Welcome

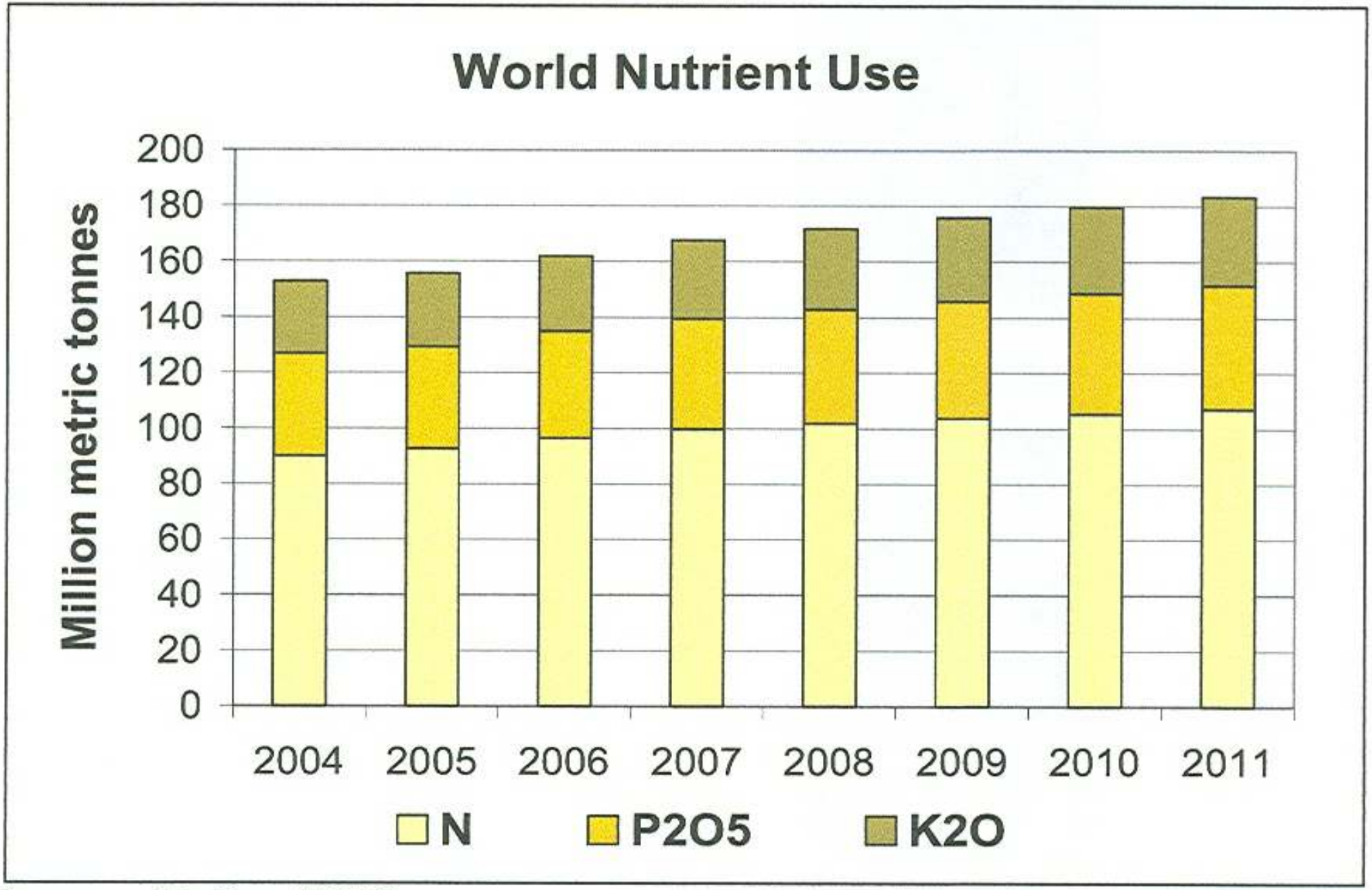
Greg Patterson C.C.A.

