



2019 North American Proficiency Testing Program
Quarter 3 Soil Report - Monday, October 21, 2019

Laboratory ID
General

| Soil | Soil 2019-111 | | | | Soil 2019-112 | | | Soil 2019-113 | | | Soil 2019-114 | | | Soil 2019-115 | | | |
|---------------------------------------------------------------------|---------------|----|--------|-------|--------------------|--------|-------|--------------------|--------|-------|--------------------|--------|-------|--------------------|--------|-------|--------------------|
| 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 | 58.4 | 4.75 | | 49.2 | 5.35 | | 57.4 | 4.05 | | 49.7 | 3.80 | | 52.9 | 3.50 | |
| pH - sp | Unit | 28 | 7.04 | 0.055 | | 7.29 | 0.090 | | 6.66 | 0.055 | | 5.25 | 0.120 | | 6.40 | 0.105 | |
| ECe - sp | dS/m | 28 | 1.43 | 0.130 | | 0.480 | 0.050 | | 0.465 | 0.035 | | 0.350 | 0.045 | | 0.280 | 0.024 | |
| HCO ₃ - sp | mmolc/L | 13 | 4.70 | 0.490 | | 4.30 | 0.577 | | 3.88 | 0.691 | | 0.990 | 0.220 | | 1.50 | 0.250 | |
| Ca - sp | mmolc/L | 25 | 7.40 | 0.760 | | 3.00 | 0.430 | | 2.74 | 0.410 | | 1.89 | 0.240 | | 2.40 | 0.350 | |
| Mg - sp | mmolc/L | 25 | 3.20 | 0.400 | | 1.42 | 0.250 | | 1.74 | 0.300 | | 0.675 | 0.095 | | 0.430 | 0.047 | |
| Na - sp | mmolc/L | 25 | 1.80 | 0.150 | | 0.780 | 0.113 | | 0.377 | 0.077 | | 0.110 | 0.005 | | 0.261 | 0.051 | |
| SAR - sp | value | 23 | 0.800 | 0.043 | | 0.470 | 0.036 | | 0.210 | 0.030 | | 0.107 | 0.026 | | 0.236 | 0.050 | |
| Cl - sp | mmolc/L | 17 | 1.18 | 0.150 | | 0.230 | 0.033 | | 0.200 | 0.020 | | 0.250 | 0.040 | | 0.230 | 0.056 | |
| SO ₄ - sp | mmolc/L | 16 | 1.26 | 0.130 | | 0.546 | 0.088 | | 0.600 | 0.082 | | 0.502 | 0.119 | | 0.333 | 0.043 | |
| NO ₃ - sp | mmolc/L | 10 | 5.24 | 1.24 | | 0.020 | 0.005 | | 0.107 | 0.026 | | 0.430 | 0.103 | | 0.355 | 0.062 | |
| B - sp | mg/L | 14 | 0.120 | 0.016 | | 0.110 | 0.017 | | 0.124 | 0.024 | | 0.082 | 0.010 | | 0.052 | 0.009 | |
| Soil pH & EC | | | | | | | | | | | | | | | | | |
| Soil EC (1:1) | (dS/m) | 37 | 0.712 | 0.058 | | 0.300 | 0.030 | | 0.310 | 0.039 | | 0.190 | 0.020 | | 0.160 | 0.013 | |
| Soil EC (1:2) | (dS/m) | 47 | 0.522 | 0.062 | | 0.181 | 0.021 | | 0.190 | 0.030 | | 0.128 | 0.009 | | 0.124 | 0.016 | |
| pH (1:1) Water | Unit | 84 | 7.20 | 0.059 | | 7.35 | 0.070 | | 6.72 | 0.070 | | 5.29 | 0.060 | | 6.32 | 0.065 | |
| pH (1:2) Water | Unit | 30 | 7.34 | 0.115 | | 7.48 | 0.095 | | 6.86 | 0.065 | | 5.40 | 0.070 | | 6.40 | 0.075 | |
| pH (1:1) 0.01M CaCl ₂ | Unit | 24 | 6.89 | 0.040 | | 6.94 | 0.040 | | 6.30 | 0.045 | | 4.76 | 0.045 | | 5.88 | 0.020 | |
| pH (1:2) 0.01M CaCl ₂ | Unit | 12 | 6.89 | 0.045 | | 6.88 | 0.065 | | 6.34 | 0.050 | | 4.78 | 0.068 | | 5.85 | 0.075 | |
