Soil Science Society of America

# 2003 North American Proficiency Testing Program

## 1st Quarter Report June 8, 2003

**Laboratory ID**

| Soil | | | Soil 2003-101 | | | Soil 2003-102 | | | Soil 2003-103 | | | Soil 2003-104 | | | Soil 2003-105 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analysis** | **Units** | ***n*** | **Median** | ***MAD*** | **Lab[1]** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** |
| **Salinity -SP** | | | | | | | | | | | | | | | | | |
| Sat. Paste Moisture | % | 25 | 30.5 | 2.4 | | 46.9 | 1.8 | | 28.6 | 2.2 | | 24.4 | 1.4 | | 31.7 | 3.1 | |
| pH - sp | Unit | 34 | 6.11 | 0.11 | | 5.80 | 0.14 | | 7.50 | 0.11 | | 4.43 | 0.12 | | 5.77 | 0.07 | |
| ECe - sp | dS/m | 39 | 0.42 | 0.04 | | 1.02 | 0.11 | | 8.7 | 0.96 | | 0.63 | 0.08 | | 0.74 | 0.12 | |
| $HCO_3$ - sp | mmolc/L | 15 | 1.00 | 0.50 | | 0.71 | 0.28 | | 5.13 | 2.07 | | 0.49 | 0.25 | | 0.95 | 0.42 | |
| Ca - sp | mmolc/L | 30 | 1.11 | 0.21 | | 5.99 | 0.65 | | 43.3 | 4.2 | | 2.59 | 0.33 | | 2.08 | 0.27 | |
| Mg - sp | mmolc/L | 30 | 0.92 | 0.18 | | 2.64 | 0.21 | | 17.6 | 1.83 | | 1.30 | 0.13 | | 1.51 | 0.21 | |
| Na - sp | mmolc/L | 30 | 1.80 | 0.20 | | 1.65 | 0.13 | | 40.3 | 4.9 | | 0.65 | 0.30 | | 0.41 | 0.22 | |
| SAR - sp | value | 24 | 1.8 | 0.25 | | 0.79 | 0.06 | | 7.31 | 0.66 | | 0.48 | 0.22 | | 0.25 | 0.15 | |
| Cl - sp | mmolc/L | 18 | 0.89 | 0.12 | | 3.95 | 0.35 | | 54.6 | 8.5 | | 0.64 | 0.15 | | 0.50 | 0.15 | |
| $SO_4$ - sp | mmolc/L | 18 | 1.06 | 0.10 | | 1.12 | 0.07 | | 32.5 | 2.9 | | 1.04 | 0.10 | | 0.42 | 0.06 | |
| $NO_3$ - sp | mmolc/L | 9 | 1.00 | 0.09 | | 3.71 | 0.22 | | 10.2 | 2.06 | | 3.04 | 0.58 | | 4.20 | 0.69 | |
| B - sp | mg/L | 17 | 0.11 | 0.02 | | 0.13 | 0.03 | | 0.87 | 0.13 | | 0.10 | 0.02 | | 0.26 | 0.04 | |
| **Soil EC** | | | | | | | | | | | | | | | | | |
| Soil EC (1:1) | (dS/m) | 33 | 0.15 | 0.03 | | 0.30 | 0.06 | | 2.55 | 0.58 | | 0.21 | 0.06 | | 0.33 | 0.06 | |
| Soil EC (1:2) | (dS/m) | 42 | 0.09 | 0.02 | | 0.27 | 0.03 | | 1.75 | 0.22 | | 0.15 | 0.03 | | 0.17 | 0.03 | |
| **Soil pH** | | | | | | | | | | | | | | | | | |
| pH (1:1) | Unit | 93 | 6.26 | 0.11 | | 5.91 | 0.09 | | 7.90 | 0.10 | | 4.66 | 0.09 | | 6.10 | 0.10 | |
| pH (1:2) | Unit | 26 | 6.33 | 0.25 | | 6.00 | 0.10 | | 8.02 | 0.17 | | 4.70 | 0.15 | | 6.17 | 0.13 | |
| pH (1:1) 0.01M $CaCl_2$ | Unit | 19 | 5.50 | 0.05 | | 5.52 | 0.07 | | 7.68 | 0.21 | | 4.14 | 0.16 | | 5.60 | 0.07 | |
