

Update on Reference Sample Exchange



Soil profile near sample collection area in Underhill State Park, VT

Brief history

- Samples collected from Underhill State Park, western slopes of Mt. Mansfield in 2003 or so.
- About 30 gallons of each sent to Mike Amacher, USFS, Utah. Sieved, homogenized and stored. Five gal. (20 liters) of each sent back to UVM.
- The remaining portion was originally intended for a sample exchange run out of Utah but, at last word, only being used as a pH reference.
- UVM now has another 5 gallon pail of each.

Reference soil update

- Our idea was to use it as a reference soil for analysis of samples from our 200-yr soil monitoring plots.
- Distributed through this group (NESMC) beginning a few years ago.
- Participation (not all labs have run all tests)
 - 2008 6 labs
 - 2009 9 labs
 - 2010 11 labs
 - 2011 13 labs with one more in progress

Analyses

- Exchangeable cations
 - Number of labs: Oa-8, Bs-10
- Carbon, nitrogen, (loss-on-ignition)
 - Number of labs: Oa-9, Bs-9
- pH – Number of labs: Oa-7, Bs-9
- Exchangeable acidity (5 labs), CEC (3 labs)
- Total elemental analysis (2 labs)

Extractable Cations, Bs horizon

Removed for revised statistics								
Outside of 95% confidence interval of revised statistics								
Bs								
	n	Ca	Mg	K	Na	Al	Fe	Mn
		cmolc/kg	cmolc/kg	cmolc/kg	cmolc/kg	cmolc/kg	cmol/kg	cmol/kg
Lab 1	12	0.156	0.074	0.041	0.022	11.29		0.023
Lab 2	23	0.168	0.069	0.037	0.012	4.90	0.202	0.008
Lab 3	7	0.210	0.093	0.041	0.021	6.43	0.179	0.012
Lab 6		0.181	0.207					
Lab 7	5	0.149	0.066	0.037	0.015	12.64		
Lab 8	3	0.143	0.069	0.034	0.014	5.13	0.121	0.005
Lab 10	5	0.143	0.061	0.024	0.015	6.81		
Lab 11	3	0.096	0.065	0.140	0.057	4.64	0.063	0.005
Lab 12	6	0.137	0.065	0.040		7.489		0.010
Lab 13	5	0.080	0.057	0.036				
<i>All</i>		Ca	Mg	K	Na	Al		
	Grand mean	0.147	0.083	0.048	0.022	7.45		
	n	10	10	9	7	8		
	Std Dev	0.032	0.047	0.038	0.016	3.27		
	95% confidence int.	0.020	0.029	0.025	0.012	2.26		
	acceptable min	0.127	0.054	0.023	0.010			
	acceptable max	0.166	0.112	0.073	0.034			
<i>With outliers removed</i>		Ca	Mg	K	Na	Al		
	Grand mean	0.147	0.069	0.037	0.016			
	n	8	9	8	6			
	Std Dev	0.015	0.013	0.004	0.004			
	95% confidence int.	0.010	0.008	0.002	0.003			
	acceptable min	0.136	0.061	0.034	0.013			
	acceptable max	0.157	0.078	0.039	0.020			

Extractable Cations, Oa horizon

			Left out of statistics						
			Outside of 95% confidence interval of revised statistics						
Oa									
	Sol:soil ratio		Ca	Mg	K	Na	Al	Fe	Mn
			cmolc/kg	cmolc/kg	cmolc/kg	cmolc/kg	cmolc/kg	cmolc/kg	cmolc/kg
Lab 1	15	mean	1.10	0.56	0.51	0.08	20.89		0.08
Lab 2	6	mean	1.15	0.46	0.55		9.96	0.18	0.02
Lab 3	7	mean	0.98	0.55	0.52	0.07	10.75	0.47	0.04
Lab 6		mean	1.07	0.39					
Lab 7	11	mean	1.02	0.55	0.54	0.06	4.83		
Lab 8	3	mean	0.94	0.51	0.47	0.05	10.74	0.29	0.02
Lab 10		mean	0.87	0.44	0.41	0.04	10.72		
Lab 13	5	mean	0.53	0.42	0.51				
<i>All</i>			Ca	Mg	K	Na	Al		
		Grand mean	0.95	0.48	0.50	0.06	11.13		
		<i>n</i>	8	8	7	5	6		
		Std Dev	0.10	0.06	0.03	0.02	5.27		
		95% confidence int.	0.07	0.04	0.02	0.01	4.22		
		acceptable min	0.88	0.44	0.48	0.04			
		acceptable max	1.02	0.53	0.52	0.07			
<i>With outlier removed</i>			Ca	Mg	K	Na	Al		
		Grand mean	1.01	0.50	0.51				
		<i>n</i>	7	7	6				
		Std Dev	0.09	0.05	0.03				
		95% confidence int.	0.07	0.03	0.02				
		acceptable min	0.94	0.46	0.49				
		acceptable max	1.08	0.53	0.54				

