83.0	56.0
Bt2	39-62	31	22	9	256	81.0	53.0
2Btss	62-96	56	36	20	3738	97.0	75.5
2C	96-130	36	24	12	478	92.4	57.6

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-14	1.54	0.01	41.89	18	5	13
Bt1	14-39	1.58	0.05	40.38	21	15	6
Bt2	39-62	1.64	0.01	38.11	21	14	7
2Btss	62-96	1.38	0.06	47.92	35	25	10
2C	96-130	1.49	0.07	43.77	29	15	14

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	39-62	4	7	3	3	--	2	--
		----- % of clay -----						
		20	40	15	15	--	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **61-3 Creedmoor**
Date: 15 August 1996
Described by: P.J. Thomas, J.F. Conta, S.M. Nagle, R.S. Alls
Location: Cumberland County, VA
Physiography: Farmville Triassic Basin
Landscape position: Upland summit
Vegetation: Mixed hardwoods and pines (red oak, sweetgum, dogwood, white oak, hickory, tulip poplar, Virginia pine)
Parent material: Gritty sandstone residuum
Slope gradient: 2%
Drainage class: Moderately well drained
Additional notes:

Profile Description

Ap--0 to 15 cm, dark grayish brown (10YR 4/2) fine sandy loam; moderate medium granular and weak medium subangular blocky structure; friable, nonsticky, nonplastic; common fine, medium, and coarse roots; few coarse and common medium tubular pores; few fine mica flakes; strongly acid; abrupt wavy boundary.

Btss--15 to 47 cm, strong brown (7.5YR 4/6) clay; common fine distinct brown (10YR 5/3) iron depletions along root and pore channels; weak medium and coarse subangular blocky structure; firm, very sticky, very plastic; few fine and medium roots; few coarse and common fine tubular pores; few distinct clay films on faces of peds; few distinct slickensides 5 cm in width and 5 cm in length; few distinct black (10YR 2/1) iron and manganese concentrations; few fine mica flakes; strongly acid; gradual smooth boundary.

BCtss--39 to 62 cm, yellowish brown (10YR 5/6) sandy clay loam; weak coarse subangular blocky structure; friable, sticky, slightly plastic; few fine roots; few coarse and common medium tubular pores and common coarse vesicular pores; few faint brown (10YR 4/3) clay films on faces of peds and common distinct clay bridging between sand grains; few distinct slickensides 5 cm in width and 5 cm in length; strongly acid; gradual boundary.

BCt--62 to 110+ cm, strong brown (7.5YR 4/6 and 5/8) and pale brown (10YR 6/3) sandy loam; massive; friable, slightly sticky, slightly plastic; brittle; few fine pores; few distinct clay films on faces of peds; common fine mica flakes; moderately acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-15	2.0	4.6	9.9	25.1	21.1	62.7	33.0	4.3
Btss	15-47	0.1	0.7	3.1	9.0	9.9	22.8	23.3	53.9
BCtss	47-70	1.1	4.7	8.6	18.0	15.6	48.0	25.5	26.5
BCt	70-110	9.6	11.1	11.2	17.5	15.1	64.5	20.2	15.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Ap	0-15	5.16	0.67	0.39	0.07	12.80	1.90	13.93	3.03	8.11	37.29
Btss	15-47	5.35	0.38	0.30	0.14	10.72	8.10	11.54	8.92	7.11	9.19
BCtss	47-70	5.40	10.99	16.46	0.39	14.40	6.70	42.24	34.54	65.91	80.60
BCt	70-110	5.58	10.38	16.74	0.21	13.60	5.20	40.93	32.53	66.77	84.01

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-15	--	--	NP**	--	92.0	52.0
Btss	15-47	67	36	31	3960	98.6	83.9
BCtss	47-70	40	32	8	1588	92.4	62.6
BCt	70-110	29	22	7	214	77.0	45.5

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-15	1.47	0.01	44.53	17	4	13
Btss	15-47	1.32	0.09	50.19	39	29	10
BCtss	47-70	1.48	0.07	44.15	31	18	13
BCt	70-110	1.48	0.05	44.15	29	17	12

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss	15-47	22	16	5	3	--	8	--
		----- % of clay -----						
		40	30	10	5	--	15	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **165-1 Davidson**
Date: 30 August 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls, J.C. Baker
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Ridge summit
Vegetation: Orchard (pear)
Parent material: Diabase
Slope gradient: 3%
Drainage class: Well drained
Additional notes:

Profile Description

Ap--0 to 17 cm, dusky red (2.5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; many medium and coarse and common fine roots; common medium pores; slightly acid; clear wavy boundary.

Bt1--17 to 26 cm, dark red (2.5YR 3/6) clay; moderate fine and medium subangular blocky structure; friable, sticky, plastic; common few, medium, and coarse roots; common medium and few fine pores; common prominent clay films on faces of peds; few krotovinas 1 cm in width; slightly acid; gradual wavy boundary.

Bt2--26 to 60 cm, dark red (2.5YR 3/6) clay; moderate medium and coarse subangular blocky structure; friable, sticky, plastic; few medium and coarse and few fine roots; common medium pores; many prominent clay films on faces of peds; slightly acid; diffuse smooth boundary.

Bt3--60 to 76 cm, dark red (2.5YR 3/6) clay; few medium prominent reddish yellow (7.5YR 6/8) parent material mottles; moderate medium and coarse subangular blocky structure; friable, sticky, plastic; few fine and medium roots; common fine pores; many prominent clay films on faces of peds; slightly acid; diffuse smooth boundary.

Bt4--76 to 219 cm, dark red (2.5YR 3/6) clay; moderate coarse subangular blocky structure; friable, sticky, plastic; few fine and medium roots; few fine pores; many prominent clay films on faces of peds; common distinct slickensides 12 cm in width and 45 cm in length; common fine and medium black (10YR 2/1) iron and manganese concretions; moderately acid; diffuse smooth boundary.

BCt--219 to 270 cm, dark red (2.5YR 3/6) clay; weak medium subangular blocky structure; friable, sticky, slightly plastic; few fine pores; few distinct clay films on faces of peds; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-17	3.6	6.8	6.1	12.3	7.8	36.6	52.4	11.0
Bt1	17-26	1.3	1.5	2.6	6.8	10.0	22.2	36.1	41.7
Bt2	26-60	0.8	0.9	1.4	4.7	4.7	12.5	21.3	66.2
Bt3	60-76	0.9	0.9	1.6	4.0	4.5	11.9	20.0	68.1
Bt4	76-219	0.4	0.6	1.8	4.4	5.2	12.4	18.7	68.9
BCt	219-270	0.3	0.8	2.2	7.3	9.3	19.9	28.0	52.1

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-17	6.42	8.62	1.66	1.21	6.60	0.30	18.09	11.79	63.52	97.46
Bt1	17-26	6.28	6.10	1.57	0.79	2.20	0.40	10.66	8.86	79.36	95.49
Bt2	26-60	6.26	6.05	1.97	0.84	4.40	0.10	13.26	8.96	66.82	98.88
Bt3	60-76	6.39	6.29	2.30	0.78	2.20	0.20	11.57	9.57	80.99	97.91
Bt4	76-219	5.93	5.05	2.28	0.06	5.40	0.30	12.79	7.69	57.78	96.10
BCt	219-270	4.76	0.77	1.47	0.33	13.80	2.40	16.37	4.97	15.70	51.71

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-17	43	34	9	1175	88.7	68.8
Bt1	17-26	36	22	14	2980	96.8	84.4
Bt2	26-60	51	31	20	3169	98.0	90.8
Bt3	60-76	55	38	17	3256	97.9	91.1
Bt4	76-219	55	40	15	3025	98.7	91.1
BCt	219-270	61	52	9	2602	98.3	86.4

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-17	1.49	0.03	43.85	22	17	5
Bt1	17-26	1.53	0.05	42.47	22	19	3
Bt2	26-60	1.40	0.04	47.12	28	25	3
Bt3	60-76	1.42	0.04	46.42	29	25	4
Bt4	76-219	1.44	0.04	45.75	31	27	4
BCt	219-270	--	--	--	36	29	7

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	26-60	40	3	--	13	3	7	tr
		----- % of clay -----						
		60	5	--	20	5	10	tr

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite; tr=trace.

Soil type: **40-1 Frederick**
Date: 8 August 1996
Described by: P.J. Thomas, P.R. Cobb, W.T. Price, P.D. Schroeder
Location: Rockbridge County, VA
Physiography: Ridge and Valley
Landscape position: Upland summit
Vegetation: Pasture
Parent material: Limestone residuum
Slope gradient: 4%
Drainage class: Well drained
Additional notes: Mapped as Frederick-Christian in Rockbridge Soil Survey

Profile Description

Ap--0 to 23 cm, strong brown (10YR 5/3) silty clay loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; compact in place; common fine and medium roots; common fine pores; moderately acid; abrupt wavy boundary.

Bt1--23 to 42 cm, yellowish red (5YR 5/6) clay; fine medium prominent brownish yellow (10YR 6/8) mottles; weak fine prismatic parting to moderate medium and coarse subangular blocky structure; friable, sticky, plastic; common medium and few fine roots; few coarse and common medium pores; many prominent clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2--42 to 77 cm, yellowish red (5YR 4/6) clay; common coarse prominent yellowish brown (10YR 6/8) mottles; weak coarse prismatic parting to moderate coarse subangular blocky structure; friable, sticky, plastic; few fine and medium roots; common fine pores; many prominent clay films on faces of peds; 5 percent quartz gravel; strongly acid; gradual irregular boundary.

Bt3--77 to 121 cm, yellowish red (5YR 4/6) clay; common coarse prominent yellow (10YR 7/8) mottles; weak coarse prismatic parting to moderate medium and coarse subangular blocky structure; friable, sticky, plastic; few fine roots; few medium pores; many prominent clay films on faces of peds; very strongly acid; diffuse smooth boundary.

Bt4--121 to 150 cm, yellowish red (5YR 4/6) clay; many coarse prominent yellow (10YR 7/8) mottles; weak medium and coarse prismatic parting to moderate medium subangular blocky structure; friable, sticky, plastic; few fine roots; common medium pores; common distinct clay films on faces of peds; moderately acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-23	1.7	1.9	2.7	3.4	3.5	13.2	51.7	35.1
Bt1	23-42	0.4	0.5	0.7	1.0	1.1	3.7	17.7	78.6
Bt2	42-77	0.6	0.7	0.9	1.4	1.6	5.2	18.9	75.9
Bt3	77-121	0.6	1.0	0.9	1.2	1.8	5.5	24.7	69.8
Bt4	121-150	3.4	1.9	1.7	2.1	2.3	11.4	27.7	60.9

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Ap	0-23	5.83	5.39	0.92	0.14	10.20	0.10	16.65	6.55	38.74	98.47
Bt1	23-42	4.90	5.40	1.03	0.19	10.40	3.00	17.02	9.62	38.90	68.81
Bt2	42-77	5.08	0.22	0.66	0.09	12.80	6.20	13.77	7.17	7.04	13.53
Bt3	77-121	4.71	0.73	0.35	0.21	11.40	6.30	12.69	7.59	10.17	17.00
Bt4	121-150	5.78	0.02	0.22	0.20	12.40	2.30	12.84	2.74	3.43	16.06

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-23	35	25	10	478	95.8	89.2
Bt1	23-42	64	46	18	880	99.0	97.1
Bt2	42-77	67	58	9	3405	98.1	95.9
Bt3	77-121	62	47	15	1060	98.5	95.6
Bt4	121-150	59	44	15	1569	94.4	90.1

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-23	1.84	0.01	30.50	25	16	9
Bt1	23-42	1.28	0.05	51.80	41	31	10
Bt2	42-77	1.37	0.04	48.30	56	30	26
Bt3	77-121	1.29	0.03	51.32	39	30	9
Bt4	121-150	1.32	0.04	50.19	39	24	15

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	42-77	34	11	4	11	8	8	tr
		----- % of clay -----						
		45	15	5	15	10	10	tr

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite; tr=trace.

Soil type: **40-2 Frederick**
Date: 8 August 1996
Location: Augusta County, VA
Described by: P.J. Thomas, P.R. Cobb, W.T. Price, P. D. Schroeder
Physiography: Valley and Ridge
Landscape position: Side slope
Vegetation: Scrub (**poison ivy**)
Parent material: Limestone residuum
Slope gradient: 3%
Drainage class: Well drained
Additional notes: Slickenside orientation is from NE-SW 80°

Profile Description

Ap--0 to 24 cm, brown (7.5YR 4/4) silty clay loam; massive (compacted); friable, slightly sticky, slightly plastic; few coarse and common fine and medium roots; many medium continuous tubular pores; 5 percent angular chert fragments 1 cm in diameter; moderately acid; abrupt wavy boundary.