| pH (1:2) 0.01M $CaCl_2$ | Unit | 11 | 5.53 | 0.07 | | 5.50 | 0.02 | | 7.59 | 0.21 | | 4.10 | 0.01 | | 5.49 | 0.05 | |
| **Buffer pH** | | | | | | | | | | | | | | | | | |
| SMP Buffer pH | Unit | 64 | 6.92 | 0.08 | | 6.40 | 0.10 | | 7.54 | 0.06 | | 6.23 | 0.12 | | 7.05 | 0.06 | |
| Adams-Evans Buf pH | Unit | 12 | 7.59 | 0.02 | | 7.25 | 0.05 | | 7.85 | 0.05 | | 7.22 | 0.12 | | 7.62 | 0.05 | |
| Woodruff Buf. pH | Unit | 15 | 6.70 | 0.10 | | 6.45 | 0.06 | | 7.11 | 0.05 | | 6.18 | 0.11 | | 6.75 | 0.05 | |
| Mehlich Buf. pH | Unit | 5 | 6.23 | 0.03 | | 6.00 | 0.05 | | 6.80 | 0.04 | | 5.85 | 0.15 | | 6.19 | 0.05 | |
| Titratable Acidity | cmol/kg | 2 | 4.70 | - | | 14.2 | - | | 0.00 | - | | 6.74 | 0.22 | | 4.32 | 0.01 | |

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| **Analysis** | **Units** | ***n*** | **Median** | ***MAD*** | **Lab[1]** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** |
| **Nitrate ($NO_3$-N)** | | | | | | | | | | | | | | | | | |
| Cd. Rd. | mg/kg | 54 | 5.5 | 1.0 | | 27.8 | 1.4 | | 71.3 | 7.3 | | 14.3 | 1.5 | | 23.7 | 2.3 | |
| ISE | mg/kg | 25 | 5.0 | 1.3 | | 23.4 | 3.0 | | 72.8 | 14.9 | | 14.0 | 2.2 | | 21.3 | 3.3 | |
| CTA | mg/kg | 6 | 5.2 | 1.0 | | 31.1 | 1.2 | | 83.0 | 11.0 | | 21.5 | 6.2 | | 25.7 | 1.7 | |
| Ion Chromatography | mg/kg | 1 | 3.6 | - | | 20.8 | - | | 58.4 | - | | 9.2 | - | | 18.0 | - | |
| Other | mg/kg | 9 | 5.1 | 0.7 | | 29.0 | 5.5 | | 74.1 | 11.0 | | 15.5 | 3.8 | | 28.0 | 6.1 | |
| $NH_4$ - N (KCl Extr.) | mg/kg | 47 | 3.3 | 0.8 | | 4.4 | 1.0 | | 9.0 | 2.3 | | 5.2 | 1.2 | | 1.4 | 0.8 | |
| Amino-N (Mulvaney) | mg/kg | 5 | 70 | 7 | | 165 | 16 | | 56 | 10 | | 82 | 11 | | 115 | 12 | |
| **Phosphorus & Sulfur** | | | | | | | | | | | | | | | | | |
| $PO_4$-P Bray P1 (1:10) | mg/kg | 51 | 8.0 | 1.0 | | 51.2 | 7.1 | | 3.0 | 1.0 | | 43 | 4.0 | | 52 | 5.0 | |
| $PO_4$-P Bray P1 (1:7) | mg/kg | 13 | 7.0 | 1.0 | | 28.0 | 6.5 | | 3.2 | 1.0 | | 35 | 4.0 | | 46.1 | 4.3 | |
| $PO_4$-P Olsen/Bicarb | mg/kg | 59 | 4.7 | 1.2 | | 36.0 | 4.0 | | 11.3 | 1.3 | | 19.0 | 2.0 | | 28.2 | 2.4 | |
| $PO_4$-P AB-DTPA | mg/kg | 1 | 6.0 | - | | 51.1 | - | | 4.2 | - | | 31.0 | - | | 12.7 | - | |
| $PO_4$-P M. Morgan | mg/kg | 12 | 1.0 | 0.3 | | 6.2 | 1.2 | | 34.8 | 3.8 | | 4.9 | 0.9 | | 11.5 | 2.9 | |
| $PO_4$-P M. Kewlona | mg/kg | 3 | 7.0 | 1.0 | | 33.0 | 4.0 | | 18.0 | 3.0 | | 26 | 1.0 | | 43.0 | 1.5 | |
