



2019 North American Proficiency Testing Program
Quarter 1 Soil Report - Tuesday, April 16, 2019

Laboratory ID
303255

Soil	Soil 2019-101					Soil 2019-102			Soil 2019-103			Soil 2019-104			Soil 2019-105		
Analysis	Units	n	Median	MAD	Lab ^{1,2}	Median	MAD	Lab ^{1,2}	Median	MAD	Lab ^{1,2}	Median	MAD	Lab ^{1,2}	Median	MAD	Lab ^{1,2}
Salinity																	
Sat. Paste Moisture	%	20	48.0	2.55	47.701	36.5	3.74	36.727	50.3	5.01	50.915	41.7	3.90	41.68	50.7	4.60	50.353
pH - sp	Unit	29	7.78	0.110	7.94	5.43	0.070	5.52	5.20	0.100	5.34	7.10	0.100	7.2	6.33	0.070	6.34
ECe - sp	dS/m	29	0.810	0.082	0.7279	0.780	0.084	0.7544	0.380	0.062	0.3574	3.28	0.250	3.081	0.400	0.050	0.3841
HCO ₃ - sp	mmolc/L	11	4.57	0.768	3.991	1.22	0.119	1.2237	0.968	0.238	0.9677	4.68	0.745	4.535	2.69	0.400	2.2875
Ca - sp	mmolc/L	26	3.41	0.405	2.761	3.15	0.450	3.0493	1.98	0.345	1.77	21.6	3.22	20.484	3.03	0.466	2.569
Mg - sp	mmolc/L	27	1.87	0.210	1.481	1.97	0.274	1.8551	0.717	0.127	0.5926	7.74	1.04	6.6793	1.08	0.170	0.953
Na - sp	mmolc/L	27	3.02	0.450	2.538	0.960	0.160	0.8853	0.130	0.010	0.1086	11.0	1.09	10.054	0.163	0.016	0.1377
SAR - sp	value	20	1.82	0.090	1.74	0.555	0.055	0.57	0.120	0.030	0.1	2.83	0.120	2.73	0.110	0.010	0.11
Cl - sp	mmolc/L	15	1.81	0.445	1.8127	0.590	0.080	0.5224	0.226	0.054	0.21	2.96	0.483	2.6142	0.200	0.043	0.088 * L
SO ₄ - sp	mmolc/L	17	1.30	0.224	1.1618	1.91	0.230	1.416	0.430	0.090	0.2823	29.4	3.30	26.097	0.950	0.210	0.4919
NO ₃ - sp	mmolc/L	9	0.015	0.003	0.0148	2.02	0.356	1.446	0.945	0.190	0.402 * L	1.44	0.150	1.8657 * H	0.010	0.002	0.0028 ** L
B - sp	mg/L	16	0.100	0.011	0.1079	0.712	0.071	0.6327	0.075	0.016	0.0563	0.728	0.092	0.6956	0.070	0.006	0.0609
Soil pH & EC																	
Soil EC (1:1)	(dS/m)	40	0.400	0.038	0.4152	0.264	0.044	0.3161	0.192	0.022	0.2107	1.27	0.125	1.881 ** H	0.213	0.028	0.2165
Soil EC (1:2)	(dS/m)	48	0.278	0.028	0.2711	0.190	0.017	0.1864	0.126	0.018	0.1262	0.942	0.160	1.172	0.122	0.018	0.1211
pH (1:1) Water	Unit	90	8.10	0.100	8.2	5.60	0.065	6 ** H	5.28	0.045	5.96 ** H	7.34	0.057	7.71 ** H	6.50	0.070	7.05 ** H
pH (1:2) Water	Unit	30	8.28	0.126	8.12	5.72	0.070	5.97 * H	5.40	0.080	6.04 ** H	7.51	0.075	7.67	6.62	0.080	6.84 * H
pH (1:1) 0.01M CaCl ₂	Unit	27	7.66	0.060		5.15	0.070		4.77	0.050		7.15	0.070		6.02	0.080	
pH (1:2) 0.01M CaCl ₂	Unit	13	7.60	0.100		5.14	0.060		4.80	0.070		7.15	0.150		6.00	0.060	
Buffer pH, Lime Req.																	
SMP Buffer pH	Unit	27	7.48	0.060	7.48	6.81	0.070	6.77	6.50	0.090	6.41	7.35	0.050	7.35	6.94	0.040	6.9
Adams-Evans Buf pH	Unit	7	7.85	0.080		7.61	0.075		7.56	0.080		7.79	0.060		7.66	0.060	
Woodruff Buf. pH	Unit	20	7.12	0.025		6.68	0.060		6.46	0.065		7.06	0.035		6.80	0.030	
Mehlich Buffer pH	Unit	8	6.85	0.065		6.12	0.050		5.96	0.060		6.65	0.025		6.28	0.020	
Sikora Buffer pH	Unit	29	7.50	0.030		6.80	0.070		6.52	0.065		7.36	0.040		6.99	0.060	
Titratable Acidity	cmol/kg	1	0.000	0.000	0	0.103	0.000	0.1028	0.123	0.000	0.1234	0.000	0.000	0	0.000	0.000	0
Inorganic Nitrogen (NO₃-N & NH₄-N)																	
NO ₃ -N Cd. Rd.	mg/kg	69	2.60	0.400	3.718 * H	15.2	0.750	15.4	15.2	0.800	16.788	31.8	1.64	30.225	2.53	0.400	2.5845
NO ₃ -N ISE	mg/kg	11	5.00	0.74		15.9	1.58		15.1	2.10		33.4	3.30		4.30	0.700	
NO ₃ -N CTA	mg/kg	2	2.40	0.628		14.2	0.852		14.8	1.51		27.1	2.38		3.02	0.475	
NO ₃ -N Ion Chr.	mg/kg	1	2.69	0.000		15.1	0.000		16.0	0.000		31.9	0.000		2.71	0.000	
NO ₃ -N Other	mg/kg	8	2.52	0.500		15.0	1.03		15.0	1.76		29.1	1.78		3.00	0.185	
NH ₄ - N (KCl Extr.)	mg/kg	55	2.25	0.420	1.659	7.05	0.705	7.16	5.60	0.620	5.645	5.28	0.605	4.9495	29.4	2.46	32
Phosphorus and Sulfur																	
PO ₄ -P Bray P (1:10)	mg/kg	48	51.0	4.60	54.266	104	6.90	106.57	61.0	4.43	65.567	43.0	3.31	43.492	33.0	2.42	34.524
PO ₄ -P Bray P1 (1:7)	mg/kg	8	43.2	8.98		109	17.0		54.8	7.20		40.9	6.76		36.0	5.50	
PO ₄ -P Olsen/Bicarb	mg/kg	57	24.7	1.58	25.357	55.5	5.72	51.701	34.1	3.37	34.551	21.0	1.65	19.692	18.4	1.45	16.042
PO ₄ -P AB-DTPA	mg/kg	4	11.1	0.313	11.327	28.7	0.786	27.528	15.6	1.29	13.282	11.0	0.778	9.991	12.4	1.07	10.829
PO ₄ -P Modified Morgan	mg/kg	5	36.0	1.40		11.9	0.900		5.00	0.180		20.3	0.600		4.09	0.090	
PO ₄ -P True Morgan	mg/kg	7	33.2	4.80		14.8	1.10		5.60	0.300		21.0	1.10		5.80	0.600	
PO ₄ -P Mod. Kewlona	mg/kg	1	47.0	0.000		75.0	0.000		50.0	0.000		38.0	0.000		24.0	0.000	
PO ₄ -P Stong Bray (1:10)	mg/kg	11	319	26.6		286	11.2		80.8	6.60		144	3.67		55.9	4.20	
PO ₄ -P Water Soluble	mg/kg																
SO ₄ - S (PO ₄ Extr.)	mg/kg	34	11.3	1.78		11.9	1.74		5.61	0.76		151	28.0		9.00	1.65	