| Buffer pH, Lime Req. | | | | | | | | | | | | | | | | | |
| SMP Buffer pH | Unit | 24 | 7.16 | 0.045 | | 7.29 | 0.030 | | 6.91 | 0.055 | | 6.52 | 0.085 | | 6.70 | 0.045 | |
| Adams-Evans Buf pH | Unit | 9 | 7.65 | 0.060 | | 7.71 | 0.030 | | 7.62 | 0.070 | | 7.51 | 0.090 | | 7.47 | 0.050 | |
| Woodruff Buf. pH | Unit | 19 | 7.00 | 0.030 | | 7.01 | 0.020 | | 6.81 | 0.030 | | 6.49 | 0.050 | | 6.69 | 0.040 | |
| Mehlich Buffer pH | Unit | 6 | 6.56 | 0.025 | | 6.57 | 0.015 | | 6.30 | 0.020 | | 5.96 | 0.075 | | 6.25 | 0.040 | |
| Sikora Buffer pH | Unit | 32 | 7.18 | 0.054 | | 7.30 | 0.041 | | 6.96 | 0.060 | | 6.56 | 0.075 | | 6.83 | 0.065 | |
| Titratable Acidity | cmol/kg | | | | | | | | | | | | | | | | |
| Inorganic Nitrogen (NO₃-N & NH₄-N) | | | | | | | | | | | | | | | | | |
| NO ₃ -N Cd. Rd. | mg/kg | 68 | 64.0 | 7.56 | | 15.0 | 0.900 | | 13.7 | 0.970 | | 14.4 | 0.895 | | 16.6 | 1.26 | |
| NO ₃ -N ISE | mg/kg | 11 | 58.0 | 7.07 | | 16.7 | 0.400 | | 14.1 | 0.445 | | 15.0 | 0.300 | | 15.9 | 1.10 | |
| NO ₃ -N CTA | mg/kg | 2 | 70.7 | 2.24 | | 17.8 | 2.42 | | 16.0 | 2.34 | | 16.1 | 1.93 | | 18.3 | 2.09 | |
| NO ₃ -N Ion Chr. | mg/kg | 1 | 76.1 | 0.000 | | 16.1 | 0.000 | | 14.5 | 0.000 | | 16.2 | 0.000 | | 18.8 | 0.000 | |
| NO ₃ -N Other | mg/kg | 8 | 63.8 | 9.68 | | 13.8 | 0.830 | | 12.9 | 1.00 | | 14.3 | 1.00 | | 16.0 | 1.44 | |
| NH ₄ - N (KCl Extr.) | mg/kg | 52 | 105 | 14.3 | | 3.98 | 0.480 | | 7.76 | 0.705 | | 6.06 | 0.625 | | 7.20 | 0.850 | |
| Phosphorus and Sulfur | | | | | | | | | | | | | | | | | |
| PO ₄ -P Bray P (1:10) | mg/kg | 48 | 73.1 | 6.95 | | 66.9 | 5.95 | | 37.9 | 2.60 | | 62.0 | 2.05 | | 97.7 | 13.8 | |
| PO ₄ -P Bray P1 (1:7) | mg/kg | 5 | 56.0 | 4.00 | | 60.7 | 3.67 | | 34.7 | 2.30 | | 50.5 | 1.59 | | 48.2 | 7.80 | |
| PO ₄ -P Olsen/Bicarb | mg/kg | 53 | 55.1 | 5.78 | | 35.7 | 2.70 | | 21.2 | 2.10 | | 34.0 | 3.49 | | 27.0 | 2.60 | |
| PO ₄ -P AB-DTPA | mg/kg | 3 | 30.7 | 3.94 | | 19.9 | 0.506 | | 11.8 | 0.403 | | 17.2 | 1.24 | | 14.0 | 1.08 | |
| PO ₄ -P Modified Morgan | mg/kg | 5 | 37.5 | 0.600 | | 45.7 | 3.10 | | 5.36 | 0.340 | | 4.60 | 0.340 | | 5.22 | 0.280 | |
| PO ₄ -P True Morgan | mg/kg | 8 | 39.5 | 1.05 | | 43.7 | 2.35 | | 6.92 | 0.405 | | 5.48 | 0.270 | | 5.70 | 0.450 | |
| PO ₄ -P Mod. Kewlona | mg/kg | 1 | 64.9 | 0.000 | | 50.6 | 0.000 | | 27.6 | 0.000 | | 41.3 | 0.000 | | 49.4 | 0.000 | |
| PO ₄ -P Stong Bray (1:10) | mg/kg | 11 | 249 | 13.0 | | 470 | 23.0 | | 63.0 | 2.00 | | 81.0 | 2.82 | | 166 | 4.40 | |
| PO ₄ -P Water Soluble | mg/kg | | | | | | | | | | | | | | | | |
| SO ₄ - S (PO ₄ Extr.) | mg/kg | 36 | 10.1 | 2.25 | | 5.00 | 1.00 | | 5.93 | 0.73 | | 5.70 | 0.60 | | 5.86 | 0.89 | |