| $PO_4$-P Strg Bray P-2 | mg/kg | 11 | 13 | 1.8 | | 116 | 17.4 | | 95 | 19.0 | | 49 | 3.8 | | 91 | 13.0 | |
| $PO_4$-P Water Soluble | mg/kg | 1 | 1.1 | - | | 28.0 | - | | 2.0 | - | | 28.8 | - | | 2.1 | - | |
| $SO_4$ -S ($PO_4$ Extr.) | mg/kg | 43 | 8.3 | 2.2 | | 18.0 | 4.4 | | 140 | 42.0 | | 11.9 | 4.1 | | 4.0 | 1.7 | |
| **Ammonium Ace. Bases** | | | | | | | | | | | | | | | | | |
| K | mg/kg | 91 | 78 | 7 | | 92 | 12 | | 461 | 33 | | 240 | 27 | | 1022 | 105 | |
| Ca | mg/kg | 83 | 936 | 94 | | 1323 | 123 | | 4134 | 619 | | 347 | 50 | | 1330 | 122 | |
| Mg | mg/kg | 84 | 312 | 27 | | 155 | 14.4 | | 311 | 28 | | 75 | 11 | | 438 | 37 | |
| Na | mg/kg | 69 | 57 | 6.6 | | 48 | 6.8 | | 478 | 57.0 | | 17 | 8.0 | | 15 | 6.1 | |
| K - Bray (1:10) | mg/kg | 5 | 71 | 4 | | 76 | 6 | | 333 | 27 | | 240 | 12.9 | | 791 | 43.0 | |
| K- Bicarb. | mg/kg | 9 | 70 | 6 | | 114 | 13 | | 344 | 16 | | 176 | 31 | | 747 | 104 | |
| K - Modified Morgan | mg/kg | 8 | 75 | 9 | | 99 | 6 | | 403 | 87 | | 234 | 39 | | 1065 | 256 | |
| Ca Modified Morgan | mg/kg | 5 | 1043 | 70 | | 1519 | 83 | | 19075 | 1691 | | 623 | 148 | | 1508 | 128 | |
| Al KCL Extr. | mg/kg | 8 | 1.31 | 0.61 | | 1.43 | 0.62 | | 0.72 | 0.25 | | 92.8 | 11 | | 2.6 | 1.4 | |

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| **Analysis** | **Units** | ***n*** | **Median** | ***MAD*** | **Lab[1]** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** |
| **Mehlich-1 Multi Element** | | | | | | | | | | | | | | | | | |
| **Soil Scoop Mass** | g | 12 | **5.00** | *0.18* | | **5.00** | *0.19* | | **5.00** | *0.04* | | **5.00** | *0.62* | | **5.00** | *0.52* | |
| **P** | mg/kg | 13 | **4.2** | *0.5* | | **26** | *7.4* | | **18.1** | *1.6* | | **18.8** | *1.5* | | **72.1** | *6.4* | |
| **K** | mg/kg | 12 | **49** | *6.5* | | **84** | *6.5* | | **176** | *9* | | **158** | *19* | | **538** | *36* | |
| **Ca** | mg/kg | 12 | **755** | *56* | | **1557** | *325* | | **5535** | *574* | | **268** | *40* | | **1019** | *127* | |
| **Mg** | mg/kg | 12 | **264** | *29* | | **162** | *17* | | **272** | *15* | | **60.2** | *5.8* | | **338** | *40* | |
| **Mn** | mg/kg | 10 | **20.2** | *1.0* | | **18.0** | *1.6* | | **2.8** | *0.95* | | **56.2** | *5.5* | | **10.1** | *1.2* | |
| **Zn** | mg/kg | 11 | **0.31** | *0.15* | | **0.79** | *0.12* | | **0.10** | *0.03* | | **0.81** | *0.13* | | **0.53** | *0.19* | |