Bt1--24 to 49 cm, yellowish red (5YR 4/6) clay; few medium prominent brownish yellow (10YR 6/8) soft masses of iron; moderate medium and coarse prismatic parting to weak coarse subangular blocky structure; firm, sticky, plastic; few coarse and common fine and medium roots; common fine continuous tubular pores; many prominent clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2--49 to 94 cm, yellowish red (5YR 4/6) and brownish yellow (10YR 6/8) clay; common medium prominent light olive brown (2.5Y 5/4) soft masses of iron along ped faces; strong medium prismatic parting to strong medium and coarse subangular blocky structure; firm, sticky, plastic; few coarse and many fine roots; few coarse and common fine continuous tubular pores; many prominent clay films on faces of peds; strongly acid; gradual wavy boundary.

BCt--94 to 140 cm, yellowish red (5YR 4/6) and brownish yellow (10YR 6/8) clay; common medium prominent light olive brown (2.5Y 5/3) soft masses of iron along ped faces; weak coarse prismatic parting to moderate medium subangular blocky structure; friable, sticky, plastic; few coarse and common fine roots; few medium continuous tubular pores; common distinct clay films on faces of peds; few faint slickensides 10 cm in length and 5 cm in width; common distinct black (10YR 2/1) iron and manganese coatings; very strongly acid; gradual smooth boundary.

Ct--140 to 160 cm, yellowish red (5YR 4/6) clay; common coarse prominent brownish yellow (10YR 6/8) soft masses of iron; massive; friable, sticky, plastic; few fine roots along clay flows; few fine continuous tubular pores; common prominent red (2.5YR 4/6) clay flows; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-24	2.6	3.2	4.0	5.7	5.8	21.3	47.5	31.2
Bt1	24-49	0	0.2	0.4	1.0	1.7	3.3	25.4	71.3
Bt2	49-94	0	0.1	0.2	0.2	0.4	0.9	20.1	79.0
BCt	94-140	0.2	0.5	0.4	0.7	1.5	3.3	29.3	67.4
Ct	140-160	0.6	0.6	0.6	1.5	2.8	6.1	35.6	58.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Ap	0-24	5.61	4.07	0.81	0.14	1.20	0.60	6.22	5.62	80.71	89.32
Bt1	24-49	5.03	6.20	1.86	0.23	9.80	2.20	18.09	10.49	45.83	79.03
Bt2	49-94	5.11	0.65	1.46	0.29	12.00	7.50	14.40	9.90	16.67	24.24
BCt	94-140	4.98	0.52	0.74	0.33	13.60	7.10	15.19	8.69	10.47	18.30
Ct	140-160	4.82	0.23	0.50	0.26	14.50	6.40	15.49	7.39	6.39	13.40

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	----- % -----	
Ap	0-24	35	23	12	200	93.8	82.7
Bt1	24-49	64	39	25	1615	99.4	97.8
Bt2	49-94	68	52	16	2148	99.8	99.4
BCt	94-140	63	50	13	2559	99.2	97.6
Ct	140-160	63	44	19	2246	98.6	95.8

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-24	1.59	0.02	40.00	23	14	9
Bt1	24-49	1.31	0.06	50.57	37	27	10
Bt2	49-94	1.26	0.04	52.45	42	33	9
BCt	94-140	1.22	0.05	53.96	41	26	15
Ct	140-160	1.23	0.02	53.58	37	27	10

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	49-94	40	8	4	4	4	20	--
		----- % of clay -----						
		50	10	5	5	5	25	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **40-3 Frederick**
Date: 22 August 1996
Location: Smyth County, VA
Described by: P.J. Thomas, R.K. Conner, J.R. Thomas, M.A. Saluta
Physiography: Valley and Ridge
Landscape position: Bench
Vegetation: Pasture
Parent material: Colluvium over limestone residuum
Slope gradient: 9%
Drainage class: Moderately well drained
Additional notes:

Profile Description

Ap--0 to 22 cm, brown (10YR 4/3) silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and few coarse roots; many fine continuous tubular pores; 2 percent rounded gravel; moderately acid; abrupt smooth boundary.

Bt1--22 to 54 cm, strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable and firm, sticky, slightly plastic; common fine roots; many fine and few coarse continuous tubular pores; common faint clay films on faces of peds; moderately acid; gradual wavy boundary.

Bt2--54 to 103 cm, yellowish red (5YR 4/64) silty clay loam; moderate fine and medium subangular blocky structure; firm, sticky, slightly plastic, slightly brittle; very few very fine roots; many very fine continuous tubular pores; many prominent clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt3--103 to 130+cm, yellowish red (5YR 5/6) clay; common coarse prominent yellow (10YR 7/8) parent material mottles; weak coarse prismatic parting to moderate medium and coarse subangular blocky structure; firm, sticky, slightly plastic; few fine roots; few medium continuous tubular pores; common distinct clay films on faces of peds; few faint pressure faces; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-22	1.3	3.0	7.0	9.3	6.2	26.8	60.4	12.8
Bt1	22-54	0.9	1.9	4.4	6.5	5.2	18.9	49.7	31.4
Bt2	54-103	0.3	0.3	0.3	0.5	1.3	2.7	59.8	37.5
Bt3	103-130	1.9	2.1	5.2	6.6	7.1	22.9	36.7	40.4

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-22	5.61	2.48	0.75	0.10	13.40	0.60	16.73	3.93	19.90	84.73
Bt1	22-54	5.58	5.39	0.97	0.10	10.40	0.60	16.86	7.06	38.32	91.50
Bt2	54-103	5.42	3.77	4.95	0.22	9.60	4.60	18.54	13.54	48.22	66.03
Bt3	103-130	4.96	0.80	0.42	0.16	11.60	4.20	12.98	5.58	10.63	24.73

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-22	35	28	7	100	94.7	77.4
Bt1	22-54	38	29	9	1046	96.3	84.8
Bt2	54-103	40	33	7	2254	99.2	98.2
Bt3	103-130	44	35	9	866	95.2	81.9

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-22	1.39	0.03	47.55	21	12	9
Bt1	22-54	1.32	0.04	50.19	41	15	26
Bt2	54-103	1.51	0.02	43.02	42	18	24
Bt3	103-130	1.50	0.02	43.40	32	17	15

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	54-103	13	6	2	8	4	6	tr
		----- % of clay -----						
		35	15	5	20	10	15	tr

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite; tr=trace.

Soil type: **62-1 Iredell**
Date: 7 June 1993
Location: Appomattox County, VA
Described by: P.J. Thomas, J.C. Baker, W.F. Kitchel, H.T. Saxton, M.H. Stolt
Physiography: Piedmont upland
Landscape position: Drainageway
Vegetation: Native grasses
Parent material: Colluvium over chlorite schist residuum
Slope gradient: 1%
Drainage class: Somewhat poorly drained
Additional notes:

Profile Description

Ap-0 to 25 cm, dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, slightly sticky, nonplastic; common fine and medium roots; few coarse and common medium tubular pores; 5 percent subrounded quartz gravel; clear smooth boundary.

Bt1--25 to 70 cm, yellowish brown (10YR 5/8) clay loam; moderate medium subangular blocky structure; friable, sticky, plastic; common fine and few medium roots; few coarse and common medium tubular pores; common distinct clay films on faces of peds; 5 percent subrounded quartz gravel; gradual smooth boundary.

Bt2--70 to 90 cm, strong brown (7.5YR 5/8) silty clay; moderate medium subangular blocky structure; firm, sticky, plastic; common fine and few medium roots; few coarse tubular pores; many distinct clay films on faces of peds; clear wavy boundary.

2Btss--90 to 125 cm, dark gray (7.5YR 4/1) clay; moderate coarse prismatic parting to weak medium and coarse subangular blocky structure; friable, sticky, plastic; few fine roots; few coarse tubular pores; many distinct clay films on faces of peds; many prominent slickensides 5 cm in length and 5 cm in width; very strongly acid; gradual smooth boundary.

2Cr--125 to 180+ cm, partially weathered chlorite schist.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
2Btss	90-125	0.2	0.4	1.3	2.7	0.9	5.5	26.4	68.1

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
2Btss	90-125	4.64	0.02	0.76	0.15	4.60	3.70	5.53	4.63	16.82	20.09

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
2Btss	90-125	70	33	37	5567	99.1	95.1

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
2Btss	90-125	1.68	0.09	36.60	45	28	17

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
2Btss	90-125	17	31	14	3	2	1	--
		----- % of clay -----						
		25	45	20	5	3	2	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **67-1 Jackland**
Date: 29 August 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls, J.C. Baker, M.H. Stolt, D. Brown
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Sideslope
Vegetation: Pasture
Parent material: Diabase
Slope gradient: 2%
Drainage class: Moderately well drained
Additional notes: Slickensides are oriented NE-SW in Bt1, Bt2, and Bt3 horizons.

Profile Description

Apc--0 to 20 cm, dark yellowish brown (10YR 4/4) silt loam; moderate medium granular and weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and common medium roots; common fine pores; few fine black (10YR 2/1) iron and manganese concretions; neutral; abrupt smooth boundary.

BEtc--20 to 50 cm, light yellowish brown (2.5Y 6/4) silt loam; common medium distinct light brownish gray (2.5Y 6/2) iron depletions and yellowish brown (10YR 5/6) masses; weak fine, medium, and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; common medium and fine roots; many fine pores; few distinct clay films on faces of peds; few fine black (10YR 2/1) iron and manganese concretions; moderately acid; clear smooth boundary.

Btc--50 to 68 cm, yellowish brown (10YR 5/6) clay; common medium prominent light gray (10YR 6/1) iron depletions; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine roots; few fine pores; many distinct clay films on faces of peds; many fine and medium black (10YR 2/1) iron and manganese concretions; few distinct black (10YR 2/1) manganese coatings on faces of peds; moderately acid; clear smooth boundary.

Btssc1--68 to 90 cm, yellowish brown (10YR 5/4) clay; common medium distinct gray (10YR 5/1) iron depletions; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine roots; few fine pores; many distinct clay films on faces of peds; few distinct slickensides 12 cm in width and 12 cm in length; many fine and medium black (10YR 2/1) iron and manganese concretions; common prominent black (10YR 2/1) manganese coatings on faces of peds; slightly acid; clear smooth boundary.

Btssc2--90 to 104 cm, yellowish brown (10YR 5/6) sandy clay loam; common medium distinct grayish brown (10YR 5/2) iron depletions; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine roots; few fine pores; common distinct clay films on faces of peds; common distinct slickensides 12 cm in width and 45 cm in length; common fine

and medium black (10YR 2/1) iron and manganese concretions; few distinct black (10YR 2/1) manganese coatings on faces of ped; lens of grayish brown (10YR 5/2) clayey material 5 cm thick with common medium distinct brownish yellow (10YR 6/6) masses and common distinct slickensides; slightly acid; abrupt wavy boundary.

BCt--104 to 121 cm, yellowish brown (10YR 5/6) sandy clay loam; common medium distinct very pale brown (10YR 7/3) masses; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; common distinct clay films on faces of ped and clay bridging between sand grains; slightly acid; gradual wavy boundary.

C--121 to 146 cm, yellowish brown (10YR 5/6) loamy coarse sand; massive; loose, nonsticky, nonplastic; many fine pores; neutral; clear wavy boundary.