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 | 74 | 983 | 117 | 336 | 12.9 | 404 | 21.9 | 223 | 11.2 | 67.9 | 7.62 |
| Ca Ammonium Acetate | mg/kg | 70 | 4,230 | 392 | 2,890 | 147 | 2,890 | 123 | 1,070 | 61.6 | 975 | 54.8 |
| Mg Ammonium Acetate | mg/kg | 70 | 681 | 71.0 | 511 | 19.5 | 676 | 31.1 | 155 | 9.00 | 48.1 | 4.70 |
| Na Ammonium Acetate | mg/kg | 59 | 81.4 | 10.8 | 34.7 | 3.89 | 21.5 | 4.09 | 9.40 | 1.25 | 16.6 | 3.40 |
| Bray Extractable K | mg/kg | 7 | 603 | 12.1 | 244 | 11.4 | 274 | 10.0 | 174 | 10.0 | 45.0 | 5.18 |
| K- Olsen/Bicarb. | mg/kg | 5 | 822 | 3.00 | 235 | 8.00 | 326 | 11.0 | 227 | 6.00 | 66.3 | 4.30 |
| K Modified Morgan | mg/kg | 5 | 1,040 | 26.0 | 311 | 47.0 | 386 | 11.0 | 218 | 14.0 | 61.2 | 2.70 |
| K True Morgan | mg/kg | 6 | 602 | 7.00 | 163 | 1.50 | 235 | 6.00 | 174 | 1.75 | 52.2 | 3.85 |
| Ca Modified Morgan | mg/kg | 4 | 4,470 | 401 | 3,070 | 218 | 2,990 | 115 | 1,140 | 145 | 1,070 | 63.8 |
| Aluminum KCL Extr. | mg/kg | 4 | 0.355 | 0.135 | 0.320 | 0.070 | 0.116 | 0.081 | 10.0 | 1.79 | 1.55 | 0.350 |

| 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 | 101 | 16.1 | 360 | 18.0 | 40.0 | 2.44 | 31.7 | 2.29 | 61.4 | 7.19 |
| K | mg/kg | 9 | 505 | 30.6 | 177 | 13.1 | 223 | 13.6 | 154 | 2.41 | 42.0 | 2.26 |
| Ca | mg/kg | 9 | 3,880 | 346 | 3,330 | 208 | 2,520 | 54.0 | 923 | 28.6 | 1,260 | 33.0 |
| Mg | mg/kg | 9 | 604 | 21.3 | 505 | 27.2 | 572 | 20.4 | 136 | 6.71 | 48.7 | 2.13 |
| Mn | mg/kg | 8 | 150 | 12.1 | 38.7 | 2.84 | 76.5 | 1.80 | 98.4 | 2.13 | 34.0 | 1.25 |
| Zn | mg/kg | 8 | 5.54 | 0.522 | 3.70 | 0.380 | 3.42 | 0.235 | 2.58 | 0.074 | 2.37 | 0.080 |

