



Supplement of

Soil signals of key mechanisms driving greater protection of organic carbon under aspen compared to spruce forests in a North American montane ecosystem

Lena Wang et al.

Correspondence to: Pamela L. Sullivan (sullipam@oregonstate.edu)

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Horizon	Original Depth	Corrected Depth	Bnd ^a	Color	D Moist	Text ^b	Coarse Fract ^c	Fraction Gr	St	B	Structure ^d	Consistence ^e	Dry	Moist	Stick	Plast	PVSF ^f	Roots ^g	Pores ^h	Efferv ⁱ
CC2 (Conifer-Sandstone Site) - [38.862703, -107.033522] 9357 ft., 352'																				
Oe	0-5	5-0	aw															3vf,1fT		
A	5-21	0-16	as	7.5YR3/2	cl	2	8	0	0	2vf,fg, 1-	s	vs			vp			1vf,f,3m,1c	3vfIG, 1fDT	ne
B/Ct	21-61.5	16-56.5	vs	10YR4/4	sl	5	2	0	0	1vf,f,msbk,	sh	ss			po	1dpFEFPf		1vf,f,2mT	3vfIG, 2fDT	ne
2A	61.5-64	56.5-59	vs	10YR3/2	sicl	0	0	0	0	ma		vfr	ms		vp			1vfT	3vfIR	ne
2Bwt	64-70	59-65	vs	10YR5/4	scl	0	0	0	0	1vfbsk, sg		vfr	vs		vp	0dpCLFPf		1fT		ne
2Bt	70-72	65-67	vs	10YR5/4	sic	0	0	0	0	ma		vfr	vs		vp	2fcCLFCf		1f,m,cT	3vfIR	ne
2CBw	72-96+	67-91+		10YR4/6	ls	0	2	0	0	1vf,fsbk, sg		vfr	ss		sp			1f,2mT	3vfIR	ne
CC2 Notes																				
Oe	Texture appeared to be somewhat variable in different locations in the pit																			
B/Ct	8 cm diameter krotovina observed from 12-25 cm below the surface; 5 mm charcoal concentrations observed in the backfilled material of the krotovina																			
2A	2-5 mm charcoal concentrations observed; brown-reddish stains observed just below this horizon interpreted as possible thermal transformation from goethite to hematite																			
2Bwt																				
2Bt	Horizon interpreted as a 2-cm thick clay lamellae																			
2CBw	2-10 mm charcoal concentrations observed																			
^a Bnd, boundary; v, very abrupt; a, abrupt; c, clear; g, gradual; s, smooth; w, wavy; i, irregular; b, broken. ^b Text, Texture; ls, loamy sand; sl, sandy loam; scl, sandy clay loam; cl, clay loam; sicl, silty clay loam; sic, silty clay. ^c Gr, gravel; Cb, cobbles; St, Stones; Bd, boulder. ^d 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; co, coarse; vc, very coarse; gr, granular; sbk, subangular blocky; sg, single grained; ma, massive; -, to; /. ^e Stick, stickiness; plast, plasticity; s, soft; sh, slightly hard; vfr, very friable; ss, slightly sticky; ms, moderately sticky; vs, very sticky; po, non-plastic; sp, slightly plastic; mp, plastic. ^f PVSF, ped/void surface features; 0, very few (<5%); 1, few (5-25%); f, faint; d, distinct; r, prominent; p, patchy; n, discontinuous; c, continuous; CLF, clay films; BRf, clay 0, very few; 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; co, coarse; vc, very coarse; T, throughout; R, matted around rock fragments. ^h 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; DT, dendritic tubular; IG, irregular; TU, tubular; IR, interstitial. ⁱ Efferv, effervescence; ne, non-effervescent.																				