Cr--146 to 225 cm, black (10YR 2/1), brownish yellow (10YR 6/6), strong brown (7.5YR 5/6) weathered diabase; slightly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Apc	0-20	3.1	6.4	3.4	5.9	8.4	27.2	65.1	7.7
BEtc	20-50	1.6	4.1	2.1	4.2	7.3	19.3	60.2	20.5
Btc	50-68	3.3	3.8	2.1	3.6	5.3	18.1	28.4	53.5
Btss1	68-90	4.7	4.9	2.2	1.9	8.1	21.8	9.4	68.8
Btss2	90-104	13.6	11.7	3.9	7.5	9.9	46.6	23.5	29.9
BCt	104-121	9.3	9.0	4.0	7.7	12.1	42.1	25.0	32.9
C	121-146	27.1	21.0	12.5	12.1	8.6	81.3	13.7	5.0
Cr	146-225	28.1	17.0	11.2	15.2	12.1	83.6	13.6	2.8

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Apc	0-20	6.87	5.17	0.21	0.07	6.80	0.10	12.25	5.55	44.49	98.20
BEtc	20-50	5.62	3.91	0.85	0.05	6.60	0.40	11.41	5.21	42.16	92.32
Btc	50-68	5.73	8.78	11.75	0.30	11.40	0.40	32.23	21.23	64.63	98.12
Btss1	68-90	6.42	9.80	14.80	0.18	4.80	0.10	29.58	24.88	83.77	99.60
Btss2	90-104	6.31	8.90	13.70	0.21	3.80	0.40	26.61	23.21	85.72	98.28
BCt	104-121	6.45	9.64	18.50	0.23	8.20	0.20	36.57	28.57	77.58	99.30
C	121-146	6.83	10.54	27.84	0.21	2.60	0.10	41.19	38.69	93.69	99.74
Cr	146-225	6.53	4.82	3.74	0.06	1.40	0.30	10.02	8.92	86.03	96.64

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Apc	0-20	27	23	4	--	89.8	78.2
BEtc	20-50	27	16	11	1702	93.9	85.6
Btc	50-68	67	41	26	3358	92.4	85.5
Btss1	68-90	65	28	37	3589	89.9	83.8
Btss2	90-104	52	25	27	2602	73.5	60.0
BCt	104-121	55	30	25	2309	81.0	66.0
C	121-146	--	--	NP**	--	49.0	24.9

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Apc	0-20	1.39	0.03	47.58	20	9	11
BEc	20-50	1.65	0.01	37.58	17	15	2
Btc	50-68	1.39	0.12	47.72	29	26	3
Btss1	68-90	1.28	0.14	51.57	38	27	11
Btss2	90-104	1.31	0.14	50.45	36	24	12
BCt	104-121	1.39	0.06	47.46	28	23	5
C	121-146	--	--	--	12	7	5

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss1	68-90	10	34	10	3	3	7	--
		----- % of clay -----						
		15	50	15	5	5	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **67-2 Jackland**
Date: 1 September 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Ridge summit
Vegetation: Loblolly pine plantation (6-7 years)
Parent material: Diabase
Slope gradient: 1%
Drainage class: Moderately well drained
Additional notes: Slickensides are oriented SW-NE in Btss horizon

Profile Description

Apc--0 to 19 cm, dark gray (10YR 4/1) loam; weak medium granular and weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; many fine, common medium, and few coarse roots; common fine and few medium pores; few distinct black (10YR 2/1) iron and manganese nodules; strongly acid; clear wavy boundary.

BAtc--19 to 30 cm, yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) clay loam; moderate medium subangular blocky structure; firm, sticky, plastic; common fine and few medium and coarse roots; few fine and medium pores; many distinct yellowish brown (10YR 5/4) clay films on faces of peds; many distinct black (10YR 2/1) iron and manganese nodules; slightly acid; clear smooth boundary.

Btssc--30 to 63 cm, olive brown (2.5Y 4/4) clay; few fine distinct brownish yellow (10YR 6/6) and brown (10YR 5/3) masses; moderate fine and medium subangular blocky structure; firm, very sticky, very plastic; few fine and medium and common coarse roots; few fine and medium pores; many prominent dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct slickensides 5 cm in width and 30 cm in length; many distinct black (10YR 2/1) iron and manganese nodules; neutral; gradual smooth boundary.

BCtc1--63 to 72 cm, yellowish brown (10YR 5/6) clay loam; common fine distinct very pale brown (10YR 7/3) and yellow (10YR 7/8) masses; weak medium and coarse subangular blocky structure; friable, sticky, plastic; few fine roots; few fine pores; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct dark yellowish brown (10YR 4/6) iron and manganese streaks and many prominent black (10YR 2/1) iron and manganese concentrations; neutral; clear wavy boundary.

BCtc2--72 to 109 cm, brownish yellow (10YR 6/8), very pale brown (10YR 7/3), and black (10YR 2/1) loamy coarse sand; weak coarse subangular blocky structure; friable, nonsticky, nonplastic; few fine roots between cracks; very few fine pores; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common prominent black (10YR 2/1) iron and

manganese vertical streaks 2 to 5 mm wide; slightly acid; gradual smooth boundary.

Crc--109 to 120 cm, brownish yellow (10YR 6/8), very pale brown (10YR 7/3), dark yellowish brown (10YR 4/4), black (10YR 2/1), and olive (5Y 5/3) loamy coarse sand diabase material; massive; firm and brittle, nonsticky, nonplastic; few fine roots between cracks; common prominent black (10YR 2/1) and dark yellowish brown (10YR 4/6) iron and manganese vertical streaks 2 to 5 mm wide; neutral.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Apc	0-19	6.4	13.1	6.4	5.8	6.2	37.9	43.0	19.1
BAtc	19-30	4.3	3.9	4.8	6.0	6.8	25.8	40.0	34.2
Btssc	30-63	0.7	1.4	1.7	3.4	3.9	11.1	21.0	67.9
BCtc1	63-72	0.7	4.2	6.3	10.9	15.9	38.0	33.1	28.9
BCtc2	72-109	8.0	20.8	18.7	14.7	13.0	75.2	19.9	4.9
Crc	109-120	21.6	28.4	15.0	9.9	10.2	85.1	13.6	1.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Apc	0-19	5.45	7.32	5.70	0.15	3.60	0.30	16.77	13.47	78.53	97.77
BAtc	19-30	6.07	8.52	15.60	0.22	4.80	1.20	29.14	25.54	83.53	95.30
Btssc	30-63	6.68	11.86	21.30	0.33	2.20	0.50	35.69	33.99	93.84	98.53
BCtc1	63-72	6.69	11.27	21.80	0.30	2.80	0.20	36.17	33.57	92.26	99.40
BCtc2	72-109	6.39	12.21	21.10	0.17	3.20	0.40	36.68	33.88	91.28	98.82
Crc	109-120	6.95	7.59	7.50	0.08	1.40	0.20	16.57	15.37	91.55	98.70

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Apc	0-19	44	30	14	1490	79.0	66.2
BAtc	19-30	46	27	19	2330	90.9	78.8
Btssc	30-63	90	42	48	5037	97.7	91.5
BCtc1	63-72	47	32	15	1364	93.8	72.5
BCtc2	72-109	--	--	NP**	--	67.5	33.8
Crc	109-120	--	--	NP**	--	47.0	22.0

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Apc	0-19	1.58	0.03	40.53	24	20	4
BAtc	19-30	1.30	0.11	50.81	35	21	14
Btssc	30-63	1.16	0.16	56.39	45	36	9
BCtc1	63-72	1.23	0.08	53.66	36	27	9
BCtc2	72-109	1.45	0.05	45.23	25	20	5
Crc	109-120	1.97	0.02	27.71	13	6	7

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btssc	30-63	7	14	44	--	--	3	--
		----- % of clay -----						
		10	20	65	--	--	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **67-3 Jackland**
Date: 10 October 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls, H. Mast
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Corn
Parent material: Diabase residuum
Slope gradient: 1%
Drainage class: Moderately well drained
Additional notes: Slickensides are oriented SW-NE in Btss horizon

Profile Description

Apc--0 to 12 cm, dark grayish brown (10YR 4/2) silt loam; weak fine granular and weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; common roots; common fine pores; many prominent black (10YR 2/1) iron and manganese nodules; 1 percent subrounded gravel; moderately acid; abrupt smooth boundary.

BAc--12 to 26 cm, brown (10YR 5/3) loam; weak coarse subangular blocky and weak fine granular structure; friable, slightly sticky, slightly plastic; common medium and many fine roots; many fine pores; many prominent black (10YR 2/1) iron and manganese nodules; neutral; clear smooth boundary.

Btssc--26 to 57 cm, yellowish brown (10YR 5/4) clay; common prominent gray (10YR 5/1) iron depletions and yellowish red (5YR 5/8) soft masses of iron; moderate medium and coarse subangular blocky structure; very firm, very sticky, very plastic; few fine roots; few fine pores; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common prominent slickensides 5 cm in width and 5 cm in length; many distinct black (10YR 2/1) iron and manganese nodules; very strongly acid; gradual wavy boundary.

BCtc1--57 to 78 cm, light olive brown (2.5Y 5/4), reddish yellow (7.5YR 6/8), and yellowish brown (10YR 5/6) clay loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; few fine pores; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common prominent black (10YR 2/1) iron and manganese nodules; slightly acid; gradual wavy boundary.

C--78 to 104 cm, yellowish brown (10YR 5/6) and light gray (2.5Y 7/2) loamy sand; massive, rock-controlled structure; friable, nonsticky, nonplastic, hard; common prominent black (10YR 2/1) iron and manganese coatings along fractures; neutral; gradual wavy boundary.

Cr--104 to 130 cm, yellowish brown (10YR 5/6) and light gray (2.5Y 7/2) diabase; massive, rock-controlled structure; firm, hard; common prominent black (10YR 2/1) iron and manganese

coatings along rock fractures; neutral.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Apc	0-12	5.3	6.4	4.8	9.8	7.2	33.5	52.1	14.4
BAtc	12-26	5.3	7.7	5.1	10.1	7.0	35.2	48.1	16.7
Btssc	26-57	1.4	1.5	1.1	3.0	3.6	10.6	23.2	66.2
BCtc	57-78	0.4	1.8	5.0	11.9	12.6	31.7	32.7	35.6
C	78-104	6.1	17.3	23.6	19.3	12.2	78.5	15.7	5.8
Cr	104-130	21.2	26.7	18.4	11.7	7.7	85.7	12.1	2.2

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Apc	0-12	5.94	6.78	1.26	0.30	8.80	0.10	17.14	8.44	48.66	98.82
BAtc	12-26	6.79	5.86	1.55	0.12	6.40	0.20	13.93	7.73	54.06	97.41
Btssc	26-57	4.84	11.26	20.00	0.36	6.20	0.30	37.82	31.92	83.65	99.06
BCtc	57-78	6.37	10.88	19.50	0.33	2.60	0.40	33.31	31.11	92.19	98.71
C	78-104	6.67	8.60	10.00	0.12	1.20	0.40	19.92	19.12	93.98	97.91
Cr	104-130	6.78	9.45	12.30	0.10	4.40	0.20	26.25	22.05	83.24	99.09

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft²</i>	-----%-----	
Apc	0-12	29	22	7	--	87.5	72.6
BAtc	12-26	27	21	6	--	86.0	69.5
Btssc	26-57	82	38	44	4680	97.0	91.8
BCtc	57-78	51	31	20	2204	97.0	76.7
C	78-104	--	--	NP**	--	72.5	29.9
Cr	104-130	--	--	NP**	--	48.0	19.5

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Apc	0-12	1.59	0.02	40.11	18	12	6
BAtc	12-26	1.61	0.03	39.19	19	14	5
Btssc	26-57	1.22	0.17	53.99	35	10	25
BCtc	57-78	1.20	0.09	54.60	35	30	5
C	78-104	1.55	0.02	41.43	22	14	8
Cr	104-130	1.70	0.02	35.88	16	14	2

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btssc	26-57	13	26	10	3	--	7	--
		----- % of clay -----						
		20	40	15	5	--	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **63-1 Kelly**
Date: 31 August 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Cropland (pumpkins, corn)
Parent material: Thermal shale
Slope gradient: 0%
Drainage class: Poorly drained
Additional notes: Slickenside orientation is from NW-SE in Btssg1 and Btssg2

Profile Description

Ap--0 to 19 cm, brown (10YR 5/3) silt loam; weak medium granular and weak coarse subangular blocky structure; firm, slightly sticky, slightly plastic; many fine roots; common fine and few medium pores; slightly acid; clear smooth boundary.

Btg--19 to 36 cm, light brownish gray (10YR 6/2) clay; many common prominent strong brown (7.5YR 5/6) masses along root channels; weak coarse subangular blocky structure; friable, sticky, plastic; few fine roots; few fine pores; few fine clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btssg1--36 to 62 cm, gray (10YR 5/1) and yellowish brown (10YR 5/8) clay; moderate coarse subangular blocky structure; firm, very sticky, very plastic; few fine roots; few fine pores; common distinct gray (10YR 5/1) clay films on faces of peds; common distinct slickensides 6 cm in width and 5 cm in length; 2 percent shale channers 2 to 8 cm in length; strongly acid; clear wavy boundary.

Btssg2--62 to 82 cm, gray (10YR 5/1) clay; many common prominent yellowish brown (10YR 5/8) masses; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine roots along ped faces; few fine pores; common distinct gray (N 5/0) clay films on faces of peds; common distinct slickensides 15 cm in width and 12 cm in length; 20 percent shale channers 2 to 8 cm in length; extremely acid; clear smooth boundary.