President A&L Canada Laboratories

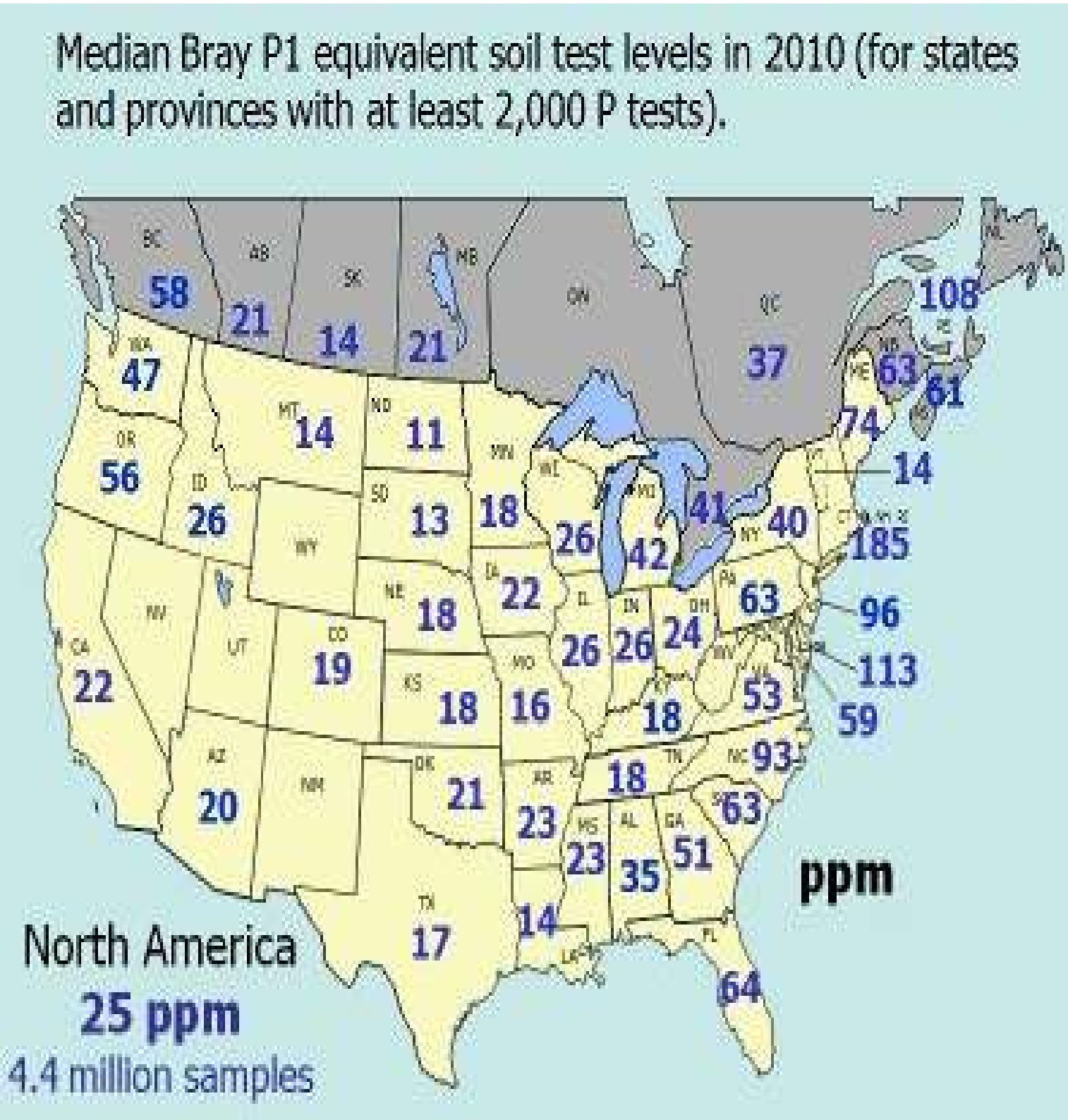
Discussion

- Soil test levels Dropping – P,K
- Organic matter levels dropping
- Cost of Fertilizer Increasing due to Global Demand
- Environmental Pressures
- Experts in Our Industry in the Dark Ages
- Your Customers Looking for New Technology and Information

Figure 2 World Nutrient Use, 2004-2011



Source: (Heffer, 2007).



- Bray P1 41

IPNI

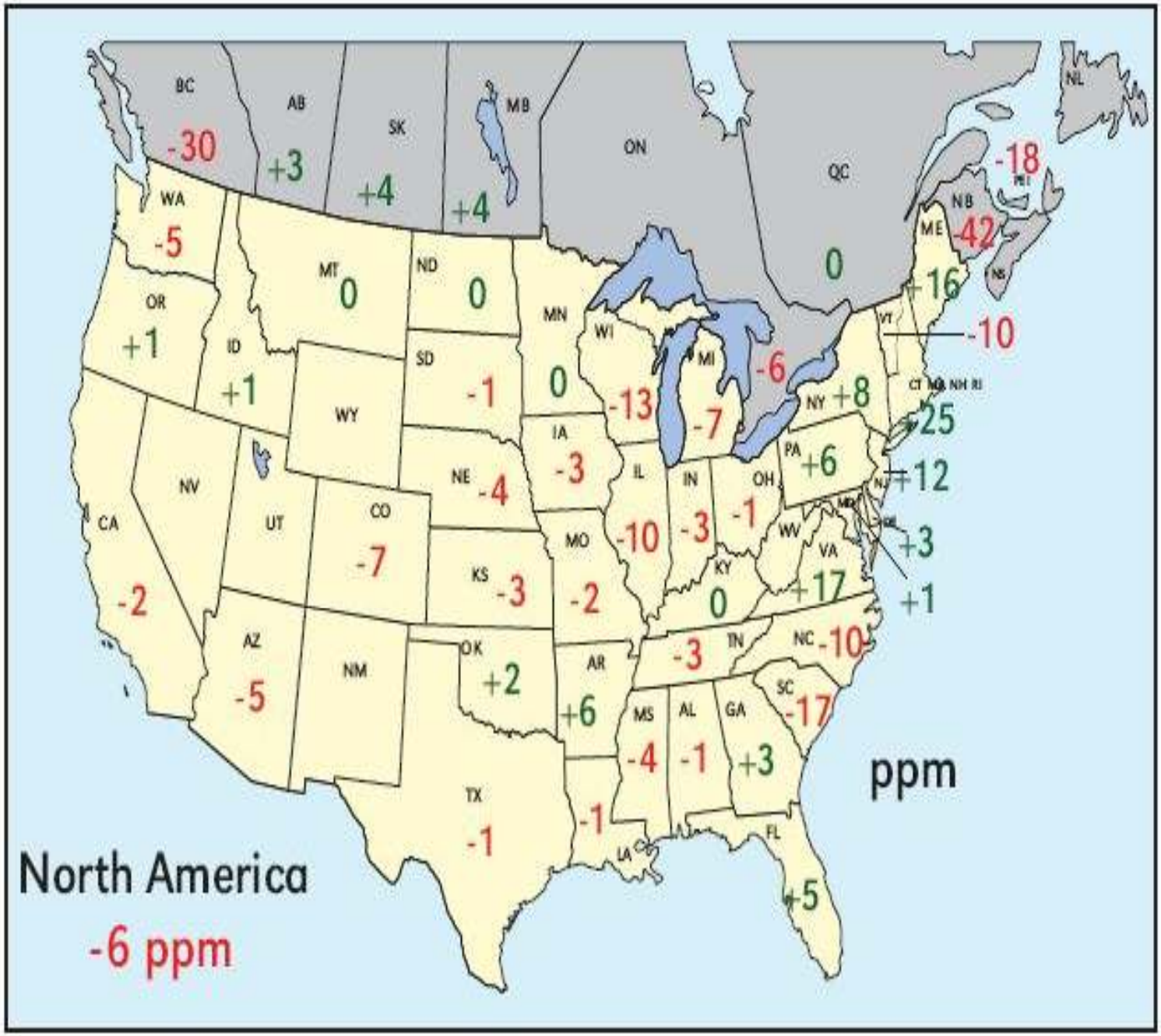


Figure 2. Change in median Bray P1 equivalent soil test levels from 2005 to 2010.