% C,
N and
LOI
(about
the
same
as
2010)

Way outside of 95% confidence interval of statistics							
	Oa	Oa	Oa		Bs	Bs	Bs
	%C	%N	LOI		%C	%N	LOI
Lab 1	29.27	1.65	53.89		3.41	0.18	7.33
std dev			0.74				0.13
<i>n</i>			6				6
Lab 3	27.00	1.64	52.71		3.53	0.21	7.40
std dev	1.20	0.07	0.32		0.23	0.03	0.29
<i>n</i>	6	6	2		6	6	2
Lab 5	30.60	1.73	52.90		3.96	0.18	7.80
std dev							
<i>n</i>	3	3	3		3	3	3
Lab 6	21.02	1.30			3.63	0.19	
Lab 7	30.34	1.78	54.83		3.88	0.19	6.98
std dev	2.47	0.14			0.50	0.02	
<i>n</i>	25	25			25	25	
Lab 8	31.56	1.68	54.40		3.48	0.15	
std dev	3	3			3	3	
<i>n</i>							
Lab 9	29.41	1.73			3.40	0.17	
std dev	0.74	1.66			1.19	1.74	
<i>n</i>	3				9	9	
Lab 10	26.68	1.49	60.36		3.06	0.18	9.23
std dev	0.92	0.05	2.52		0.13	0.00	0.65
<i>n</i>	4	4	4		4	4	4
Lab 11	28.42	1.68			3.11	0.15	
std dev							
<i>n</i>	3	3			4	4	
Grand mean	28.14	1.63	55.04		3.52	0.18	7.85
<i>n</i>	9	9	6		9	9	5
Std Dev	3.34	0.16	3.11		0.33	0.02	0.98
confidence int.	2.18	0.10	2.49		0.21	0.02	0.86

pH
(about the
same as 2010)

Way outside of 95% confidence interval of statistics				
	Oa	Oa	Bs	Bs
	pH _{Ca}	pH _w	pH _{Ca}	pH _w
Lab 1	3.45		3.61	
std dev	0.067		0.038	
<i>n</i>	7		7	
Lab 2				4.04
std dev				0.05
<i>n</i>				10
Lab 3	3.51	4.37	3.63	4.04
std dev	0.06	0.11	0.04	0.04
<i>n</i>	3	3	3	3
Lab 4	3.47	4.53	3.58	4.10
std dev				
<i>n</i>				
Lab 5	3.49	3.84	3.73	3.93
std dev				
<i>n</i>	3	3	3	3
Lab 6	3.55	4.22	3.50	4.04
std dev				
<i>n</i>				
Lab 7	3.45	4.21	3.48	3.96
<i>n</i> =3-5				
Lab 8	3.50	4.30	3.77	4.13
std dev				
<i>n</i>	3	3	3	3
Lab 11			3.73	4.10
std dev				
<i>n</i>			1	1
Grand mean	3.51	4.22	3.63	4.04
<i>n</i>	7	6	8	8
Std Dev	0.05	0.25	0.12	0.08
% confidence int.	0.04	0.20	0.08	0.05

Next steps?

- We should have enough of the sample to add more labs. Email: dross@uvm.edu
- Require a minimum number of reps from each participating lab?
- Publish something?
- Feedback welcome.