R--82 to 98 cm+, dark red (2.5YR 3/6) red shale; gray (N 5/0) iron depleted silt coatings along rock faces.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-19	2.1	3.9	3.3	4.8	4.6	18.7	60.7	20.6
Btg	19-36	0.2	0.3	0.7	2.9	4.2	8.3	39.6	52.1
Btssg1	36-62	0	0.1	0.5	1.7	2.3	4.6	24.5	70.9
Btssg2	62-82	6.1	3.0	1.8	2.4	2.9	16.2	22.8	61.0

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Ap	0-19	6.53	7.23	1.11	0.09	2.30	0.30	10.73	8.73	78.56	96.56
Btg	19-36	5.01	4.10	2.26	0.14	13.00	7.00	19.50	13.50	33.33	48.15
Btssg1	36-62	5.39	8.29	1.34	0.21	25.20	16.10	35.04	25.94	28.08	37.93
Btssg2	62-82	4.43	2.90	7.10	0.33	17.00	8.30	37.33	18.63	37.80	55.45

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-19	36	24	12	145	93.2	84.5
Btg	19-36	43	27	16	922	99.2	94.5
Btssg1	36-62	71	33	38	2087	99.7	96.9
Btssg2	62-82	58	38	20	2268	90.5	85.7

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-19	1.60	0.03	39.50	21	16	5
Btg	19-36	1.38	0.04	47.97	28	23	4
Btssg1	36-62	1.18	0.11	55.44	36	28	8
Btssg2	62-82	1.37	0.09	48.35	40	29	11

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btssg1	36-62	14	4	14	28	4	7	--
		----- % of clay -----						
		20	5	20	40	5	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **63-2 Kelly**
Date: 31 August 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Fescue pasture
Parent material: Thermal shale
Slope gradient: 0%
Drainage class: Somewhat poorly drained
Additional notes: Slickenside orientation is from NW-SE in Btssc

Profile Description

Ap--0 to 22 cm, dark yellowish brown (10YR 4/4) silt loam; weak medium granular and weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common very fine and fine and few medium pores; 1 percent rounded quartz gravel; neutral; abrupt smooth boundary.

Bt1--22 to 44 cm, brownish yellow (10YR 6/6) silty clay loam; friable, sticky, plastic; common fine roots; common fine and few medium pores; common distinct clay films on faces of peds; 1 percent subrounded quartz gravel; neutral; clear smooth boundary.

Bt2--44 to 60 cm, brownish yellow (10YR 6/6) silty clay; common fine faint brownish yellow (10YR 6/8) masses throughout and common medium distinct light brownish gray (10YR 6/2) iron depletions on faces of peds; moderate medium and coarse subangular blocky structure; friable, sticky, plastic; common fine roots; common fine and few medium pores; common distinct clay films on faces of peds; 1 percent rounded quartz gravel; very strongly acid; clear wavy boundary.

Btssc--60 to 82 cm, reddish brown (2.5YR 4/4) clay; common medium prominent gray (N 5/0) iron depletions on faces of peds, light gray (5YR 6/1) iron depletions along root channels and yellowish brown (10YR 5/8) masses throughout, and few medium prominent strong brown (7.5YR 5/6) masses throughout; weak coarse subangular blocky structure; friable, sticky, plastic; few fine roots; common fine pores; many prominent reddish brown (2.5YR 4/4) clay films on faces of peds; few faint slickensides 5 cm in width and 5 cm in length; few distinct black (10YR 2/1) iron and manganese nodules; 1 percent rounded quartz gravel; very strongly acid; gradual wavy boundary.

C--82 to 102 cm, reddish brown (2.5YR 4/4) very channery clay; common coarse prominent light gray (5YR 6/1) iron depletions and few medium prominent yellowish brown (10YR 5/8) masses and gray (N 5/0) iron depletions along channer faces; weak coarse prismatic rock controlled structure; friable, sticky, plastic; 40 percent shale channers 3 to 10 cm in length;

strongly acid; clear wavy boundary.

R--102 to 112 cm, dusky red (10R 3/4) shale; black (N 2/0) manganese coatings.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-22	2.0	2.4	2.0	3.4	5.5	15.3	68.0	16.7
Bt1	22-44	1.2	1.3	0.8	1.9	3.8	9.0	55.0	36.0
Bt2	44-60	1.9	1.2	0.5	1.8	3.9	9.3	43.8	46.9
Btssc	60-82	1.6	1.8	1.3	1.9	2.2	8.8	32.3	58.9
C	82-102	2.8	3.2	2.6	2.8	5.5	16.9	37.8	45.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-22	7.27	8.63	0.37	0.06	5.80	0.30	14.86	9.36	60.97	96.79
Bt1	22-44	6.56	6.58	1.39	0.09	7.40	0.50	15.46	8.56	52.13	94.16
Bt2	44-60	4.67	3.73	14.65	0.16	10.00	7.60	28.54	26.14	64.96	70.93
Btssc	60-82	4.77	5.19	13.35	0.30	14.60	4.80	33.44	23.64	56.34	79.70
C	82-102	5.24	5.28	19.30	0.31	10.20	2.20	35.09	27.09	70.93	91.88

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft²</i>	-----%-----	
Ap	0-22	41	25	16	798	95.1	88.4
Bt1	22-44	37	23	14	462	97.4	93.5
Bt2	44-60	45	12	33	1049	96.8	93.9
Btssc	60-82	70	36	34	1364	96.3	92.7
C	82-102	51	26	25	714	93.5	86.8

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-22	1.59	0.01	40.10	21	10	11
Bt1	22-44	1.49	0.02	43.64	25	16	9
Bt2	44-60	1.38	0.04	48.03	29	23	6
Btssc	60-82	1.24	0.10	53.10	37	30	7
C	82-102	1.41	0.07	46.69	28	20	8

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	44-60	9	14	2	14	2	5	--
		----- % of clay -----						
		20	30	5	30	5	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **63-3 Kelly**
Date: 27 October 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls, H. Mast
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Cropland (corn stubble)
Parent material: Colluvium over thermal shale
Slope gradient: 0%
Drainage class: Somewhat poorly drained
Additional notes:

Profile Description

Ap--0 to 20 cm, dark grayish brown (10YR 4/2) silt loam; few fine distinct yellowish brown (10YR 5/6) masses along root channels; moderate medium granular and weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common fine pores; few distinct black (10YR 2/1) iron and manganese concentrations; 10 percent rounded quartz gravel; moderately acid; abrupt smooth boundary.

Bt1--20 to 42 cm, yellowish brown (10YR 5/8) and light yellowish brown (2.5Y 6/4) gravelly silty clay; common medium distinct light gray (10YR 7/1) iron depletions; weak medium and coarse subangular blocky structure; firm, sticky, slightly plastic; few fine roots; many fine pores; common distinct yellowish brown (10YR 5/8) clay films on faces of peds; 10 percent cobbles and 15 percent subrounded quartz gravel; strongly acid; clear smooth boundary.

2Bt2--42 to 73 cm, yellowish brown (10YR 5/6) clay; many coarse prominent light gray (10YR 6/1) iron depletions; moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; few fine and medium pores; many prominent dark yellowish brown (10YR 4/4) clay films on faces of peds; 10 percent shale gravel and channers; very strongly acid; gradual wavy boundary.

2C--73 to 105 cm, yellowish brown (10YR 5/6), light gray (10YR 6/1), and strong brown (7.5YR 5/6) very channery clay loam; light gray (10YR 6/1) silt coatings on rock faces; firm, very sticky, very plastic; 55 percent shale gravel and channers; strongly acid; clear wavy boundary.

2R--105 to 115 cm, dusky red (10R 3/4) thermal shale.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-20	4.9	5.1	3.8	3.0	2.3	19.1	71.7	9.2
Bt1	20-42	0.6	0.5	0.5	0.8	1.2	3.6	55.8	40.6
2Bt2	42-73	0.8	1.4	1.8	2.6	2.4	9.0	25.3	67.7
2C	73-105	13.3	7.8	4.7	4.1	3.2	33.1	31.6	35.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-20	5.79	5.49	0.67	0.13	11.00	0.10	17.29	6.39	36.38	98.44
Bt1	20-42	5.09	1.73	7.63	0.12	7.80	1.90	17.28	11.38	54.86	83.30
2Bt2	42-73	4.85	0.10	1.07	0.19	11.40	6.80	12.76	8.16	10.66	16.67
2C	73-105	5.33	3.26	28.90	0.25	12.60	1.40	45.01	33.81	72.01	95.86

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-20	33	30	3	--	89.4	82.4
Bt1	20-42	40	26	14	1532	98.7	97.2
2Bt2	42-73	71	32	39	2686	97.5	92.5
2C	73-105	54	26	28	2498	78.0	69.0

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-20	1.41	0.03	46.82	26	14	12
Bt1	20-42	1.36	0.04	48.73	29	23	5
2Bt2	42-73	1.14	0.14	56.84	45	15	29
2C	73-105	1.32	0.10	50.32	37	22	16

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
2Bt2	42-73	20	7	14	20	3	3	--
		----- % of clay -----						
		30	10	20	30	5	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **59-1 Mayodan**
Date: 16 August 1995
Described by: P.J. Thomas, F.C. Smith, R.L. Mendenhall
Location: Chesterfield County, VA
Physiography: Richmond Triassic Basin
Landscape position: Upland rise
Vegetation: Pasture
Parent material: Shale residuum
Slope gradient: 1%
Drainage class: Well drained
Additional notes:

Profile Description

Ap--0 to 27 cm, dark yellowish brown (10YR 4/4) gravelly sandy loam; weak moderate granular structure and massive; friable, nonsticky, nonplastic; many fine and medium and few coarse roots; common fine tubular pores; 20 percent subrounded gravel; common fine mica flakes; very strongly acid; abrupt smooth boundary.

Btss1--27 to 40 cm, yellowish brown (10YR 5/6) and dark red (2.5YR 4/8) clay; strong coarse prismatic parting to strong coarse subangular blocky structure; very firm, very sticky, very plastic; few fine and medium roots; many prominent strong brown (7.5YR 4/6) clay films on faces of peds; few distinct slickensides 10 cm in width and 10 cm in length; many fine mica flakes; very strongly acid; gradual smooth boundary.

Btss2--40 to 56 cm, dark red (2.5YR 4/8, yellowish red (5YR 5/8), and brownish yellow (10YR 6/8) sandy clay loam; moderate coarse subangular blocky structure; very firm, very sticky, very plastic; few medium roots; common prominent strong brown (7.5YR 4/6) clay films on faces of peds; few faint slickensides 5 cm in width and 5 cm in length; common fine mica flakes; extremely acid; clear smooth boundary.

BCt1--56 to 80 cm, brownish yellow (10YR 6/8), yellowish red (5YR 4/8), and yellow (10YR 7/8) gravelly sandy clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few faint yellowish brown (10YR 5/8) clay films along root channels; 30 percent subrounded gravel less than 0.5 cm in diameter; common fine mica flakes; extremely acid; clear smooth boundary.

BCt2--80 to 92 cm, dark red (2.5YR 4/8), strong brown (7.5YR 5/6), and brownish yellow (10YR 6/8) clay; weak medium subangular blocky structure; firm, sticky, plastic; few medium roots; many prominent strong brown (7.5YR 5/6) clay films on faces of peds; few coarse and few fine mica flakes; extremely acid; clear smooth boundary.

C--92 to 150+ cm, gray (2.5Y 6/1), reddish brown (5YR 4/4), and strong brown (7.5YR 5/8) very

gravelly coarse sandy loam; massive; loose, nonsticky, nonplastic; few coarse and common fine and few coarse mica flakes; 40 percent subrounded gravel less than 0.5 cm in diameter; extremely acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-27	13.5	17.1	15.1	13.9	7.9	67.5	20.3	12.2
Btss1	27-40	7.3	13.1	8.2	7.2	5.0	40.8	15.2	44.0
Btss2	40-56	14.6	20.6	9.0	6.5	4.5	55.2	16.6	28.2
BCt1	56-80	13.3	25.6	11.2	5.8	6.4	62.3	15.8	21.9
BCt2	80-92	3.6	9.6	7.0	4.4	2.2	26.8	7.4	65.8
C	92-150	16.8	27.3	14.6	8.7	5.3	72.7	17.4	9.9

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-27	4.73	3.11	0.84	0.07	8.00	0.20	12.02	4.22	33.44	95.26
Btss1	27-40	4.65	8.73	2.64	0.19	11.00	0.10	22.56	11.66	51.24	99.14
Btss2	40-56	4.24	6.26	9.70	0.21	8.00	5.10	24.17	21.27	66.90	76.02
BCt1	56-80	4.27	1.14	0.75	0.15	11.80	2.50	13.84	4.54	14.74	44.93
BCt2	80-92	4.36	1.91	1.92	0.37	4.40	1.70	8.60	5.90	48.84	71.19
C	92-150	4.30	0.24	0.34	0.10	7.20	2.20	7.88	2.88	8.63	23.61

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-27	25	20	5	146	67.0	37.5
Btss1	27-40	61	37	24	741	78.0	62.5
Btss2	40-56	53	27	27	1726	63.0	48.0
BCt1	56-80	52	34	18	200	58.0	42.0
BCt2	80-92	99	61	38	1643	85.9	74.8
C	92-150	--	--	NP**	--	53.5	31.0

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-27	1.61	0.02	39.25	11	4	7
Btss1	27-40	1.58	0.04	40.38	31	17	14
Btss2	40-56	1.67	0.02	36.98	21	13	8
BCt1	56-80	1.63	0.03	38.49	20	9	11
BCt2	80-92	1.16	0.09	56.23	45	36	9
C	92-150	1.63	0.02	38.49	18	4	14

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss2	40-56	11	8	7	4	1	3	--
		----- % of clay -----						
		40	30	25	15	2	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **59-2 Mayodan**
Date: 16 August 1995
Described by: P.J. Thomas, F.C. Smith, R.L. Mendenhall
Location: Chesterfield County, VA
Physiography: Richmond Triassic Basin
Landscape position: Upland rise
Vegetation: Pasture
Parent material: Colluvium over shale residuum
Slope gradient: 4%
Drainage class: Well drained
Additional notes: Stone line at Bt2/2BCt contact

Profile Description

Ap--0 to 24 cm, dark brown (10YR 4/3) sandy loam; weak fine and moderate subangular blocky structure; friable, nonsticky, nonplastic; many fine and common medium roots; common medium tubular pores; 5 percent subrounded gravel less than 0.5 cm in diameter; clear smooth boundary.