- Bray P1 - 6ppm

Nitrogen Balanced Fertility
N:K RATIO

- Ratio N:K in Early season 1:3 progressing to a ratio through the season of 1:1
- Developed countries in the 60's and 70's fairly balanced at 1:0.8 to a current use N:K use of 1:0.36
- Developing countries little change 1:0.10 –1:0.13 except South America has increased to 1:0.96 because of the response soybeans have to K

Nitrogen Balanced Fertility
N:K RATIO

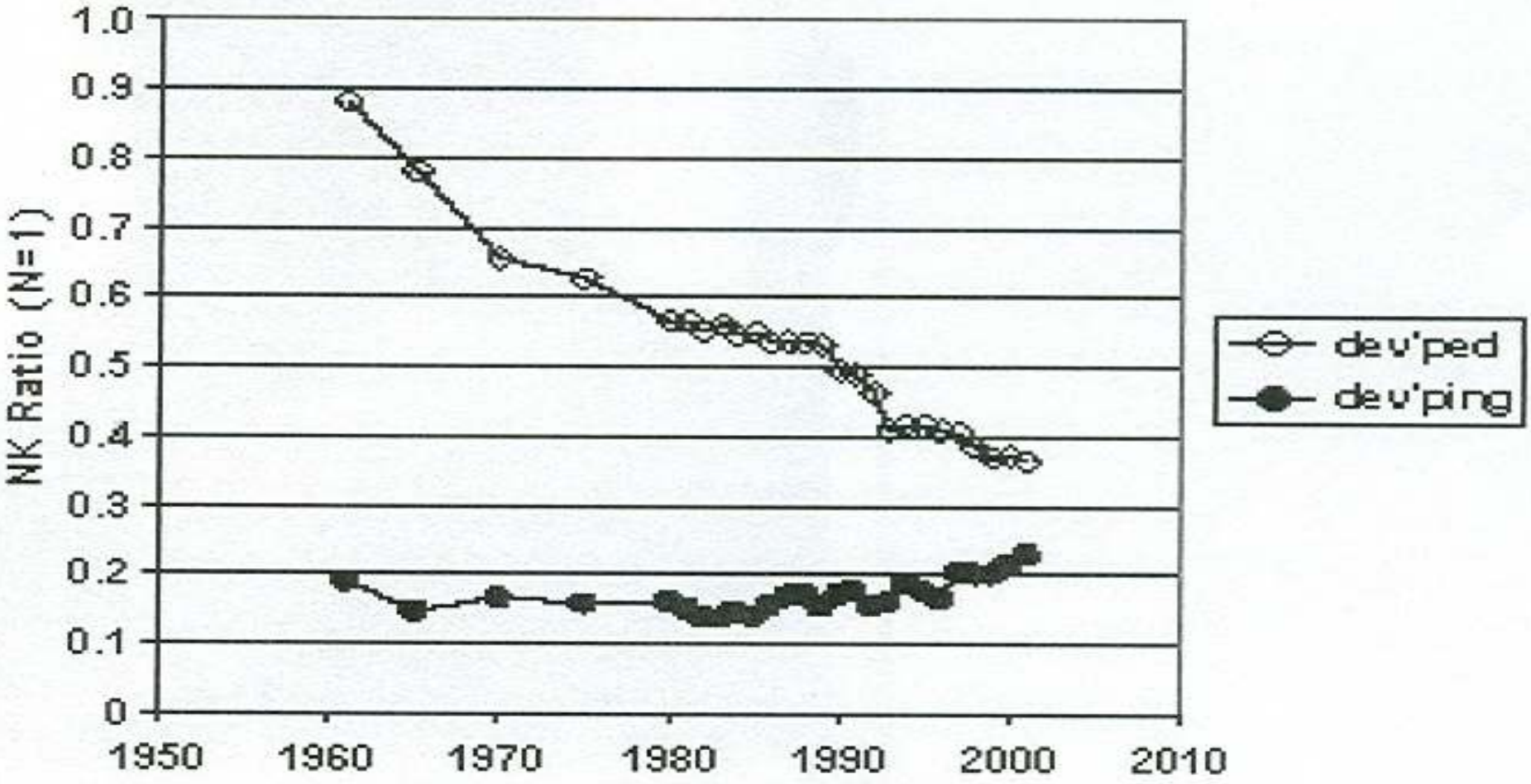
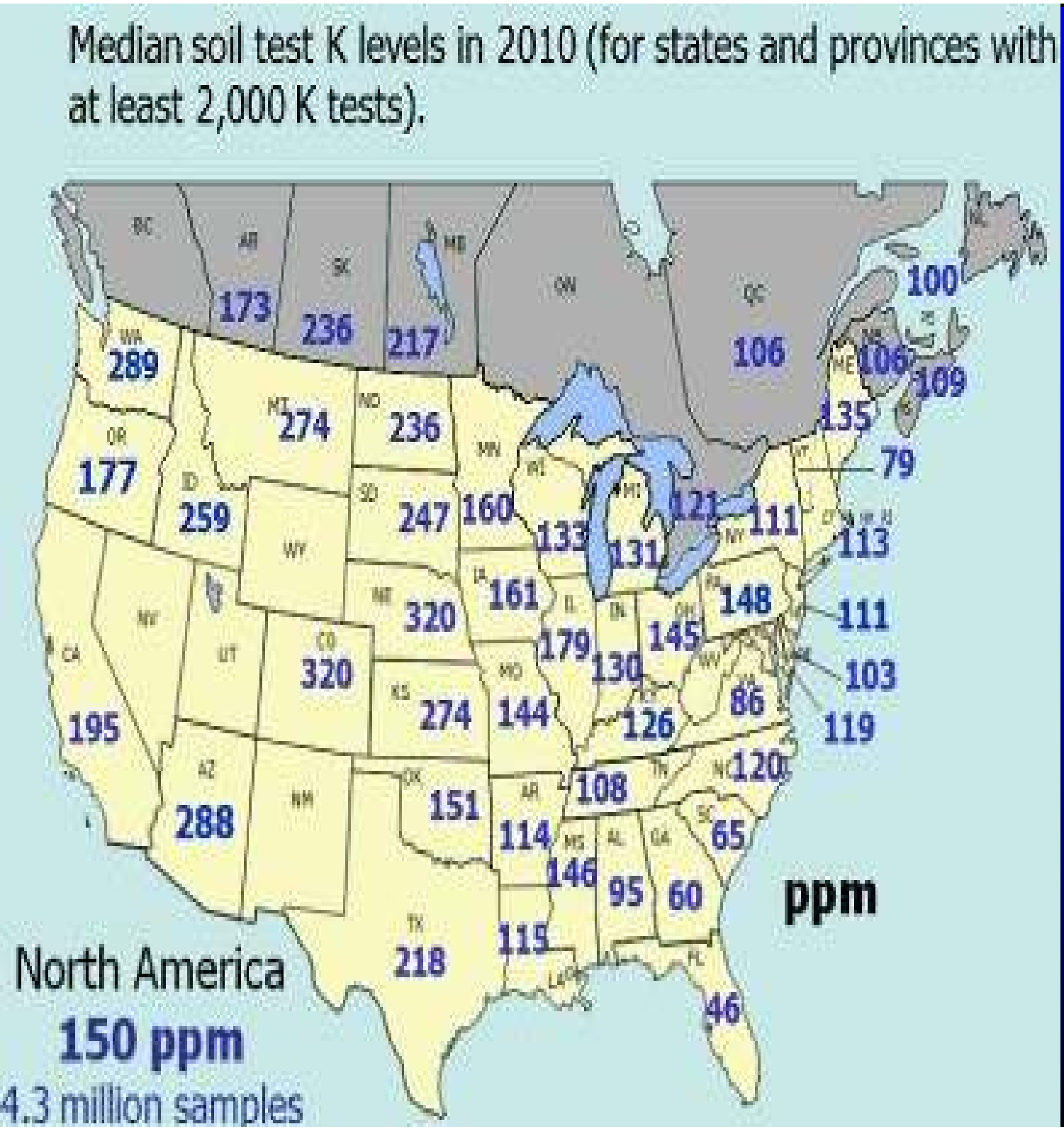