Horizon	Original Depth	Corrected Depth	Bnd ^a	Color D Moist	Text ^b	Coarse Fraction				Structure ^d	Consistence ^e			PVSF ^f	Roots ^g	Pores ^h	Efferv ⁱ												
						Gr	Cb	St	B		Dry	Moist	Stick	Plast															
CC3 [Conifer-Granite Elk Site] - [38.859111, -107.066069] 9902 ft., 36"																													
Oi	0-1	2-1	as						0						2vf,1f,m,c,v														
Oe	1-2	1-0	as						0						2vf,1f,3m,1														
A	2-10	0-8	aw	10YR3/2	I	2	5	0	0	1-2m,cosbk	sh		ms	mp	1vf,2f,2m,c,	2vf,fDT	ne												
Bt1	10-21	8-19	cw	7.5YR6/4	scl	2	10	0	0	1cosbk / 1msbk	sh		ms	mp	0fpCLFdT, 0dpCLF,FE Frfr	1vcT 2vct 2fDT	3vfIG ne												
2Bt2	21-61	19-59	gw	7.5YR4/3	scl	40	10	30	0	3vfsbk	I		vs		0- 1dpBRFfg, 3d,rcCLF,F EFgr.cb	3vf,f,2m,1c, vcT	3f,m,c,vclIR ne												
2Bt3	61-92+	59-90+			scl	25	5	50	0	2vfsbk	I		ms		1dpBRFfg, 1dpCLF,FE Fgr.cb	1vf,2f,m,1v cT	2m,3c,vclIR ne 3vf,fiG												
CC3 Notes																													
Oi																													
Oe																													
A						Few (5-25%)				1-3 mm charcoal concentrations observed																			
Bt1						Few (5-25%)				1-3 mm charcoal concentrations observed																			
2Bt2						Texture was assessed without a sieve in the field; many of the structural units are associated with very fine and fine root masses																							
2Bt3						Texture was assessed without a sieve in the field																							
^a Bnd, boundary; v, very abrupt; a, abrupt; c, clear; g, gradual; s, smooth; w, wavy; i, irregular; b, broken.																													
^b Text, Texture; ls, loamy sand; sl, sandy loam; scl, sandy clay loam; cl, clay loam; silcl, silty clay loam; sic, silty clay.																													
^c Gr, gravel; Cb, cobbles; St, Stones; Bd, boulder.																													
^d 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; co, coarse; vc, very coarse; gr, granular; sbk, subangular blocky; sg, single grained; ma, massive; -, to; /.																													
^e Stick, stickiness; plast, plasticity; s, soft; sh, slightly hard; vfr, very friable; ss, slightly sticky; ms, moderately sticky; vs, very sticky; po, non-plastic; sp, slightly plastic; mp,																													
^f PVSF, ped/void surface features; 0, very few (<5%), 1, few (5-25%); f, faint; d, distinct; r, prominent; p, patchy; n, discontinuous; c, continuous; CLF, clay films; BRf, clay																													
^g 0, very few; 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; T, throughout; R, matted around rock fragments.																													
^h 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; DT, dendritic tubular; IG, irregular; TU, tubular; IR, interstitial.																													
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Horizon	Original Depth	Corrected Depth	Bnd ^a	Color D Moist	Text ^b	Coarse Fraction																							

Horizon	Original Depth	Corrected Depth	Bnd ^a	Color D Moist	Text ^b	Coarse	Fraction	Structure ^d	Consistence ^e	PVSF ^f	Roots ^g	Pores ^h	Efferv ⁱ				
						Gr	Cb	St	B	Dry	Moist	Stick	Plast				
CC4 (Aspen-Granite Elk Site)- [38.8586028,-107.0613111] 9767 ft., 150°																	
Oi	0-1	1-0	as														
A	1-10	0-9	as	7.5YR3/2	cl	5	0	0	2vf,fg,r, 1m.cosbk / 1vf.fsbk	s		ss	mp		3vf,f,1coT	3vf,3fDT	ne
Bw	10-40	9-39	gw	7.5YR3/3	cl	7	0	0	2m.cosbk/ 2vf.fsbk	sh		ss	mp		1vf,f,mT 2vfr	3vf,2f,1mD T	ne
CBw1	40-58	39-57	gw	7.5YR3/3	sl	2	25	0	1m.vf.fsbk, sg		vfr	ss	mp		2vf,1fT	2vf,1f,1mD T	ne
2CBw2	58-73	57-72	cw	7.5YR4/4	scl	5	5	20	1vf.fsbk, sg		fr	ss	sp	0fpCLF,FEF	2vf,1fT	2vf,1f,1mD T	ne
C/R, R/C?	73-86+	72-85+		7.5YR4/6		0	0	0				ss	sp	0dpFEFgr	2vfT		ne
CC4 Notes																	
Oi																	
A																	
Bw																	
CBw1																	
2CBw2																	
C/R, R/C?																	