BE--24 to 38 cm, light yellowish brown (10YR 6/4) sandy loam; weak medium platy structure; very friable, slightly sticky, nonplastic; common fine and medium roots; common medium tubular pores; 10 percent subrounded gravel less than 0.5 cm in diameter; abrupt smooth boundary.

Bt1--38 to 54 cm, yellowish brown (10YR 5/6) gravelly sandy clay loam; common medium distinct light yellowish brown (10YR 6/4) soft masses of iron; moderate medium subangular blocky structure; firm, sticky, plastic; common medium and few fine roots; few fine tubular pores; common prominent brown (7.5YR 5/4) clay films on faces of peds; few fine mica flakes; 20 percent subrounded gravel less than 0.5 cm in diameter; very strongly acid; gradual smooth boundary.

Bt2--54 to 152 cm, brown (7.5YR 5/4) and dark red (2.5YR 4/8) clay; moderate medium and coarse subangular blocky structure; very firm, very sticky, very plastic; few fine tubular pores; many prominent brown (7.5YR 5/4) clay films on faces of peds; 5 percent subrounded gravel less than 0.5 cm in diameter; common fine and medium mica flakes; very strongly acid; clear smooth boundary.

2BCt--152 to 164 cm, brownish yellow (10YR 6/8), dark red (2.5YR 4/6), and light gray (7.5YR 7/1) sandy clay loam; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; many prominent brown (7.5YR 4/4) clay flows along parallel fractures; common fine mica flakes; very strongly acid; clear smooth boundary.

2C--164 to 179+ cm, dark red (2.5YR 4/6) and very pale brown (10YR 7/4) fine sandy loam; single grain; loose, nonsticky, nonplastic; few medium and common fine mica flakes; very strongly

acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
Bt1	38-54	10.5	15.4	17.5	16.5	9.8	69.7	2.2	28.1
Bt2	54-152	0.4	1.1	4.1	10.3	9.1	25.0	17.5	57.5
2BCt	152-164	1.5	9.8	18.6	20.0	9.2	59.1	18.6	22.3
2C	164-179	1.4	9.7	17.9	19.1	8.7	56.8	33.6	9.6

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Bt1	38-54	4.92	2.75	1.30	0.08	5.00	0.30	9.13	4.43	45.24	93.23
Bt2	54-152	4.60	0.61	1.34	0.29	12.00	5.00	14.24	7.24	15.73	30.94
2BCt	152-164	4.57	0.18	0.62	0.19	21.20	5.40	22.19	6.39	4.46	15.49
2C	164-179	4.74	0.13	0.28	0.10	17.00	2.40	17.51	2.91	2.91	17.53

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Bt1	38-54	29	19	10	145	71.0	36.5
Bt2	54-152	51	38	13	1588	98.0	82.5
2BCt	152-164	44	36	8	2698	85.0	47.0
2C	164-179	35	30	5	61	85.0	48.5

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Bt1	38-54	1.69	0.03	36.23	16	7	9
Bt2	54-152	1.55	0.05	41.51	26	19	7
2BCt	152-164	--	--	--	23	14	9
2C	164-179	1.31	0.03	50.57	15	7	8

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	38-54	17	17	9	6	6	3	--
		----- % of clay -----						
		30	30	15	10	10	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **59-3 Mayodan**
Date: 15 August 1996
Described by: P.J. Thomas, J.F. Conta, S.M. Nagle, R.S. Alls
Location: Cumberland County, VA
Physiography: Farmville Triassic Basin
Landscape position: Upland summit
Vegetation: Mixed hardwoods and pines (red oak, sweetgum, dogwood, white oak, hickory, tulip poplar, Virginia pine)
Parent material: Gritty sandstone residuum
Slope gradient: 2%
Drainage class: Moderately well drained
Additional notes:

Profile Description

Ap--0 to 13 cm, dark grayish brown (10YR 4/2) fine sandy loam; moderate medium granular and weak fine subangular blocky structure; friable, nonsticky, nonplastic; many fine roots; common fine tubular pores; strongly acid; clear wavy boundary.

E--13 to 30 cm, light yellowish brown (10YR 6/4) fine sandy loam; weak coarse subangular blocky structure; friable, nonsticky, nonplastic; few fine roots; few coarse and common medium tubular pores; common distinct black (10YR 2/1) iron and manganese concentrations; few fine mica flakes; strongly acid; gradual smooth boundary.

BEt--30 to 49 cm, yellowish brown (10YR 5/6) loam; few fine distinct yellowish red (5YR 5/6) iron concentrations along root channels; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common medium and coarse tubular pores; few faint clay films on faces of peds; common distinct black (10YR 2/1) iron and manganese concentrations; few fine mica flakes; 10 percent rounded quartz gravel; very strongly acid; gradual wavy boundary.

Btss1--49 to 82 cm, dark red (2.5YR 4/6) clay; common medium prominent yellowish brown (10YR 5/8) soft masses of iron and pale brown (10YR 6/3) iron depletions; weak coarse subangular blocky structure; firm, sticky, slightly plastic; few fine roots; few fine and common medium tubular pores; few faint clay films on faces of peds; common distinct slickensides 5 cm in width and 5 cm in length; sand-coated pressure faces; strongly acid; gradual wavy boundary.

Btss2--82 to 140+ cm, strong brown (7.5YR 4/6) clay; common medium prominent light gray (10YR 7/2) iron depletions and dark red (2.5YR 4/6) soft masses of iron; weak coarse prismatic parting to weak medium subangular blocky structure; very firm, very sticky, very plastic; few fine roots; few medium tubular pores; many prominent slickensides 30 cm in length and 15 cm in width; few fine mica flakes; strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
BE	30-49	2.1	3.2	7.9	20.2	17.1	50.5	30.6	18.9
Btss1	49-82	0.7	1.3	4.7	12.0	10.9	29.6	19.6	50.5
Btss2	82-140	0.3	1.1	4.0	10.9	9.3	25.6	20.3	54.1

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-13	5.42	1.34	0.46	0.27	11.60	0.40	13.67	2.47	15.14	83.81
E	13-30	5.30	0.28	0.09	0.08	7.60	0.60	8.05	1.05	5.59	42.96
BE	30-49	4.95	1.05	0.78	0.13	7.60	1.60	9.56	3.56	20.50	55.06
Btss1	49-82	5.06	3.46	4.82	0.28	11.90	10.70	20.46	19.26	41.84	44.44
Btss2	82-140	5.21	1.35	1.41	0.27	13.80	11.60	16.83	14.63	18.00	20.71

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-13	--	--	NP**	--	--	--
E	13-30	--	--	NP**	--	--	--
BE	30-49	42	25	17	768	93.0	61.0
Btss1	49-82	59	35	24	2864	97.1	77.8
Btss2	82-140	57	39	18	1435	98.0	80.5

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-13	1.39	0.02	47.55	17	6	9
E	13-30	1.67	0.01	36.98	15	10	5
BE	30-49	1.70	0.01	35.85	19	10	9
Btss1	49-82	1.34	0.07	49.43	32	24	8
Btss2	82-140	1.39	0.08	47.55	37	28	9

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss1	49-82	20	10	5	5	3	8	--
		----- % of clay -----						
		40	20	10	10	5	15	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **39-1 Peawick**
Date: 31 July 1997
Described by: P.J. Thomas
Location: Surry County, VA
Physiography: Coastal Plain river terrace
Landscape position: Sideslope
Vegetation: Loblolly pine
Parent material: Clayey fluvial sediments
Slope gradient: 4%
Drainage class: Moderately well drained
Additional notes:

Profile Description

E--0 to 5 cm, brownish yellow (10YR 6/6) loam; weak fine granular structure; friable, nonsticky, nonplastic; few very coarse and common fine and medium roots; many fine continuous tubular pores; few fine mica flakes; very strongly acid; abrupt smooth boundary.

BEt--5 to 25 cm, light yellowish brown (10YR 6/4) clay loam; weak medium subangular blocky structure; friable, sticky, plastic; few fine and very coarse and common medium and coarse roots; many fine continuous tubular pores; few distinct clay films on faces of peds; few fine mica flakes; very strongly acid; clear wavy boundary.

Bt1--25 to 43 cm, brownish yellow (10YR 6/6) clay loam; common medium prominent gray (10YR 6/1) iron depletions; moderate medium subangular blocky structure; firm, sticky, plastic; few fine and very coarse and common medium and coarse roots; common fine and medium continuous tubular pores; common distinct yellowish brown (10YR 5/4) clay bridges on faces of peds; few fine mica flakes; very strongly acid; gradual wavy boundary.

Bt2--43 to 84 cm, strong brown (7.5YR 5/8), gray (10YR 6/1), yellowish brown (10YR 5/8), and reddish gray (10R 6/1) clay loam; moderate coarse prismatic parting to moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine, coarse, and very coarse and common medium roots; common fine and medium pores; common distinct clay films on faces of peds; few fine mica flakes; very strongly acid; gradual wavy boundary.

BCtg--84 to 150+ cm, gray (10YR 6/1) clay; common coarse prominent yellowish brown (10YR 5/6) soft masses of iron; weak coarse prismatic parting to weak medium subangular blocky structure; firm, sticky, plastic; few medium roots; few fine and medium pores; few distinct clay films on faces of peds; few fine mica flakes; very strongly acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
E	0-5	0.7	3.9	2.7	3.0	21.7	32.0	45.9	23.8
BEt	5-25	0.4	1.0	0.9	1.7	22.5	26.5	45.9	27.6
Bt1	25-43	0.2	0.5	0.4	1.4	29.6	32.1	34.0	33.9
Bt2	43-84	0.1	0.1	0.3	1.3	41.1	42.9	22.3	34.8
BCtg	84-150	0.1	0.1	0.1	0.5	15.7	16.5	37.2	46.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
E	0-5	4.59	0.40	1.08	0.44	14.20	11.60	16.12	13.52	11.91	14.20
BEt	5-25	4.62	1.19	2.05	0.18	14.60	11.70	18.02	15.12	18.98	22.62
Bt1	25-43	4.61	1.00	0.80	0.20	13.20	10.80	15.20	12.80	13.16	15.63
Bt2	43-84	4.65	0.88	1.60	0.23	17.60	10.70	20.31	13.41	13.34	20.21
BCtg	84-150	4.21	0.60	1.15	0.16	10.20	7.50	12.11	9.41	15.77	20.30

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	----- % -----	
E	0-5	37	29	8	464	95.0	82.5
BEt	5-25	31	24	7	589	98.6	88.8
Bt1	25-43	50	34	16	1602	99.0	88.0
Bt2	43-84	36	29	7	2957	99.7	85.0
BCtg	84-150	53	36	17	3822	99.8	94.1

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
E	0-5	--	--	--	22	15	7
BEt	5-25	--	--	--	23	11	12
Bt1	25-43	1.14	0.08	56.98	29	17	12
Bt2	43-84	1.16	0.10	56.23	24	16	8
BCtg	84-150	1.20	0.07	54.72	32	19	13

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	43-84	10	10	3	3	2	5	--
		----- % of clay -----						
		30	30	10	10	5	15	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **39-2 Peawick**
Date: 31 July 1997
Described by: P.J. Thomas
Location: Surry County, VA
Physiography: Coastal Plain river terrace
Landscape position: Sideslope
Vegetation: Loblolly pine
Parent material: Clayey fluvial sediments
Slope gradient: 5%
Drainage class: Moderately well drained
Additional notes:

Profile Description

E--0 to 5 cm, light yellowish brown (10YR 6/4) clay loam; weak fine granular structure; friable, nonsticky, nonplastic; few medium and common fine roots; many medium continuous tubular pores; few fine mica flakes; very strongly acid; abrupt wavy boundary.

Btg1--5 to 50 cm, gray (10YR 6/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/8) soft masses of iron; moderate medium subangular blocky structure; friable, sticky, plastic; few fine and coarse and common medium roots; common fine and medium continuous tubular pores; common distinct clay films on faces of peds; few fine mica flakes; very strongly acid; gradual wavy boundary.