| **Mehlich-3 Mult-Element** | | | | | | | | | | | | | | | | | |
| **Soil Scoop Mass** | g | 36 | **2.17** | *0.58* | | **1.76** | *0.58* | | **2.42** | *0.68* | | **2.44** | *0.78* | | **1.92** | *0.55* | |
| **Scoop Volume** | mL | 20 | **1.18** | *0.10* | | **1.07** | *0.11* | | **1.18** | *0.13* | | **1.18** | *0.17* | | **1.09** | *0.10* | |
| **P Colorimetric** | mg/kg | 18 | **8.5** | *1.3* | | **54.4** | *6.5* | | **38.0** | *2.8* | | **40.5** | *3.0* | | **47.5** | *4.5* | |
| **P ICP** | mg/kg | 34 | **9.5** | *1.3* | | **52.6** | *6.0* | | **39.5** | *4.3* | | **48.7** | *5.0* | | **53.2** | *6.3* | |
| **K** | mg/kg | 46 | **76** | *7* | | **92** | *10.8* | | **469** | *32.4* | | **254** | *20* | | **968** | *102* | |
| **Ca** | mg/kg | 45 | **962** | *85* | | **1469** | *149* | | **6964** | *680* | | **417** | *65* | | **1317** | *115* | |
| **Mg** | mg/kg | 45 | **326** | *27* | | **169** | *13.3* | | **423** | *33.0* | | **88** | *12* | | **437** | *31.1* | |
| **Na** | mg/kg | 26 | **63** | *7.4* | | **49** | *5.1* | | **508** | *73.0* | | **16** | *5.7* | | **15** | *4.5* | |
| **S** | mg/kg | 23 | **15.0** | *2.5* | | **29.6** | *2.7* | | **204** | *33* | | **27.0** | *3.8* | | **10.0** | *2.8* | |
| **Al** | mg/kg | 20 | **786** | *55* | | **1637** | *173* | | **92** | *18* | | **956** | *95* | | **556** | *60* | |
| **Zn** | mg/kg | 34 | **0.51** | *0.12* | | **0.92** | *0.18* | | **1.5** | *0.26* | | **1.39** | *0.20* | | **0.92** | *0.22* | |
| **Mn** | mg/kg | 32 | **39** | *3.9* | | **9.0** | *1.3* | | **60** | *6.2* | | **75** | *11.0* | | **100** | *20* | |
| **Fe** | mg/kg | 29 | **121** | *14.1* | | **332** | *40* | | **23** | *4.4* | | **154** | *15.7* | | **74** | *11.4* | |
| **Cu** | mg/kg | 32 | **0.51** | *0.11* | | **3.23** | *0.30* | | **0.97** | *0.21* | | **4.29** | *0.38* | | **1.10** | *0.19* | |
| **B** | mg/kg | 27 | **0.40** | *0.10* | | **0.81** | *0.29* | | **2.72** | *0.33* | | **0.35** | *0.15* | | **0.65** | *0.15* | |

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| **Analysis** | **Units** | ***n*** | **Median** | ***MAD*** | **Lab[1]** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** | **Median** | ***MAD*** | **Lab** |
| **Micronutrients** | | | | | | | | | | | | | | | | | |
| Zn - DTPA | mg/kg | 72 | 0.18 | 0.04 | | 0.50 | 0.09 | | 0.50 | 0.10 | | 0.86 | 0.11 | | 0.30 | 0.06 | |