| Mehlich-3 Multi-Element (scoop) | | | | | | | | | | | | |
|---------------------------------|-------------------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scoop Soil Mass | g | 22 | 1.62 | 0.086 | 2.10 | 0.100 | 1.90 | 0.075 | 1.88 | 0.120 | 1.83 | 0.091 |
| Assumed Density | g/cm ³ | 17 | 0.840 | 0.090 | 1.06 | 0.066 | 0.978 | 0.068 | 1.00 | 0.084 | 0.940 | 0.073 |
| Volume of Scoop | cm ³ | 24 | 2.00 | 0.000 | 2.00 | 0.000 | 2.00 | 0.000 | 2.00 | 0.000 | 2.00 | 0.000 |
| Extractant Volume mL | mL | 17 | 20.0 | 0.000 | 20.0 | 0.000 | 20.0 | 0.000 | 20.0 | 0.000 | 20.0 | 0.000 |
| P Colorimetric | mg/kg | 10 | 96.7 | 3.10 | 93.7 | 4.05 | 39.0 | 2.08 | 64.6 | 0.780 | 92.0 | 5.82 |
| P ICP-AES | mg/kg | 49 | 105 | 3.89 | 98.6 | 4.51 | 48.0 | 1.78 | 72.0 | 2.60 | 95.0 | 5.00 |
| K | mg/kg | 50 | 935 | 39.0 | 358 | 15.0 | 402 | 14.4 | 219 | 6.53 | 58.2 | 4.21 |
| Ca | mg/kg | 48 | 4,280 | 197 | 3,210 | 108 | 2,960 | 100 | 1,090 | 46.4 | 1,130 | 47.1 |
| Mg | mg/kg | 48 | 706 | 34.9 | 596 | 20.9 | 701 | 27.0 | 160 | 7.19 | 52.2 | 3.24 |
| Na | mg/kg | 38 | 76.5 | 5.14 | 36.2 | 4.15 | 21.6 | 2.46 | 11.0 | 2.20 | 16.9 | 2.40 |
| S | mg/kg | 41 | 17.4 | 1.62 | 10.8 | 1.29 | 13.6 | 1.40 | 11.5 | 1.54 | 15.3 | 1.42 |
| Al | mg/kg | 29 | 807 | 25.3 | 586 | 20.6 | 769 | 28.0 | 810 | 36.0 | 1,600 | 79.1 |
| Zn | mg/kg | 44 | 10.8 | 0.750 | 5.98 | 0.240 | 4.70 | 0.205 | 3.24 | 0.215 | 2.51 | 0.182 |
| Mn | mg/kg | 43 | 175 | 10.5 | 214 | 11.5 | 170 | 9.94 | 172 | 10.0 | 43.6 | 2.96 |
| Fe | mg/kg | 43 | 246 | 15.0 | 75.0 | 4.00 | 151 | 9.00 | 240 | 11.4 | 132 | 8.80 |
| Cu | mg/kg | 43 | 3.37 | 0.170 | 2.84 | 0.120 | 2.62 | 0.180 | 1.10 | 0.065 | 2.37 | 0.140 |
| B | mg/kg | 35 | 1.27 | 0.070 | 1.42 | 0.110 | 1.12 | 0.055 | 0.400 | 0.050 | 0.381 | 0.071 |

| Micronutrients | | | | | | | | | | | | |
|---------------------|-------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Zn - DTPA | mg/kg | 64 | 5.34 | 0.840 | 2.70 | 0.190 | 3.00 | 0.195 | 2.20 | 0.112 | 0.960 | 0.080 |
| Mn - DTPA | mg/kg | 48 | 148 | 18.8 | 18.0 | 2.76 | 62.5 | 7.02 | 91.2 | 7.32 | 14.1 | 1.23 |
| Fe - DTPA | mg/kg | 52 | 79.0 | 9.15 | 12.9 | 1.20 | 46.8 | 4.41 | 92.0 | 9.85 | 32.8 | 3.62 |
| Cu - DTPA | mg/kg | 53 | 2.79 | 0.370 | 0.968 | 0.078 | 1.40 | 0.100 | 0.965 | 0.065 | 1.26 | 0.090 |
| Zn - HCl | mg/kg | 3 | 14.8 | 0.790 | 6.39 | 0.100 | 4.98 | 0.040 | 3.18 | 0.280 | 2.76 | 0.060 |
| Mn-H3PO4 | mg/kg | 13 | 117 | 15.0 | 23.1 | 2.90 | 51.0 | 5.47 | 77.2 | 7.81 | 23.5 | 4.48 |
| Cl - Ca(NO3)2 Extr. | mg/kg | 15 | 19.8 | 4.00 | 3.00 | 0.700 | 4.00 | 1.00 | 3.00 | 0.700 | 3.19 | 0.35 |
| B - Hot Wat. | mg/kg | 30 | 0.790 | 0.175 | 0.705 | 0.135 | 0.720 | 0.081 | 0.300 | 0.050 | 0.235 | 0.050 |
| B-DTPA/Sorbitol | mg/kg | 18 | 0.625 | 0.070 | 0.698 | 0.045 | 0.540 | 0.080 | 0.221 | 0.033 | 0.115 | 0.025 |