Bt--50 to 77 cm, strong brown (7.5YR 5/8) clay loam; many coarse prominent gray (10YR 6/1) iron depletions; moderate medium subangular blocky structure; friable, sticky, plastic; few coarse and very coarse and common medium and few fine roots; common fine and medium and few coarse continuous tubular pores; common distinct clay bridges on faces of peds; few fine mica flakes; very strongly acid; gradual wavy boundary.

Btg2--77 to 122 cm, light gray (10YR 6/1) clay loam; many coarse prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/8) soft masses of iron; moderate coarse prismatic parting to moderate medium subangular blocky structure; friable, sticky, plastic; few medium and coarse roots; common fine and medium pores; common distinct clay films on faces of peds; few fine mica flakes; very strongly acid; gradual wavy boundary.

Cg--122 to 150+ cm, light gray (10YR 7/1) silt loam; common coarse prominent yellowish brown (10YR 5/6) soft masses of iron; massive; friable, slightly sticky, slightly plastic; few medium roots; few fine and medium pores; few fine mica flakes; extremely acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
E	0-5	0.2	1.4	1.5	2.9	29.8	35.8	28.4	35.8
Btg1	5-50	0.1	0.1	0.3	0.7	13.9	15.1	47.2	37.7
Bt	50-77	1.0	1.3	6.5	17.0	11.0	36.8	26.5	36.7
Btg2	77-122	0.1	0.1	0.3	1.3	41.1	42.9	22.3	34.8
Cg	122-150	3.0	3.7	2.8	3.6	1.1	14.2	65.8	20.0

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
E	0-5	4.59	0.40	1.08	0.44	14.20	11.60	16.12	13.52	11.91	14.20
Btg1	5-50	4.62	1.19	2.05	0.18	14.60	11.70	18.02	15.12	18.98	22.62
Bt	50-77	4.61	1.00	0.80	0.20	13.20	10.80	15.20	12.80	13.16	15.63
Btg2	77-122	4.65	0.88	1.60	0.23	17.60	10.70	20.31	13.41	13.34	20.21
Cg	122-150	4.21	0.60	1.15	0.16	10.20	7.50	12.11	9.41	15.77	20.30

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	----- % -----	
E	0-5	40	31	9	644	98.0	84.5
Btg1	5-50	45	27	18	1449	98.4	94.1
Bt	50-77	58	38	20	1643	96.0	70.5
Btg2	77-122	45	31	14	1393	99.8	85.0
Cg	122-150	29	23	6	75	92.8	86.4

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
E	0-5	--	--	--	21	16	5
Btg1	5-50	1.18	0.05	55.47	33	17	16
Bt	50-77	1.14	0.04	56.98	39	27	12
Btg2	77-122	1.15	0.07	56.60	29	27	2
Cg	122-150	--	--	--	18	12	6

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt	50-77	15	13	4	2	--	4	--
		----- % of clay -----						
		40	35	10	5	--	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **39-3 Peawick**
Date: 30 July 1997
Described by: P.J. Thomas
Location: Surry County, VA
Physiography: Coastal Plain river terrace
Landscape position: Broad interfluve
Vegetation: Loblolly pine, locust, holly, sweetgum, dogwood
Parent material: Clayey fluvial sediments
Slope gradient: 0%
Drainage class: Moderately well drained
Additional notes:

Profile Description

A&E--0 to 10 cm, dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; few coarse and common medium continuous tubular pores; few fine mica flakes; extremely acid; clear wavy boundary.

Bt1--10 to 39 cm, yellowish brown (10YR 5/6) silty clay; strong fine and medium subangular and angular blocky structure; firm, very sticky, very plastic; common fine roots; few medium and coarse continuous tubular pores; many prominent brown (10YR 5/3) clay bridges on faces of peds; few fine mica flakes; very strongly acid; clear wavy boundary.

Bt2--39 to 93 cm, yellowish brown (10YR 5/6) clay; many coarse prominent gray (10YR 6/1) iron depletions; moderate fine and medium subangular blocky structure; firm, very sticky, very plastic; few medium roots; few medium pores; common prominent clay films on faces of peds; few fine mica flakes; extremely acid; gradual smooth boundary.

BCt--93 to 150+ cm, strong brown (7.5YR 5/6), gray (10YR 6/1) yellowish red (5YR 4/6), and yellowish brown (10YR 5/6) silty clay loam; weak medium subangular blocky structure; friable, sticky, plastic; few coarse roots; few medium pores; common distinct clay films on faces of peds; few fine mica flakes; extremely acid.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V. Coarse	Coarse	Medium	Fine	V. Fine	Total		
	<i>cm</i>	----- % -----							
A&E	0-10	0.8	1.5	7.8	9.0	2.9	22.0	56.1	21.9
Bt1	10-39	1.0	1.3	1.5	1.3	6.6	11.7	39.9	48.4
Bt2	39-93	1.4	1.1	1.0	1.2	1.4	6.1	33.6	60.3
BCt	93-150	2.5	2.1	1.6	3.4	1.0	10.6	56.8	32.6

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
A&E	0-10	4.38	0.43	0.29	0.13	10.00	7.30	10.85	8.15	7.83	10.43
Bt1	10-39	4.48	0.49	0.99	0.20	18.60	7.60	20.28	9.28	8.28	18.10
Bt2	39-93	4.44	0.05	1.17	0.10	13.60	6.00	14.92	7.32	8.85	18.03
BCt	93-150	4.41	0.05	1.19	0.16	14.60	10.8	16.00	12.20	8.75	11.48

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
A&E	0-10	31	24	7	61	96.0	79.9
Bt1	10-39	74	44	30	2434	97.4	92.9
Bt2	39-93	58	38	20	2531	97.5	94.7
BCt	93-150	50	38	12	1602	95.3	90.2

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
A&E	0-10	--	--	--	26	9	17
Bt1	10-39	1.20	0.08	54.72	36	23	13
Bt2	39-93	1.26	0.08	52.45	32	23	9
BCt	93-150	1.26	0.09	52.45	34	19	15

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Bt2	39-93	21	12	6	6	--	9	--
		----- % of clay -----						
		35	20	10	10	--	15	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **66-1 Waxpool**
Date: 30 August 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls, J.C. Baker, M.H. Stolt, D. Brown
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Hardwoods (white oak - dominant, cedar)
Parent material: Diabase
Slope gradient: 0%
Drainage class: Somewhat poorly drained
Additional notes: Slickenside orientation is from NE-SW on bottom of large peds in Btss3; albic-like horizon 19-24 cm; thin C horizon just above Cr

Profile Description

Ap--0 to 8 cm, dark grayish brown (10YR 4/2) loam; common fine distinct light brownish gray (10YR 6/2) iron depletions; weak medium granular and weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine, common fine, and few medium and coarse roots; common fine pores; strongly acid; common wavy boundary.

BEg--8 to 24 cm, light brownish gray (10YR 6/2) silt loam; many medium distinct light olive brown (2.5Y 5/4) masses; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and few medium and coarse roots; common fine pores; very strongly acid; clear wavy boundary.

Btss1--24 to 56 cm, light olive brown (2.5Y 5/4) clay; many coarse prominent gray (10YR 5/1) iron depletions; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine, medium, and coarse roots; few fine pores; common prominent clay films on faces of peds; common prominent slickensides 8 cm in width and 5 cm in length; very strongly acid; diffuse smooth boundary.

Btss2--56 to 78 cm, light olive brown (2.5Y 5/6) clay; fine medium prominent light gray (10YR 6/1) iron depletions; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine and medium roots; few fine pores; many prominent yellowish brown (10YR 5/4) clay films on faces of peds; common prominent slickensides 10 cm in width and 8 cm in length; very strongly acid; diffuse smooth boundary.

Btss3--78 to 102 cm, light olive brown (2.5Y 5/4) clay; many common prominent gray (10YR 5/1) iron depletions and common coarse distinct yellowish brown (10YR 5/6) masses; moderate medium subangular blocky structure; firm, very sticky, very plastic; few fine and medium roots; few fine pores; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common prominent slickensides 10 cm in width; very strongly acid; clear wavy boundary.

BCt--102 to 115 cm, black (N 2/0), strong brown (7.5YR 4/6), and dark yellowish brown (10YR 4/4) sandy loam; weak medium and coarse subangular blocky structure; friable and firm, slightly sticky, nonplastic; few fine pores; neutral; diffuse smooth boundary.

Cr--115 to 142 cm, very dark brown (10YR 2/2), dark brown (7.5YR 4/4), and olive brown (2.5Y 4/4) silt loam; massive; friable, nonsticky, nonplastic; 20 percent brittle; neutral.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-8	7.5	9.8	4.8	6.3	6.8	35.2	49.3	15.5
BE	8-24	5.6	7.7	3.2	4.5	6.7	27.7	56.9	15.4
Btss1	24-56	3.6	5.9	3.2	3.9	3.7	20.3	16.1	63.6
Btss2	56-78	1.1	2.6	2.0	3.4	3.7	12.8	19.2	68.0
Btss3	78-102	1.3	2.5	1.9	3.6	4.0	13.3	21.5	65.2
BCt	102-115	16.4	16.0	9.9	13.2	8.9	64.4	17.1	18.5
Cr	115-142	5.4	6.1	4.1	6.3	5.5	27.4	55.6	17.0

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Ap	0-8	5.23	5.72	4.06	0.22	10.00	0.40	20.00	10.40	50.00	96.15
BE	8-24	4.76	0.44	0.93	0.05	6.60	1.80	8.02	3.22	17.71	44.10
Btss1	24-56	4.47	6.07	10.10	0.26	19.20	7.70	35.63	24.13	46.11	68.09
Btss2	56-78	4.46	6.43	13.85	0.23	13.60	9.50	34.11	30.01	60.06	68.34
Btss3	78-102	5.02	8.29	14.20	0.26	6.20	3.40	28.95	26.15	78.58	87.00
BCt	102-115	6.61	8.82	18.45	0.19	7.40	0.40	34.86	27.86	78.77	98.56
Cr	115-142	6.78	7.74	8.20	0.10	1.20	0.40	17.24	16.44	93.04	97.57

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft²</i>	-----%-----	
Ap	0-8	41	31	10	--	82.0	69.0
BEg	8-24	26	23	3	--	86.0	76.9
Btss1	24-56	65	34	31	3128	90.0	82.3
Btss2	56-78	76	36	40	5334	95.9	89.8
Btss3	78-102	81	32	49	4654	95.6	89.4
BCt	102-115	--	--	NP**	--	65.6	41.3
Cr	115-142	--	--	NP**	--	87.8	76.4

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>			----- % -----		
Ap	0-8	1.47	0.01	44.54	24	14	10
BEg	8-24	1.54	0.02	41.98	23	9	14
Btss1	24-56	1.20	0.15	54.66	41	31	10
Btss2	56-78	1.20	0.18	54.68	44	32	12
Btss3	78-102	1.17	0.19	55.73	46	28	18
BCt	102-115	1.27	0.10	51.97	37	17	20
Cr	115-142	2.09	0.01	21.08	11	8	3

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss2	56-78	10	27	17	7	3	3	--
		----- % of clay -----						
		15	40	25	10	5	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **66-2 Waxpool**
Date: 31 August 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Pasture (fescue and ryegrass)
Parent material: Basalt
Slope gradient: 1%
Drainage class: Somewhat poorly drained
Additional notes: Slickenside orientation is NW-SE and is tilted backwards in the profile in the Btssc, Btss, and BCtss horizons.

Profile Description

Ap--0 to 19 cm, brown (10YR 5/3) silt loam; few fine prominent brownish yellow (10YR 6/8) masses; weak medium granular and subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine and few medium roots; many fine and few medium pores; 1 percent rounded quartz gravel 8 cm in diameter; neutral; abrupt smooth boundary.

Btssc--19 to 40 cm, yellowish brown (10YR 5/8) silty clay; weak coarse and moderate medium subangular blocky structure; firm, very sticky, very plastic; common fine roots; common fine pores; common distinct brown (10YR 5/3) clay films on faces of peds; few prominent slickensides 5 cm in width and 5 cm in length; few distinct black (10YR 2/1) nodules; 1 percent rounded quartz gravel 2 to 8 cm in diameter; neutral; gradual smooth boundary.

Btss--40 to 62 cm, brownish yellow (10YR 6/6) clay; moderate medium and coarse subangular blocky structure; firm, very sticky, very plastic; common distinct brown (10YR 5/3) clay films on faces of peds; common prominent slickensides 10 in width and 30 cm in length; 1 percent rounded quartz gravel 2 to 8 cm in diameter; slightly alkaline; clear wavy boundary.