^a Bnd, boundary; v, very abrupt; a, abrupt; c, clear; g, gradual; s, smooth; w, wavy; i, irregular; b, broken.

^b Text, Texture; ls, loamy sand; sl, sandy loam; scl, sandy clay loam; cl, clay loam; scli, silty clay loam; sic, silty clay.

^c Gr, gravel; Cb, cobbles; St, Stones; Bd, boulder.

^d 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; co, coarse; vc, very coarse; gr, granular; sbk, subangular blocky; sg, single grained; ma, massive; -, to; /.

^e Stick, stickiness; plast, plasticity; s, soft; sh, slightly hard; vfr, very friable; ss, slightly sticky; ms, moderately sticky; vs, very sticky; po, non-plastic; sp, slightly plastic; mp, moderately plastic.

^f PVSF, ped/void surface features; 0, very few (<5%); 1, few (5-25%); f, faint; d, distinct; r, prominent; p, patchy; n, discontinuous; c, continuous; CLF, clay films; BRF, clay films.

^g 0, very few; 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; T, throughout; R, matted around rock fragments.

^h 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; DT, dendritic tubular; IG, irregular; TU, tubular; IR, interstitial.

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Table S1 Continued:

Horizon	Original Depth	Corrected Depth	Bnd ^a	Color D Moist	Text ^b	Coarse Fraction	Structure ^d	Consistence ^e	PVSF ^f	Roots ^g	Pores ^h	Efferv ⁱ
						Gr Cb St B		Dry Moist Stick Plast				
CC5 (Conifer-Granite Site) - [38.853781, -107.066397] 9875 ft., 36°												
Oe	0-4	4-0	vw	10YR2/2				s	so	po	2vf, fT	ne
A	4-7	0-3	aw	7.5YR4/4	scl	<2 0 0 0	2vf, f, mgr, 1vfbsk	s	ss	mp	3vf, f, mT	1fDT
E	7-15	3-11	cs	7.5YR4/3	I	0 0 5 0	3vf, fgr, 1fsbk / 2vfgr	s	ss	mp	3vf, f, 2m, 1c, vcT	3vfIG, 1mDT
E/Bt1	15-21	11-17	gs	10YR5/3	I	30 10 5 0	3vf, fgr, 1cosbk / 2vfgr	s	ms	mp	2fnCLF, FEF	3vf, f, 1mT
E/Bt2	21-37.5	17-33.5	cw	10YR4/4	cl	30 15 0 <5	3vf, fgr, 2cosbk / 2msbk	s	ss	vp	1fpCLF, FEF	3vf, f, 1mT, 3vf, fDT
Bt1	37.5-53	33.5-49	ci	7.5YR4/4	cl	5 5 15 0	2fsbk / 2vfbsk	s	ss	mp	2dnCLF, FE	3vf, f, 1m, 2
Bt2	53-69	49-65	aw	10YR3/6	sl	40 25 15 0	2vf, fgr, 1cosbk / 2fsbk	s	so	po	2dcFEFpf, 1dcBRFcs, f	3vf, fR
Cr	69-100+	65-96+		10YR4/4	ls		45 3vf, fgr, sg	mh	so	po	3rcSNF, 1nCLF, FEF	0mT
										cs, fg, 0dpFEFwb		
CC5 Notes												
Oe												
A	Texture was assessed without a sieve in the field											
E	Texture was assessed without a sieve in the field											
E/Bt1	Texture was assessed without a sieve in the field; charcoal observed in the horizon											
E/Bt2	Texture was assessed without a sieve in the field; krotovina present (7 cm in diameter) within 21-53 cm with charcoal (5-10 mm) concentrations (33 cm below the surface) was observed within the backfilled material of the krotovina											
Bt1	Texture was assessed without a sieve in the field; 2 large boulders in profile											
Bt2	Texture was assessed without a sieve in the field											
Cr	Texture was assessed without a sieve in the field; clay films and ferriargillans were observed within bedrock fractures											

^a Bnd, boundary; v, very abrupt; a, abrupt; c, clear; g, gradual; s, smooth; w, wavy; i, irregular; b, broken.

^b Text, Texture; ls, loamy sand; sl, sandy loam; scl, sandy clay loam; cl, clay loam; sil, silty clay loam; sic, silty clay.