| Soil Organic Matter | | | | | | | | | | | | |
|---------------------------|---|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Soil Kjeldahl N | % | 15 | 0.279 | 0.014 | 0.170 | 0.009 | 0.255 | 0.010 | 0.150 | 0.007 | 0.146 | 0.007 |
| Soil TN (combustion) | % | 39 | 0.292 | 0.012 | 0.175 | 0.009 | 0.263 | 0.017 | 0.160 | 0.009 | 0.160 | 0.010 |
| Soil TOC (Combustion) | % | 15 | 3.21 | 0.090 | 1.81 | 0.072 | 2.77 | 0.074 | 1.59 | 0.060 | 1.72 | 0.040 |
| Soil Total C (Combustion) | % | 31 | 3.19 | 0.091 | 1.80 | 0.054 | 2.77 | 0.090 | 1.60 | 0.061 | 1.75 | 0.032 |

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.

| | | | | | | | | | | | | |
|------------------------------------------|---------|----|--------------|-------|-------------|-------|--------------|-------|--------------|-------|--------------|-------|
| SOM - Walkley-Black | % | 25 | 5.40 | 0.390 | 3.00 | 0.200 | 4.63 | 0.281 | 2.86 | 0.210 | 3.03 | 0.170 |
| SOM - LOI (% Wt loss) | % | 73 | 6.39 | 0.330 | 3.48 | 0.180 | 5.22 | 0.250 | 3.30 | 0.120 | 4.00 | 0.160 |
| Other | | | | | | | | | | | | |
| CaCO3 Content | % | 12 | 1.41 | 0.263 | 1.20 | 0.260 | 0.800 | 0.125 | 0.359 | 0.052 | 0.630 | 0.108 |
| CEC - Cation Displacement | cmol/kg | 13 | 37.9 | 4.30 | 22.9 | 1.70 | 27.2 | 3.82 | 12.7 | 1.47 | 10.8 | 1.98 |
| CEC - Estimation | cmol/kg | 12 | 30.3 | 2.17 | 21.5 | 1.00 | 22.6 | 2.25 | 10.4 | 1.50 | 7.50 | 1.40 |
| Soil Density (Scoop) | g/cc | 10 | 0.945 | 0.015 | 1.20 | 0.005 | 1.14 | 0.019 | 1.10 | 0.012 | 1.05 | 0.024 |
| Particle Size Analysis-Hydrometer | | | | | | | | | | | | |
| Sand 2000 - 50 um | % | 33 | 28.5 | 4.50 | 41.5 | 4.34 | 17.0 | 3.88 | 12.8 | 2.08 | 32.1 | 4.60 |
| Silt 50 - 2 um | % | 33 | 49.9 | 3.70 | 38.6 | 4.40 | 55.0 | 3.72 | 70.4 | 3.40 | 58.4 | 5.30 |
| Clay 2 - 0 um | % | 33 | 22.5 | 3.70 | 20.0 | 2.50 | 29.0 | 3.00 | 17.6 | 2.60 | 9.40 | 1.90 |
| Particle Size Analysis- Pipette | | | | | | | | | | | | |
| Sand 2000 - 50 um | % | 4 | 23.4 | 1.50 | 43.8 | 0.300 | 8.44 | 1.35 | 4.10 | 1.30 | 35.4 | 1.15 |
| Silt 50 - 2 um | % | 4 | 54.1 | 4.00 | 36.0 | 3.00 | 59.0 | 1.35 | 76.9 | 1.00 | 57.3 | 3.00 |
| Clay 2 - 0 um | % | 4 | 22.6 | 5.45 | 22.0 | 1.65 | 30.5 | 4.80 | 17.5 | 2.70 | 7.75 | 2.10 |
| Solvita CO2 | | | | | | | | | | | | |
| Solvita CO2 | ppm | 6 | 132 | 34.0 | 124 | 37.9 | 150 | 43.0 | 117 | 15.6 | 98.1 | 13.0 |

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.