BCtss--62 to 82 cm, very dark gray (N 3/0) clay; common coarse distinct light gray (10YR 6/1) iron depletions and few fine distinct pink (5YR 7/4) masses; weak coarse subangular blocky structure; firm, very sticky, very plastic; very few fine roots; few fine pores; few faint strong (7.5YR 4/6) clay films on faces of peds; common prominent slickensides 10 cm in width and 30 cm in length on macropeds and few prominent slickensides 5 cm in width and 5 cm in length on micropeds; 10 percent basalt gravel that increases with depth; small pocket of gray (N 5/0) and pinkish gray (7.5YR 7/2) coarser material; neutral; gradual wavy boundary.

R--82 to 130 cm, very dark gray (N 3/0) basalt; common prominent yellowish red (5YR 5/6) and dark reddish brown (2.5YR 3/4) clay coatings on rock faces.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap	0-19	5.4	6.1	4.1	6.3	5.5	27.4	55.6	17.0
Btssc	19-40	0.7	1.0	0.8	1.9	1.6	6.0	48.9	45.1
Btss	40-62	1.5	1.4	1.4	2.1	2.0	8.4	27.5	64.1
BCtss	62-82	3.7	4.4	3.8	5.0	4.9	21.8	37.9	40.3

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----							----- % -----	
Ap	0-19	7.00	7.25	1.83	0.06	3.20	0.20	12.34	9.34	74.07	97.86
Btssc	19-40	6.66	9.94	10.15	0.26	3.00	0.10	23.35	20.45	87.15	99.51
Btss	40-62	7.47	10.80	14.60	0.33	0.60	0.40	26.33	26.13	97.72	98.47
BCtss	62-82	7.33	9.62	18.60	0.19	1.60	0.20	30.01	28.61	94.67	99.30

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap	0-19	29	21	8	458	87.8	76.4
Btssc	19-40	72	34	38	4569	98.1	95.1
Btss	40-62	72	33	39	4781	96.7	92.9
BCtss	62-82	56	32	24	2158	91.1	81.4

*Estimated from particle size distribution (Table 1).

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap	0-19	1.64	0.02	38.01	20	9	11
Btssc	19-40	1.23	0.14	53.51	37	28	9
Btss	40-62	1.31	0.12	50.51	35	30	5
BCtss	62-82	1.35	0.08	49.13	32	26	6

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss	40-62	6	38	6	3	6	3	--
		----- % of clay -----						
		10	60	10	5	10	5	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

Soil type: **66-3 Waxpool**
Date: 27 October 1994
Described by: P.J. Thomas, D.R. Hatch, R.S. Alls, H. Mast
Location: Fauquier County
Physiography: Triassic Basin (Culpeper)
Landscape position: Broad flat
Vegetation: Cropland (corn stubble)
Parent material: Shale colluvium over diabase
Slope gradient: 2%
Drainage class: Somewhat poorly drained
Additional notes: Slickenside orientation is from NW-SE in Btss

Profile Description

Ap1--0 to 12 cm, dark grayish brown (10YR 4/2) loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; common fine and medium roots; common fine and medium pores; 2 percent shale gravel 3 cm in diameter; slightly acid; clear smooth boundary.

Ap2--12 to 24 cm, brown (10YR 4/3) loam; friable, slightly sticky, slightly plastic; common fine and medium roots; common fine and medium pores; 5 percent shale gravel 3 cm in diameter; neutral; abrupt smooth boundary.

2Btss--24 to 62 cm, yellowish brown (10YR 5/6) clay; common fine distinct strong brown (7.5YR 5/6) masses throughout and common medium prominent light gray (10YR 6/1) iron depletions along ped faces; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky structure; very firm, very sticky, very plastic; common fine and few medium roots; common fine pores; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct slickensides on tops of prisms 5 cm in width and 5 cm in length; very strongly acid; clear smooth boundary.

BCt--62 to 86 cm, strong brown (7.5YR 5/6) sandy loam; massive parting to weak medium and coarse subangular blocky structure; firm, sticky, plastic; few fine roots along ped faces; few fine pores; few distinct yellowish red (5YR 5/6) clay films on faces of peds; many prominent black (10YR 2/1) manganese coatings; strongly acid; gradual wavy boundary.

C--86 to 122 cm, yellowish brown (10YR 5/6) coarse sand; common medium distinct strong brown (7.5YR 5/8) masses; rock controlled structure, bedding planes northwest to southeast; very friable, nonsticky, nonplastic, moderately hard dry; few fine roots in bedding planes; common prominent black (10YR 2/1) manganese coatings; neutral.

Table 1. Particle size distribution.

Horizon	Depth	Sand						Silt	Clay
		V.Coarse	Coarse	Medium	Fine	V.Fine	Total		
	<i>cm</i>	----- % -----							
Ap1	0-12	4.7	7.1	6.4	10.6	7.7	36.5	42.7	20.8
Ap2	12-24	4.6	6.1	5.6	10.2	9.0	35.5	46.6	17.9
Btss	24-62	0.1	1.2	4.3	10.5	9.0	25.1	22.4	52.5
BCt	62-86	11.9	17.3	16.8	17.3	9.8	73.1	12.7	14.2
C	86-122	32.8	26.3	15.4	10.7	4.5	89.7	6.9	3.4

Table 2. Chemical Properties.

Horizon	Depth	pH	Exchangeable Cations					CEC	ECEC	BS	EBS
			Ca ²⁺	Mg ²⁺	K ⁺	H ⁺	Al ³⁺				
	<i>cm</i>		----- <i>cmol_c kg⁻¹ of soil</i> -----						----- % -----		
Ap1	0-12	6.22	8.87	3.90	1.12	9.20	0.20	23.09	14.09	60.16	98.58
Ap2	12-24	6.79	9.17	5.15	0.62	10.00	0.30	24.94	15.24	59.90	98.03
Btss	24-62	4.59	11.43	16.30	0.25	16.80	1.40	44.78	29.38	62.48	95.23
BCt	62-86	5.51	11.53	20.75	0.20	11.00	1.90	43.48	34.38	74.70	94.47
C	86-122	6.95	12.29	25.60	0.12	1.60	0.60	39.61	38.61	95.96	98.45

Table 3. Engineering Properties.

Horizon	Depth	Atterberg Limits			Swell Index	% Passing	
		Liquid Limit	Plastic Limit	Plasticity Index		40 Sieve*	200 Sieve*
	<i>cm</i>				<i>lbs ft⁻²</i>	-----%-----	
Ap1	0-12	37	28	9	435	87.0	68.7
Ap2	12-24	38	24	14	2984	88.0	70.8
Btss	24-62	61	44	17	3114	97.9	81.0
BCt	62-86	39	31	8	679	68.0	33.0
C	86-122	--	--	NP**	--	37.7	13

*Estimated from particle size distribution (Table 1).

**NP=non-plastic.

Table 4. Physical Properties.

Horizon	Depth	Bulk Density	COLE*	Porosity	-1/3 bar Water	-15 bar Water	Available Water
	<i>cm</i>	<i>g cm⁻³</i>		----- % -----			
Ap1	0-12	1.49	0.04	43.79	22	15	7
Ap2	12-24	1.59	0.04	40.04	30	28	2
Btss	24-62	1.29	0.12	51.40	34	33	1
BCt	62-86	1.45	0.05	45.40	24	22	2
C	86-122	1.58	0.05	40.40	19	15	4

*COLE=coefficient of linear extensibility.

Table 5. Mineralogical Properties.

Horizon	Depth	KAO*	SME	INT	VER	HIV	MIC	GIB
	<i>cm</i>	----- % of soil -----						
Btss	24-62	5	26	8	5	3	5	--
		----- % of clay -----						
		10	50	15	10	5	10	--

*KAO=kaolinite; SME=smectite (montmorillonite); INT=interstratified (superstructure) minerals (2:1+2:1, 2:1+1:1); VER=vermiculite; HIV=hydroxy interlayered vermiculite; MIC=mica; GIB=gibbsite.

A.3. SPECIFIC SURFACE AREAS

Table A.6. Specific surface area for Bt horizons of soil series.

Soil Series	Site	Specific Surface Area	Average	Specific Surface Area	Average
		<i>m² g⁻¹ clay</i>	<i>m² g⁻¹ clay</i>	<i>m² g⁻¹ soil</i>	<i>m² g⁻¹ soil</i>
Carbo	25-1	470		335	
	25-2	356	433	325	319
	25-3	473		298	
Cecil	56-1	347		199	
	56-2	299	274	203	164
	56-3	175		89	
Creedmoor	61-1	736		257	
	61-2	845	635	154	195
	61-3	324		175	
Craven	83-1	375		134	
	83-2	356	374	173	157
	83-3	391		164	
Davidson	165-1	229	229	156	156
Frederick	40-1	268		203	
	40-2	307	334	243	202
	40-3	427		160	
Iredell	62-1	354	354	241	241
Jackland	67-1	473		325	
	67-2	542	505	368	341
	67-3	499		330	

Soil Series	Site	Specific Surface Area	Average	Specific Surface Area	Average
		<i>m² g⁻¹ clay</i>	<i>m² g⁻¹ clay</i>	<i>m² g⁻¹ soil</i>	<i>m² g⁻¹ soil</i>
Kelly	63-1	387		275	
	63-2	572	526	268	316
	63-3	618		406	
Mayodan	59-1	430		121	
	59-2	588	458	225	176
	59-3	355		192	
Peawick	39-1	308		107	
	39-2	402	351	260	181
	39-3	342		175	
Waxpool	66-1	682		463	
	66-2	634	644	406	397
	66-3	615		323	

A.4. X-RAY DIFFRACTION PATTERNS FOR SELECTED Bt2 HORIZONS

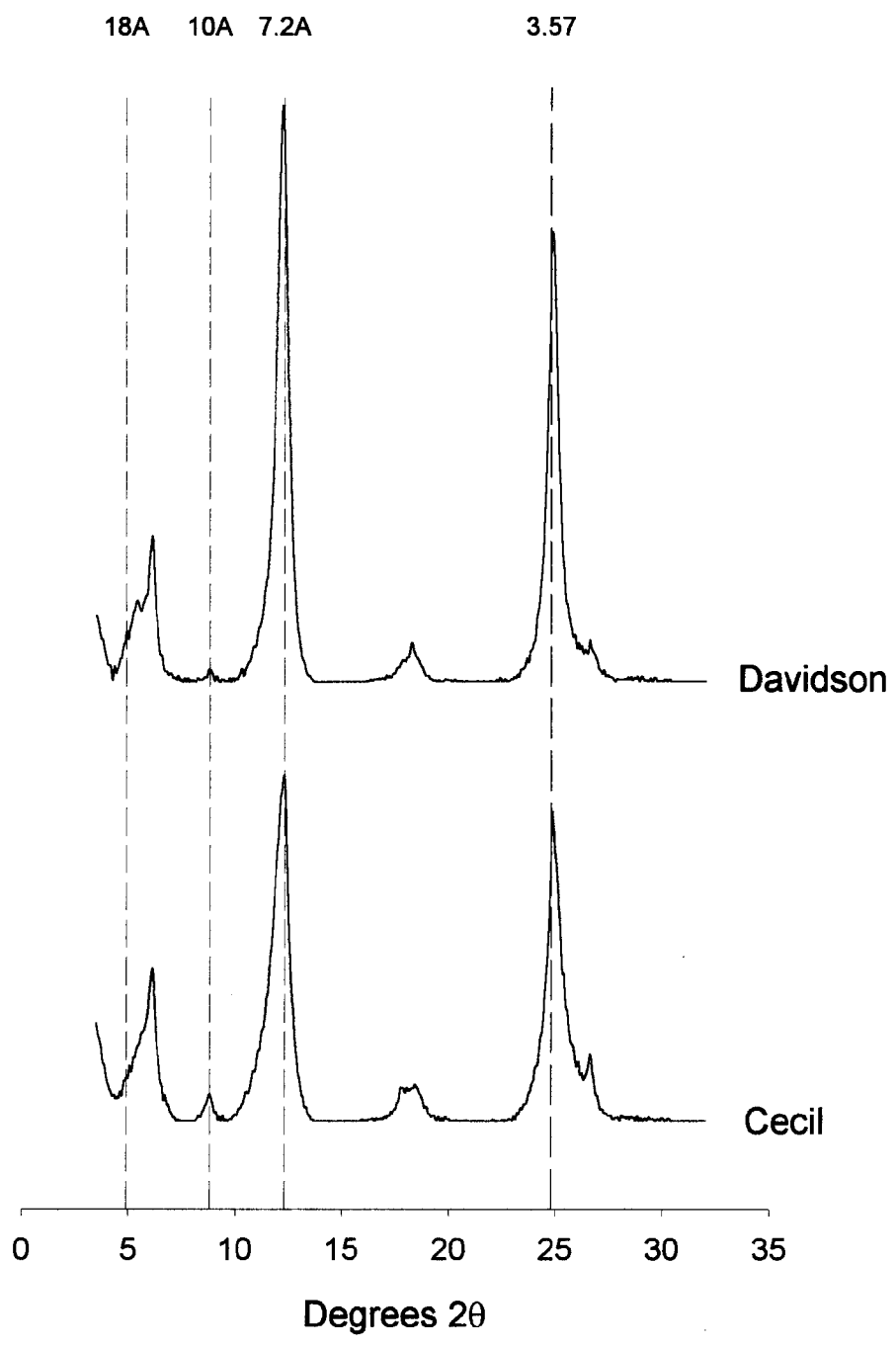


Figure A.2. X-ray diffraction patterns of Bt2 horizons for moderate shrink-swell potential soils.