Figure 4: Development of the regional NK ratio in



- Ave K ppm 121 ppm

Specializing in Soil and Plant Analysis

SOIL OPTIMUM LEVELS

CEC

PPM	SOIL	0 - 6	7 -15	16 - 25	25+
P	POOR	0 - 25	0 - 23	0 -18	0 - 13
	MED	26 - 55	24 - 43	19 - 33	14 - 23
	GOOD	56 - 93	44 - 83	34 - 55	24 - 43
	HIGH	94+	84+	56+	44+
K	POOR	0 - 45	0 - 60	0 - 80	0 - 100
	MED	46 - 90	61 - 120	81 - 160	101 - 200
	GOOD	91 - 180	121 - 240	161 - 320	201 - 400
	HIGH	181+	241+	321+	401+
Ca	POOR	0 -200	0 - 400	0 - 600	0 - 1000
	MED	201 - 400	401 - 800	601 - 1200	1001 - 2000
	GOOD	401 - 800	801 - 1600	1201 - 2400	2001 - 6000
	HIGH	801+	1600+	2400+	6000+
Mg	POOR	0 - 25	26 - 50	0 -75	0 - 100
	MED	26 - 50	51 - 100	76 - 150	101 - 200
	GOOD	51 - 100	101 - 200	151 - 300	201 - 600
	HIGH	101+	201 +	301+	601+