^c Gr, gravel; Cb, cobbles; St, Stones; Bd, boulder.

^d 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; co, coarse; vc, very coarse; gr, granular; sbk, subangular blocky; sg, single grained; ma, massive; -, to; /.

^e Stick, stickiness; plast, plasticity; s, soft; sh, slightly hard; vfr, very friable; ss, slightly sticky; ms, moderately sticky; vs, very sticky; po, non-plastic; sp, slightly plastic; mp,

^f PVSF, ped/void surface features; 0, very few (<5%), 1, few (5-25%); f, faint; d, distinct; r, prominent; p, patchy; n, discontinuous; c, continuous; CLF, clay films; BRF, clay

^g 0, very few; 1, few; 2, common; 3, many; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; T, throughout; R, matted around rock fragments.

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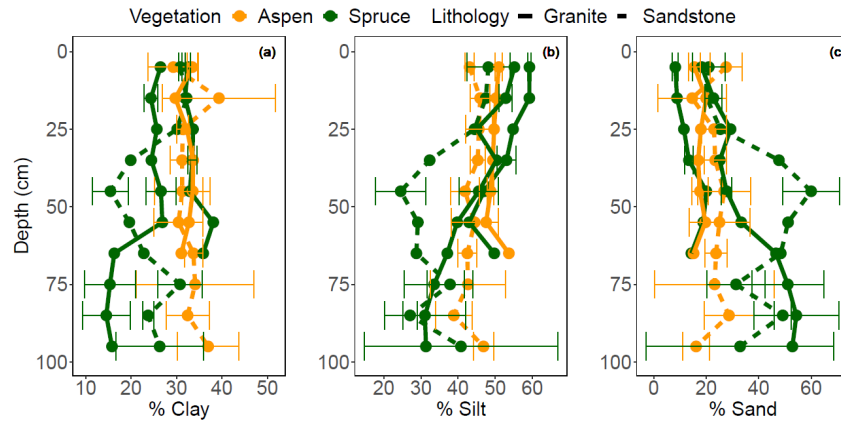


Figure S1: The mean and standard deviation of (a) % clay (<6.6µm), (b) % silt (<60.33µm), and (c) % sand. Colors are associated with vegetation, aspen (orange) and spruce (green), while line types are associated with lithology, granite (solid) and sandstone (dotted).

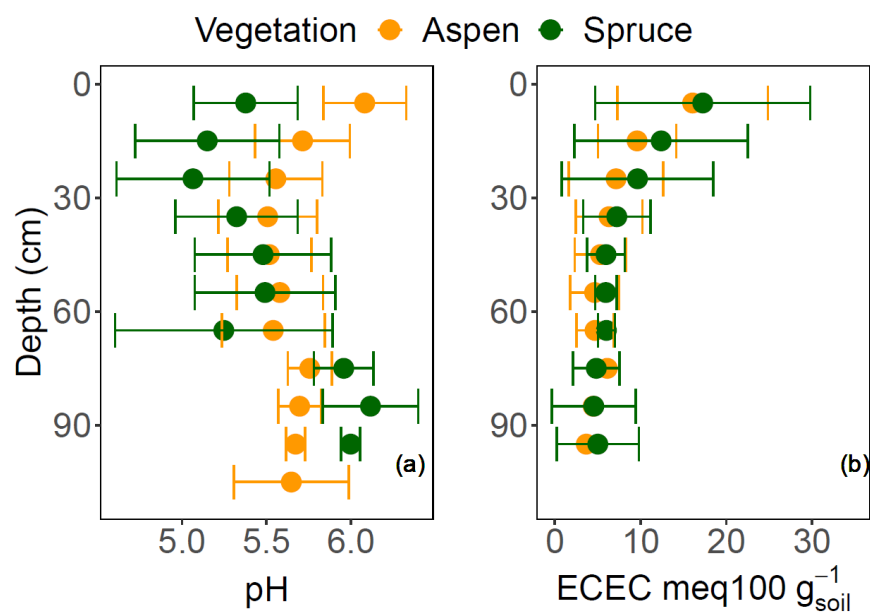


Figure S2: The mean and standard deviation of (a) soil pH and (b) effective cation exchange capacity under two vegetation types with depth, aspen (orange) and spruce (green).