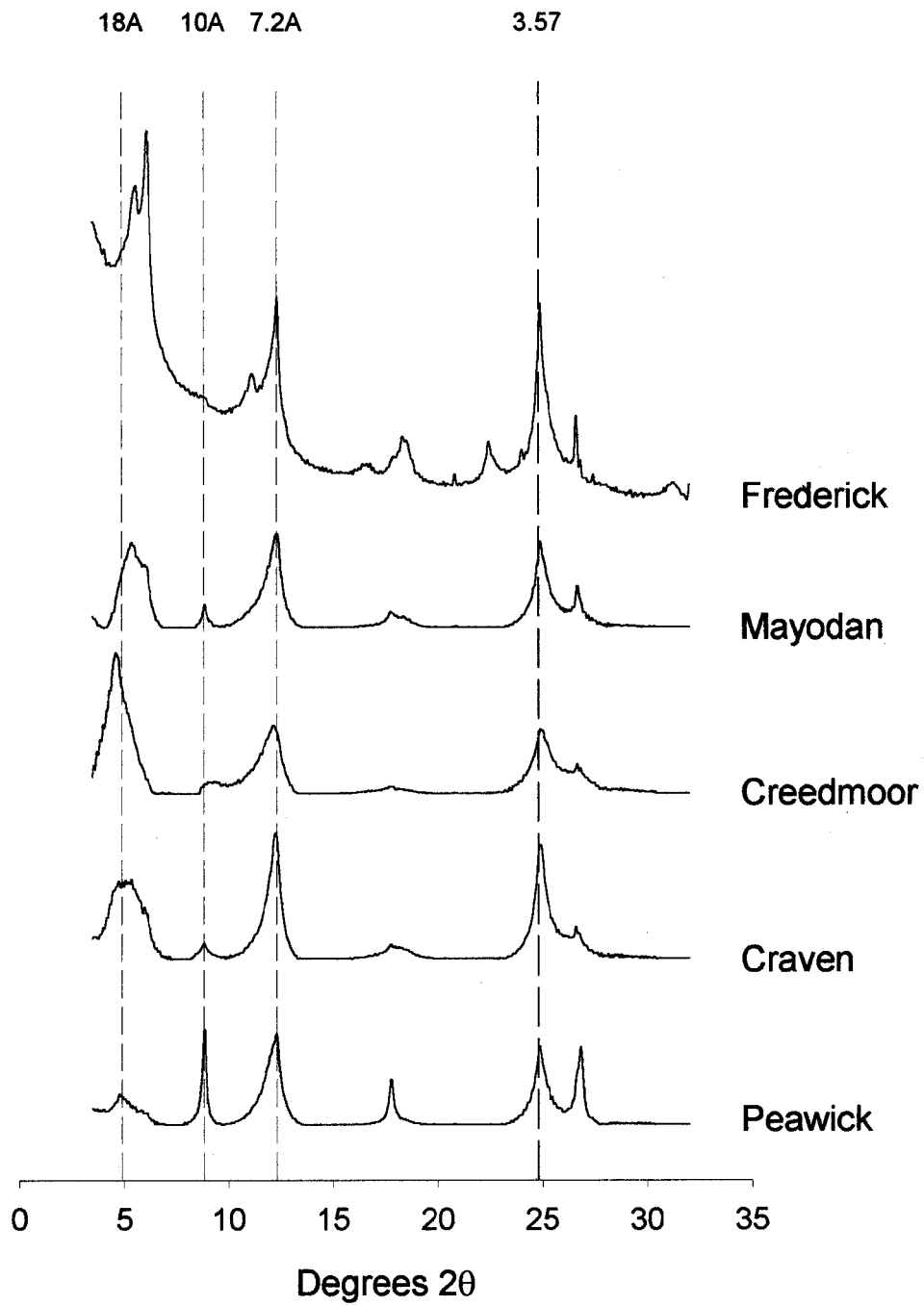


Figure A.3. X-ray diffraction patterns of Bt2 horizons for moderate to high shrink-swell potential soils.

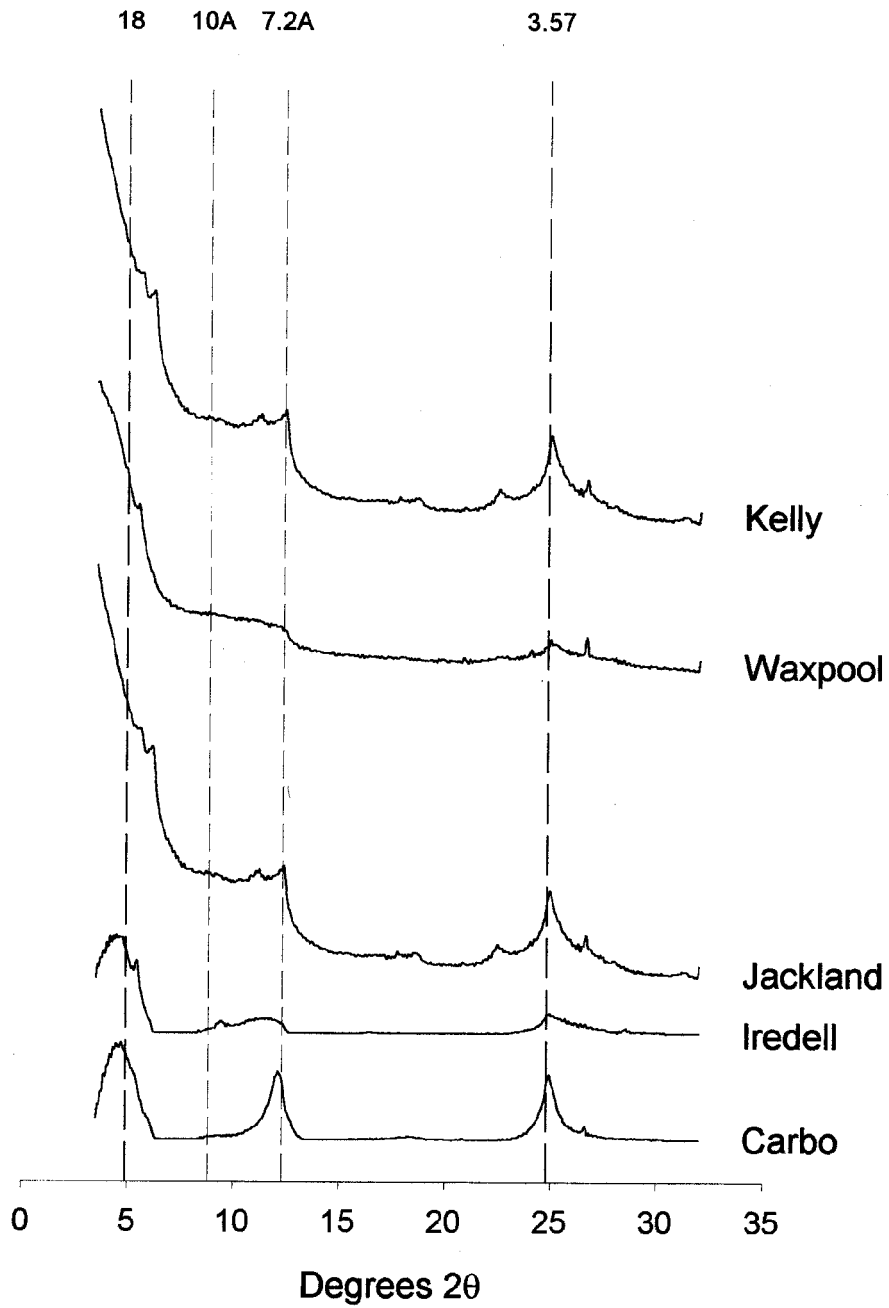
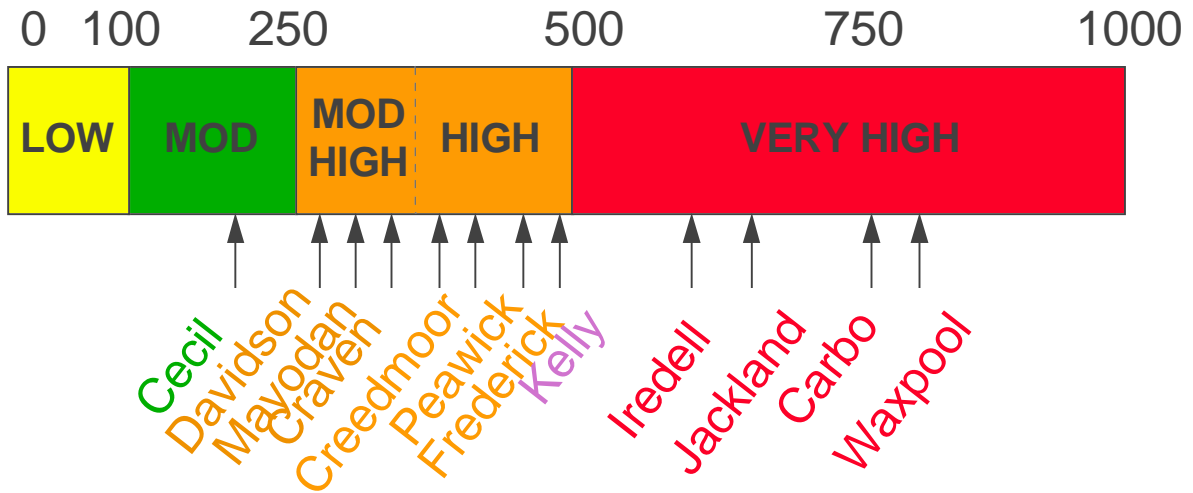
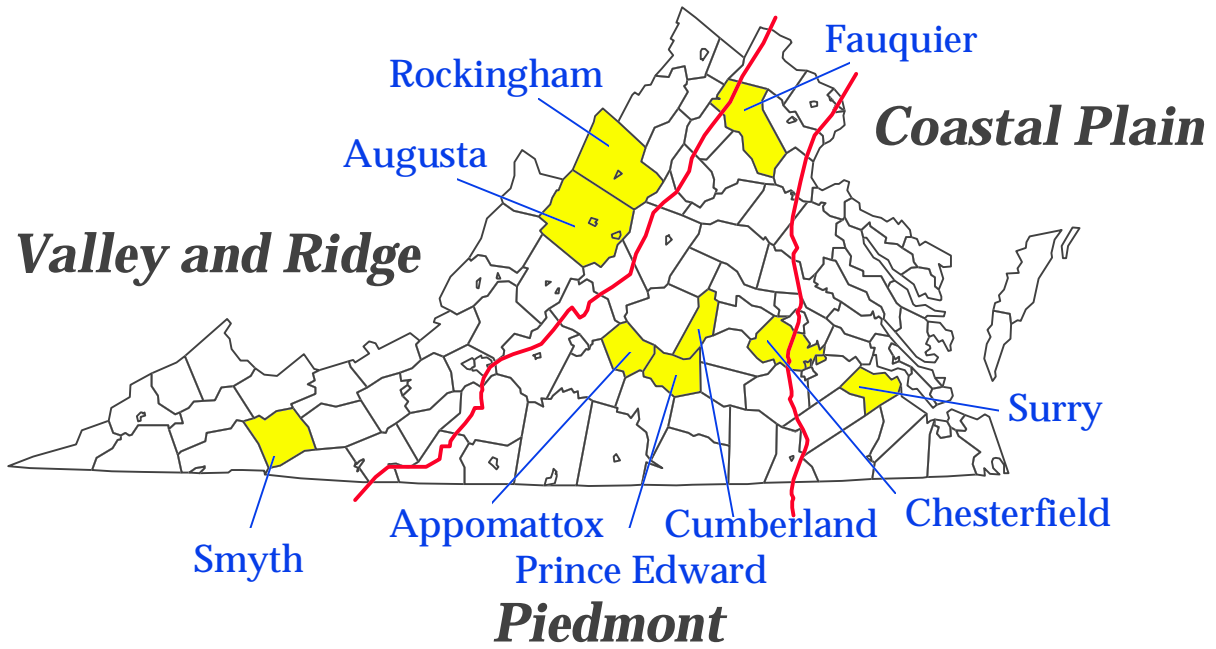


Figure A.4. X-ray diffraction patterns of Bt2 horizons for very high shrink-swell potential soils.

A.5. EXPANSIVE SOIL INDEX DIAGRAM



A.6. STUDY LOCATIONS



Triassic Basin study locations in Prince Edward, Chesterfield, and Fauquier Counties.