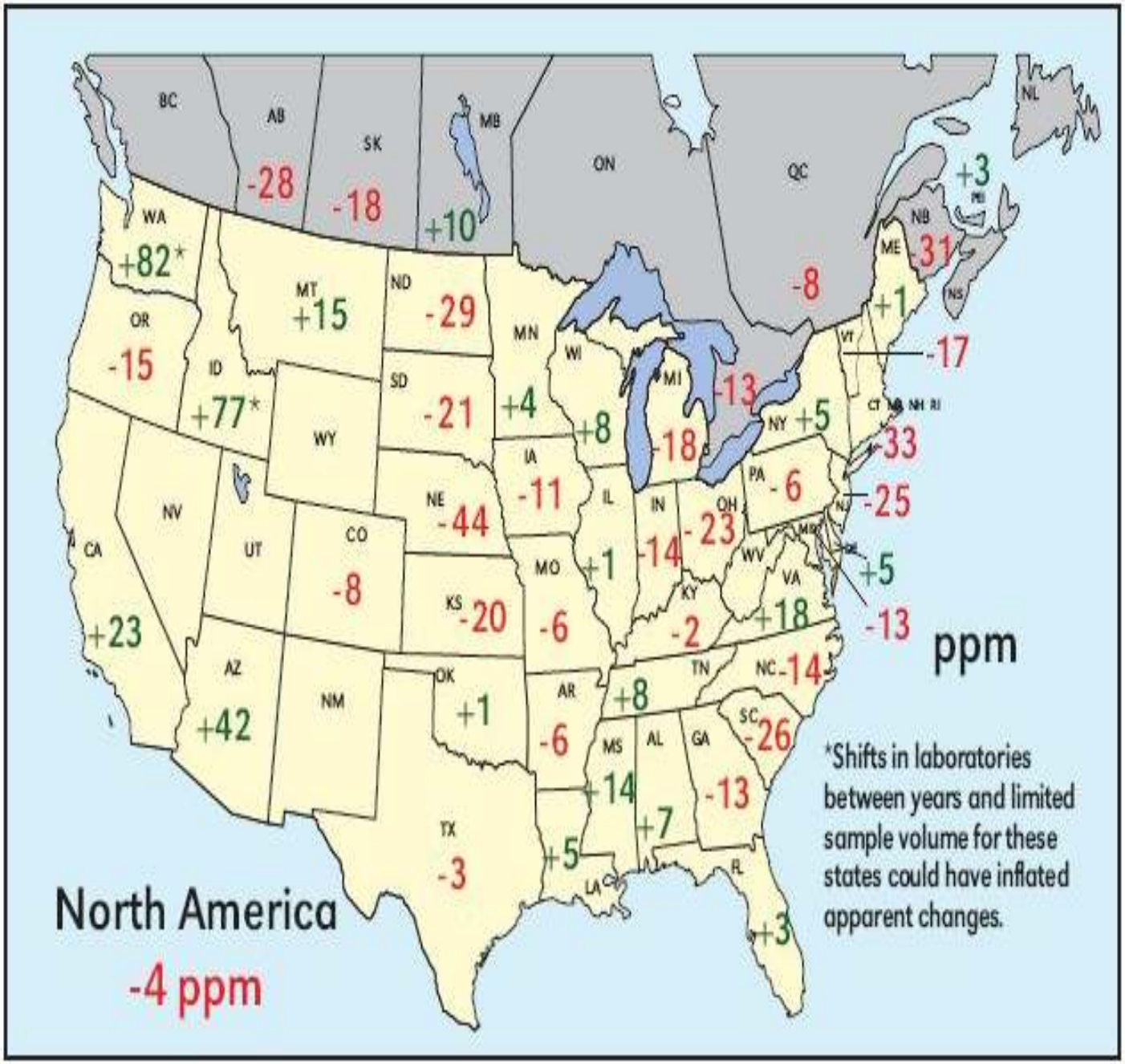


Figure 6. Change in median soil test K levels from 2005 to 2010.