1 - Values flagged exceed Warning Limits " * " 2.5 x MAD (Median Absolute Deviation) and Control Limits " ** " 4 x MAD.
2 - Limits not compared to lab data for methods with less than 7 labs reporting.

Bases																	
K Ammonium Acetate	mg/kg	78	833	65.5	937.19	434	19.5	412.55	230	14.5	233.77	308	18.7	308.37	284	11.5	278.59
Ca Ammonium Acetate	mg/kg	74	4,490	483	5159.7	1,030	59.6	1050.8	1,100	63.0	1217.1	4,060	379	4694.4	2,100	102	2291.1
Mg Ammonium Acetate	mg/kg	74	656	35.7	710.14	270	15.0	265.11	158	10.5	169.45	449	25.6	464.79	295	15.3	311.8
Na Ammonium Acetate	mg/kg	65	143	16.6	157.63	26.3	2.25	21.154	10.0	2.34	8.0968	250	20.3	251.16	11.6	1.50	8.1712
Bray Extractable K	mg/kg	7	505	34.0		366	18.8		181	5.20		216	10.3		215	10.0	
K- Olsen/Bicarb.	mg/kg	5	594	8.00		419	13.0		232	13.0		240	13.0		225	3.00	
K Modified Morgan	mg/kg	4	769	61.0		401	14.0		227	12.0		266	14.0		258	17.5	
K True Morgan	mg/kg	5	439	7.00		301	15.0		180	12.0		162	12.0		170	10.0	
Ca Modified Morgan	mg/kg	4	11,300	461		1,010	118		1,050	89.5		6,100	634		2,000	118	
Aluminum KCL Extr.	mg/kg	4	0.637	0.290		3.40	1.20		12.6	1.60		0.725	0.300		0.870	0.348	