| Mn - DTPA | mg/kg | 66 | 19.9 | 1.72 | | 3.4 | 0.39 | | 7.9 | 2.7 | | 56.8 | 9.0 | | 13.9 | 3.5 | |
| Fe - DTPA | mg/kg | 68 | 27.7 | 3.6 | | 111 | 14.00 | | 2.0 | 0.50 | | 56.2 | 7.0 | | 15.0 | 2.2 | |
| Cu - DTPA | mg/kg | 67 | 0.20 | 0.04 | | 1.95 | 0.21 | | 0.34 | 0.06 | | 3.20 | 0.36 | | 0.56 | 0.10 | |
| Zn - HCl | mg/kg | 6 | 0.85 | 0.25 | | 1.50 | 0.28 | | 0.3 | 0.18 | | 1.1 | 0.10 | | 1.05 | 0.09 | |
| Mn-$H_3PO_4$ | mg/kg | 5 | 17.5 | 1.5 | | 8.3 | 1.1 | | 8.0 | 2.0 | | 48.9 | 8.02 | | 8.0 | 1.4 | |
| Cl - $Ca(NO_3)_2$ Extr. | mg/kg | 22 | 9.9 | 1.3 | | 54.5 | 7.5 | | 552 | 146 | | 5.9 | 1.5 | | 4.0 | 1.1 | |
| B - Hot Water | mg/kg | 49 | 0.37 | 0.08 | | 0.55 | 0.12 | | 1.60 | 0.28 | | 0.34 | 0.12 | | 0.83 | 0.15 | |
| B - DTPA-Sorb | mg/kg | 13 | 0.20 | 0.03 | | 0.30 | 0.08 | | 1.80 | 0.10 | | 0.15 | 0.04 | | 0.33 | 0.11 | |
| **Soil Organic Matter** | | | | | | | | | | | | | | | | | |
| Soil Kjeldahl N | % | 22 | 0.053 | 0.003 | | 0.13 | 0.008 | | 0.060 | 0.005 | | 0.061 | 0.008 | | 0.105 | 0.006 | |
| Soil TN (combustion) | % | 34 | 0.048 | 0.009 | | 0.14 | 0.006 | | 0.054 | 0.008 | | 0.050 | 0.010 | | 0.104 | 0.014 | |
| Soil TOC (combustion) | % | 25 | 0.52 | 0.03 | | 2.58 | 0.12 | | 1.08 | 0.21 | | 0.59 | 0.03 | | 0.94 | 0.05 | |
| SOM - Walkley-Black | % | 47 | 0.93 | 0.12 | | 4.55 | 0.55 | | 1.10 | 0.17 | | 1.23 | 0.22 | | 1.6 | 0.2 | |
| SOM - LOI (Raw Values) | % | 66 | 1.42 | 0.17 | | 5.14 | 0.26 | | 1.23 | 0.15 | | 1.20 | 0.11 | | 2.2 | 0.2 | |
| **$CaCO_3$ Content** | % | 13 | 0.31 | 0.21 | | 0.30 | 0.32 | | 5.53 | 0.63 | | 0.10 | 0.05 | | 0.20 | 0.19 | |
| **CEC** - Displacement | cmol/kg | 34 | 9.7 | 1.4 | | 13.9 | 2.7 | | 9.9 | 1.64 | | 7.2 | 1.3 | | 15.7 | 1.32 | |
| - Estimation | cmol/kg | 7 | 8.0 | 1.0 | | 15.0 | 0.8 | | 28.8 | 1.8 | | 9.9 | 2.1 | | 13.8 | 1.0 | |
| **Scoop Density** | $mg/cm^3$ | 7 | 1.36 | 0.08 | | 1.06 | 0.03 | | 1.46 | 0.03 | | 1.44 | 0.05 | | 1.19 | 0.07 | |
| **Particle Size Analysis** | | | | | | | | | | | | | | | | | |
| Sand 2000 - 50 um | % | 43 | 59.0 | 2.1 | | 21.3 | 3.7 | | 65.9 | 2.1 | | 54.6 | 2.3 | | 31.4 | 4.2 | |
| Silt 50 - 2 um | % | 43 | 24.6 | 2.2 | | 68.7 | 2.7 | | 21.6 | 1.6 | | 30.9 | 1.9 | | 45.0 | 4.1 | |
| Clay 2 - 0 um | % | 43 | 16.0 | 2.1 | | 10.6 | 3.0 | | 13.0 | 1.8 | | 14.6 | 2.1 | | 23.4 | 2.4 | |

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