- Change in K
- -13ppm

- Ave CEC 18
- 234 lbs/ac
- 46.8/year

Specializing in Soil and Plant Analysis

SOIL OPTIMUM LEVELS

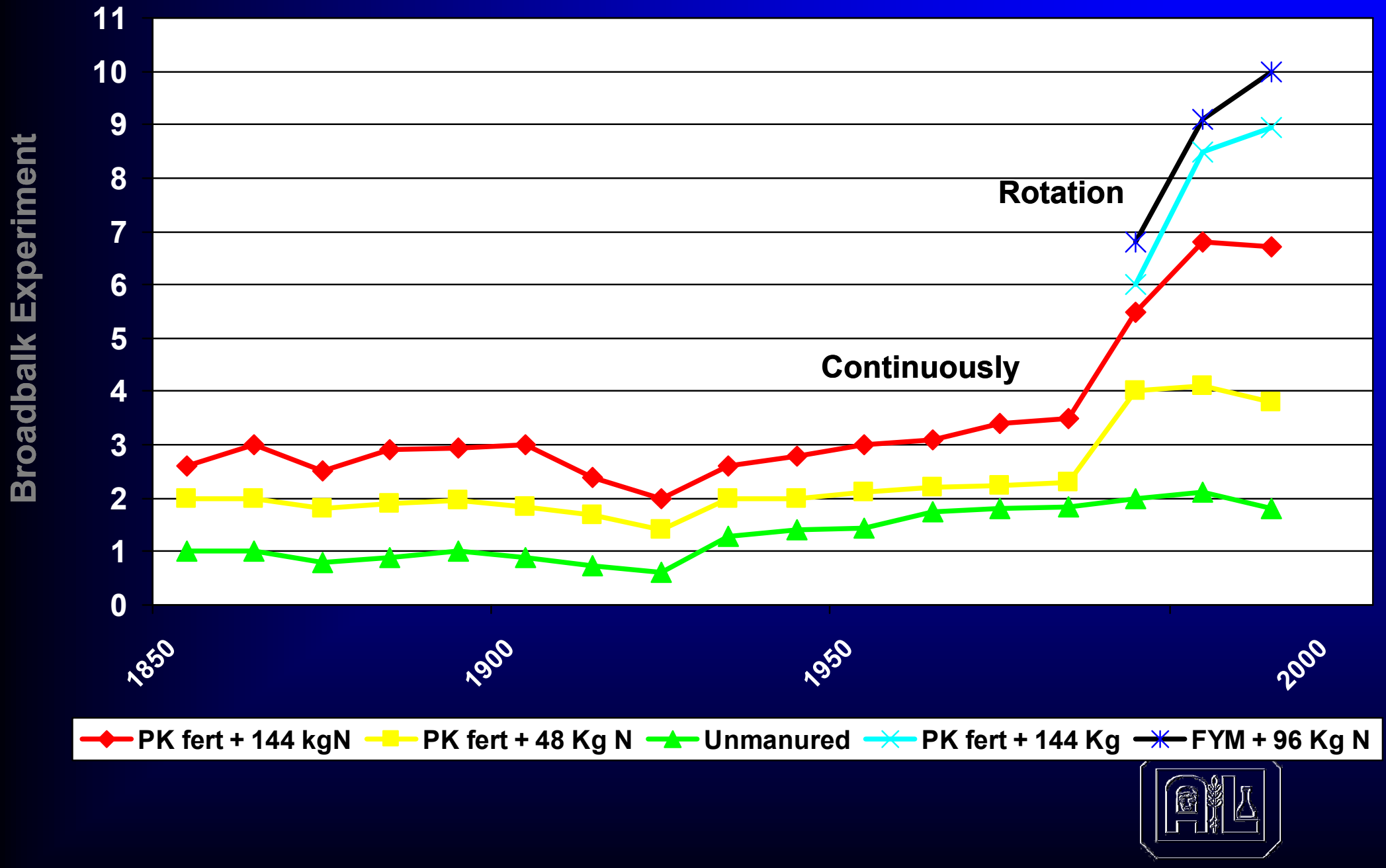
CEC

PPM	SOIL	0 - 6	7 -15	16 - 25	25+
P	POOR	0 - 25	0 - 23	0 -18	0 - 13
	MED	26 - 55	24 - 43	19 - 33	14 - 23
	GOOD	56 - 93	44 - 83	34 - 55	24 - 43
	HIGH	94+	84+	56+	44+
K	POOR	0 - 45	0 - 60	0 - 80	0 - 100
	MED	46 - 90	61 - 120	81 - 160	101 - 200
	GOOD	91 - 180	121 - 240	161 - 320	201 - 400
	HIGH	181+	241+	321+	401+
Ca	POOR	0 -200	0 - 400	0 - 600	0 - 1000
	MED	201 - 400	401 - 800	601 - 1200	1001 - 2000
	GOOD	401 - 800	801 - 1600	1201 - 2400	2001 - 6000
	HIGH	801+	1600+	2400+	6000+
Mg	POOR	0 - 25	26 - 50	0 -75	0 - 100
	MED	26 - 50	51 - 100	76 - 150	101 - 200
	GOOD	51 - 100	101 - 200	151 - 300	201 - 600
	HIGH	101+	201 +	301+	601+

% Saturation Ranges by C..E.C.

%SATURATON CATIONS	0 - 6	7 - 15	16 - 25	25+
% K SAT	4 - 6	3 - 5	2 - 4	2 - 3
% Mg SAT	10 - 20	8 - 20	5 - 20	5 - 20
% Ca SAT	60 - 80	60 - 80	60 - 80	60 - 80

Broadbalk Experiment since 1843



Analyze your soil (know your dirt!)

Soil Test Interpretation

DON'T GUESS SOIL TEST

WHY SOIL TEST

- Soil analysis provides a nutritional map of the farm
- Soil analysis removes guess work
- Crop planning
- Finds "Hidden Hungers"
- Enables forward planning of a crops nutrient needs.

Report Number: C99282-001
Account Number: 67003

A & L Canada Laboratories East, Inc.

2136 Jetstream Road, London, Ontario, N5V 3P5
Telephone: (519) 457-2575 Fax: (519) 457-2664

Potassium K ppm	Magn Mg
136 *M*	3
188 *H*	2
94 *M*	3
136 *H*	

Percent Base Saturations

% K	% Mg	% Ca	% H	% Na
2.0	17.6	72.8	6.9	0.7
6.1	22.2	63.6	4.8	3.3
1.9	22.3	56.0	19.2	0.5
8.2	4.9	29.4	56.5	1.0

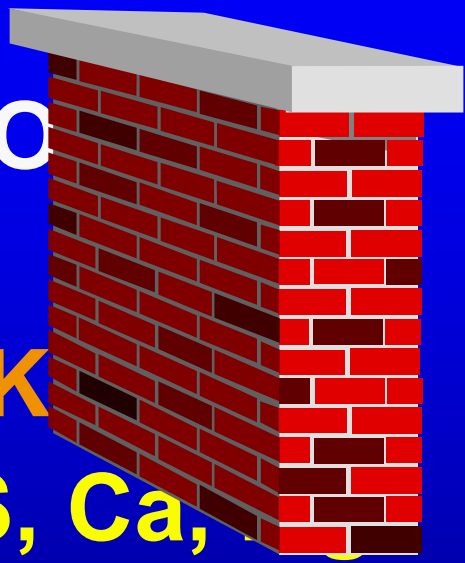
Sample Number	Crop	Yield Goal	Lime Tons/Acre	N	P2O5	K2O	Mg	Ca	S	Zn	Mn	Fe	Cu	B

Nutrients Required by Crops

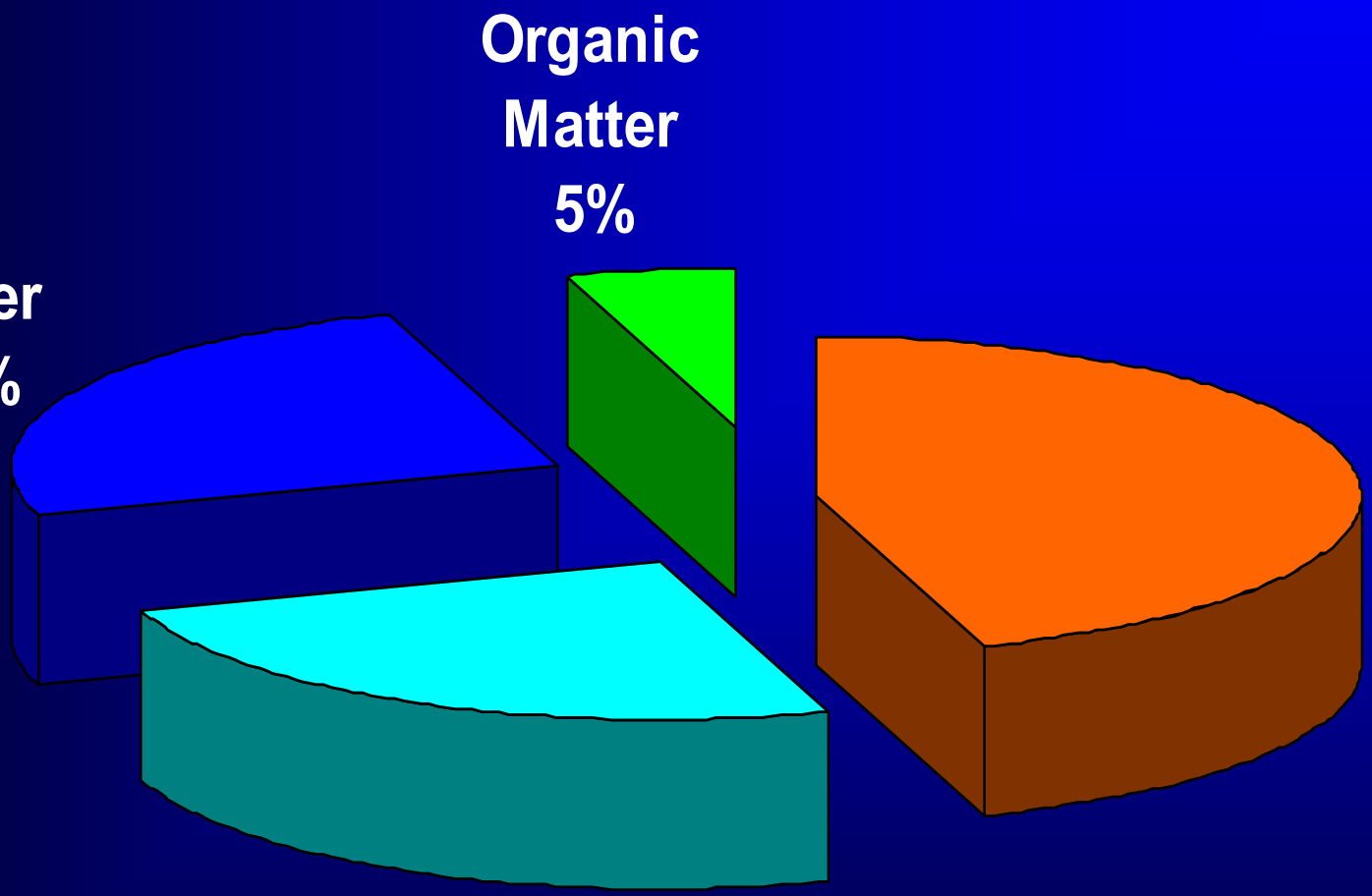
- **Building Blocks** **C, H, O**
- **Macro Nutrients- Primary N, P, K**
  - Secondary S, Ca,
- **Micronutrients** **B, Cu, Fe, Mn, Zn**