Mehlich-1 Multi Element (scoop)																	
Scoop Soil Mass	g	4	5.00	0.000		5.00	0.000		5.00	0.000		5.00	0.000		5.00	0.000	
P	mg/kg	9	34.1	03.1		227	16.6		32.5	2.16		69.0	11.0		31.3	2.26	
K	mg/kg	9	243	28.1		311	18.4		157	6.29		142	19.2		166	8.64	
Ca	mg/kg	9	5,650	658		1,260	34.4		886	33.4		5,160	580		1,840	32.0	
Mg	mg/kg	9	509	24.5		231	7.28		130	7.50		458	23.8		245	5.42	
Mn	mg/kg	8	1.78	0.271		56.3	2.80		81.6	6.86		39.4	3.84		120	5.36	
Zn	mg/kg	8	0.127	0.019		9.07	0.452		2.43	0.075		3.80	0.700		2.05	0.091	

Mehlich-3 Multi-Element (scoop)																					
Scoop Soil Mass	g	25	1.96	0.050		2.20	0.090		1.87	0.100		2.20	0.080		2.00	0.050					
Assumed Density	g/cm ³	18	1.01	0.055		1.12	0.062		0.945	0.060		1.15	0.054		1.01	0.045					
Volume of Scoop	cm ³	25	2.00	0.000		2.00	0.000		2.00	0.000		2.00	0.000		2.00	0.000					
Extractant Volume mL	mL	20	20.0	0.000		20.0	0.000		20.0	0.000		20.0	0.000		20.0	0.000					
P Colorimetric	mg/kg	11	67.2	5.10		124	3.00		64.5	4.00		50.9	3.33		37.6	3.73					
P ICP-AES	mg/kg	49	75.0	2.71	72.433	137	8.50	105.49	* L	73.1	4.81	58.861	* L	55.6	3.36	43.628	* L	45.9	2.56	37.79	* L
K	mg/kg	54	823	52.3	897.89	449	22.0	450.47		219	11.6	245.59		314	13.9	313.29		280	13.3	302.99	
Ca	mg/kg	51	6,150	423	5905.4	1,130	79.0	857.45	* L	1,100	71.7	898.47	* L	5,100	278	4145.9	* L	2,190	149	1786.1	* L
Mg	mg/kg	52	784	42.0	750.64	298	19.0	220.24	** L	160	14.8	129.51		548	30.6	425.34	** L	316	18.8	249.61	* L
Na	mg/kg	42	132	12.6	144.47	27.4	2.55	28.363		10.1	1.62	10.248		259	19.5	267.53		13.5	2.83	11.13	
S	mg/kg	45	21.0	1.65	16.777	* L	19.6	1.65	16.441		11.6	1.36	8.8789		252	13.5	232.88		16.0	1.95	12.351
Al	mg/kg	34	598	31.1	612.29	547	47.3	455.31		811	58.2	665.71		451	38.5	408.34		598	43.7	500.33	
Zn	mg/kg	45	6.03	0.290	5.5686	11.8	0.610	8.3997	** L	3.46	0.260	2.4703	* L	7.30	0.300	5.3842	** L	2.90	0.200	2.1475	* L
Mn	mg/kg	44	168	11.8	158.9	69.0	4.24	52.367	* L	17.0	11.8	132.23	* L	134	9.35	106.47	* L	148	7.16	115.71	** L
Fe	mg/kg	45	55.2	3.72	58.394	256	14.0	207.9	* L	244	18.0	198.85	* L	96.6	9.60	82.426		284	23.4	241.49	
Cu	mg/kg	45	2.39	0.110	2.3644	2.81	0.170	2.3336	* L	1.13	0.090	0.9544		7.81	0.510	6.5959		2.77	0.180	2.2752	* L
B	mg/kg	37	1.87	0.220	2.1886	0.890	0.090	0.8529		0.440	0.100	0.4754		3.05	0.380	2.8508		0.710	0.142	0.7681	