Mo, Cl, Si, Na, V

Co,



Composition of "Ideal" Soil



Nutrient Absorption by Plants

Potassium	K^{+}
Calcium	Ca^{++}
Magnesium	Mg^{++}
Copper	Cu^{++}
Iron	Fe^{++}
Manganese	Mn^{++}
Zinc	Zn^{+}

Nutrient Absorption by Plants

Phosphorus	$H_2PO_4^-$, HPO_4^{--}
Sulfur	SO_4^{--}
Boron	BO_3^{---}
Chlorine	Cl^-
Molybdenum	MoO_4^-

Nutrient Absorption by Plants

Why Soil Test?

NO_3^-

NH_4^+

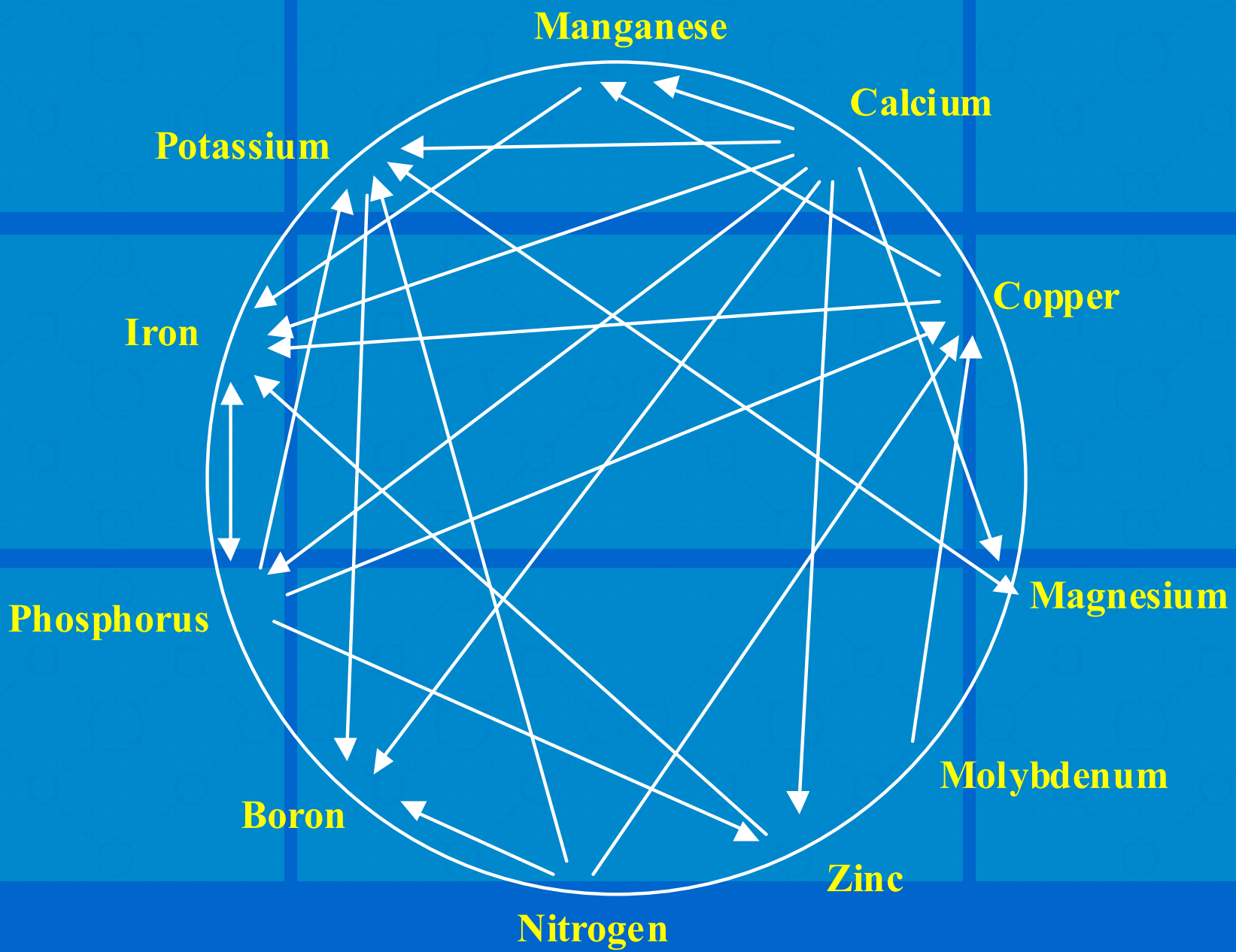
Why Soil Test?