Micronutrients																						
Zn - DTPA	mg/kg	67	2.44	0.190	2.7402	6.70	0.510	5.6586		2.21	0.148	1.6672	* L	2.90	0.200	2.8204		1.79	0.110	1.571		
Mn - DTPA	mg/kg	50	5.00	0.48	7.54	** H	43.8	2.70	37.272		75.5	7.00	60.204		24.4	2.66	24.392		120	10.3	105.19	
Fe - DTPA	mg/kg	53	11.2	1.15	12.221		78.1	8.80	72.186		88.8	10.3	77.87		16.2	1.80	17.066		100	9.25	103.44	
Cu - DTPA	mg/kg	54	0.830	0.085	0.8847	2.90	0.200	2.5456		0.950	0.050	0.7544	* L	3.67	0.330	3.5178		2.12	0.080	2.0442		
Zn - HCl	mg/kg	3	5.10	0.800		13.3	0.090		2.90	0.030		7.80	0.850		2.60	0.000						
Mn-H3PO4	mg/kg	11	1.61	0.363		42.2	2.50		67.4	2.55		30.8	3.55		97.0	4.25						
Cl - Ca(NO3)2 Extr.	mg/kg	14	31.5	4.08		8.22	1.23		3.10	0.313		50.5	3.80		3.59	0.55						
B - Hot Wat.	mg/kg	30	0.780	0.093	0.3608	** L	0.800	0.120	0.3992	* L	0.310	0.060	0.1078	* L	1.92	0.213	1.1365	* L	0.430	0.070	0.158	* L
B-DTPA/Sorbitol	mg/kg	16	1.02	0.070		0.500	0.075		0.200	0.050		2.36	0.221		0.327	0.042						

Soil Organic Matter																					
Soil Kjeldahl N	%	19	0.119	0.008	0.0928	* L	0.083	0.008	0.0663		0.149	0.009	0.1241	* L	0.099	0.009	0.0735	* L	0.147	0.017	0.1215
Soil TN (combustion)	%	40	0.126	0.014		0.090	0.010		0.162	0.012		0.102	0.008		0.160	0.012					
Soil TOC (Combustion)	%	12	1.18	0.078	1.0252	0.854	0.055	0.9923	* H	1.57	0.051	1.5393		0.968	0.035	0.928		1.69	0.052	1.5971	
Soil Total C (Combustion)	%	31	1.61	0.034	1.5278	0.850	0.031	0.8807		1.60	0.042	1.597		1.11	0.034	1.1723		1.72	0.043	1.7959	

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SOM - Walkley-Black	%	26	1.92	0.110	1.8005	1.60	0.105	1.3862	2.71	0.105	2.7246	1.72	0.100	1.577	2.89	0.165	2.883		
SOM - LOI (% Wt loss)	%	72	3.12	0.208	2.7598	1.80	0.100	1.646	3.26	0.130	3.048	2.17	0.155	1.64	* L	3.12	0.135	2.654	* L
Other																			
CaCO3 Content	%	15	4.60	0.800	5.262	0.630	0.155	0.671	0.365	0.063	0.403	1.30	0.145	2.103	** H	0.445	0.081	0.74	* H
CEC - Cation Displacement	cmol/kg	19	25.2	2.52	32.489	* H	11.7	1.70	15.639	15.0	2.00	19.057	19.0	1.96	25.89	* H	19.0	1.90	20.763
CEC - Estimation	cmol/kg	12	32.2	3.10			11.3	0.800		11.3	1.35		26.7	2.46		14.3	1.15		
Soil Density (Scoop)	g/cc	11	1.13	0.020			1.29	0.030		1.11	0.043		1.31	0.024		1.17	0.030		
Particle Size Analysis-Hydrometer																			
Sand 2000 - 50 um	%	32	38.0	3.35	34	50.0	4.72	46	12.5	1.63	6	* L	40.8	3.02	36	15.9	1.93	12	
Silt 50 - 2 um	%	32	40.0	5.05	45	40.0	5.05	45	69.5	2.80	77	* H	36.5	5.00	43	64.7	4.10	69	
Clay 2 - 0 um	%	32	23.2	2.00	21	10.0	1.70	9	18.0	2.40	17		22.2	2.20	21	19.7	2.17	19	
Particle Size Analysis- Pipette																			
Sand 2000 - 50 um	%	3	43.0	2.00		53.0	3.00		9.00	5.00			43.0	0.000		9.00	0.000		
Silt 50 - 2 um	%	3	33.0	1.00		41.0	1.00		76.0	2.00			36.0	0.000		69.0	4.00		
Clay 2 - 0 um	%	3	18.0	1.00		8.00	2.00		15.0	0.000			21.0	2.00		19.0	1.00		
Solvita CO2																			
Solvita CO2	ppm	5	85.5	5.46		110	8.15		162	17.7			108	62.0		185	30.0		

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