Element	Discovery of Essentiality
C	DeSaussure……1804
H	DeSaussure……1804
O	DeSaussure……1804
N	DeSaussure……1804
P	Ville……1860
S	Von Sachs, Knop……1865
K	Von Sachs, Knop……1860
Ca	Von Sachs, Knop……1860
Mg	Von Sachs, Knop……1860

Why Soil Test?

Element	Discovery of Essentiality
• Fe	• Von Sachs, Knop……1860
• Mn	• McHargue……..1922
• Cu	• Sommer……..1931
• Zn	• Sommer and Lipman…1926
• Mo	• Aron and Stout……..1939
• B	• Sommer and Lipman…1926
• Cl	• Stout……1954
• Ni	• Brown……198
• Na,Si,Co	

MULDER'S CHART- element interactions



Soil Test Interpretation

- Soil pH is variable throughout the season
- Buffer pH is more stable
- Soil pH is a measurement of the H+ in soil solution
- Buffer pH is a measure of the H+ on the soil particle

pH	
pH	Buffer
6.6	6.9
7.2	
6.0	6.8
4.9	6.8

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium	Magnesium	Calcium	Sodium	pH		CEC	Percent Base Saturations				
			Bicarb	Bray-P1	K ppm	Mg ppm	Ca ppm	Na ppm	pH	Buffer	meq/100g	% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
1	13 H	4.0 M	18 M	78 VH	2.8 H	1.1 M	1.2 M	1	1600	19 M	0.11	51
2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Soil pH

Soil pH measures hydrogen ion activity and is expressed in logarithmic terms

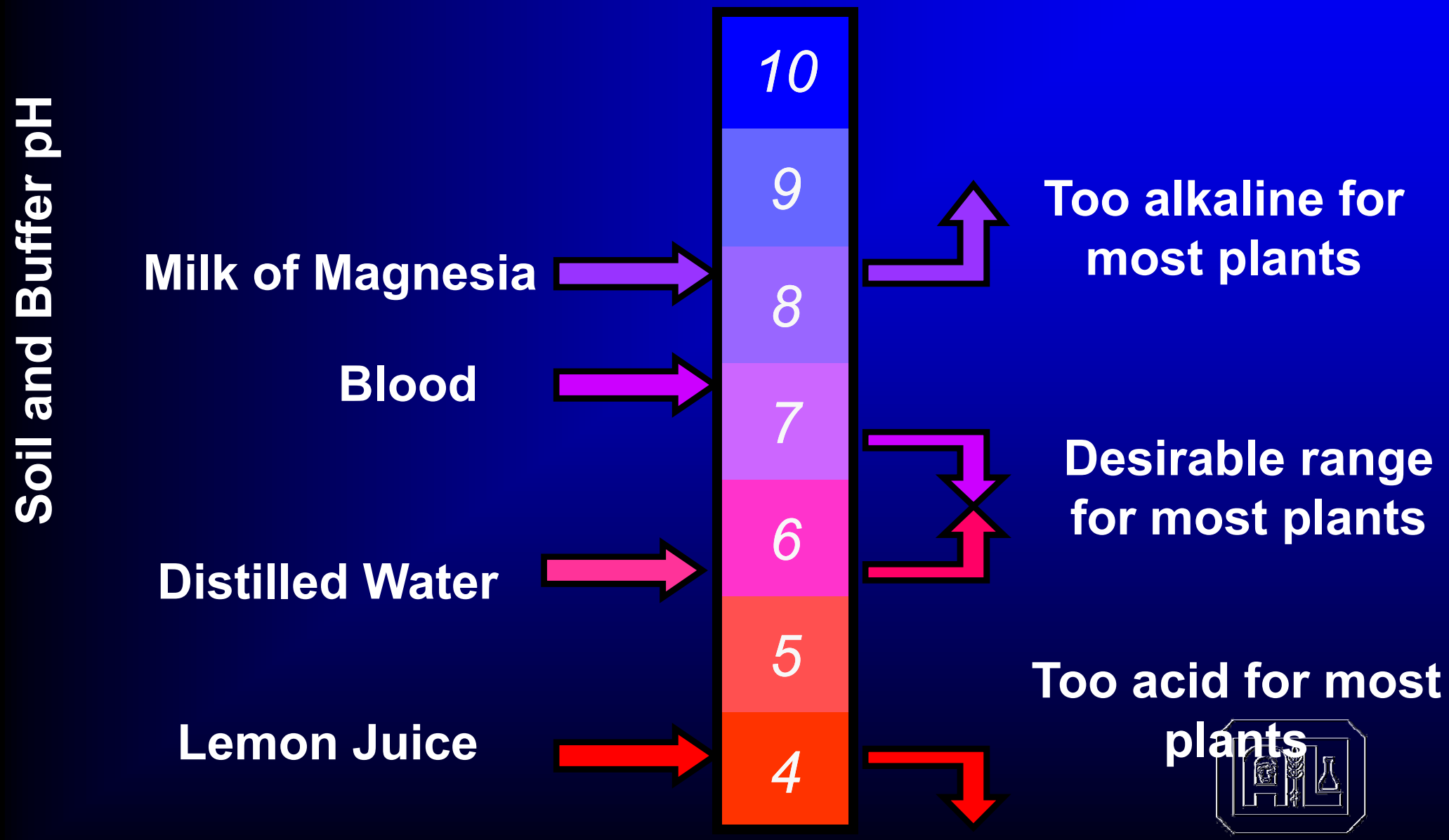
It indicates acidity of the soil solution (active acidity).

Buffer pH

Buffer pH is a measurement of the amount of hydrogen ions which must be replaced and neutralized by liming.

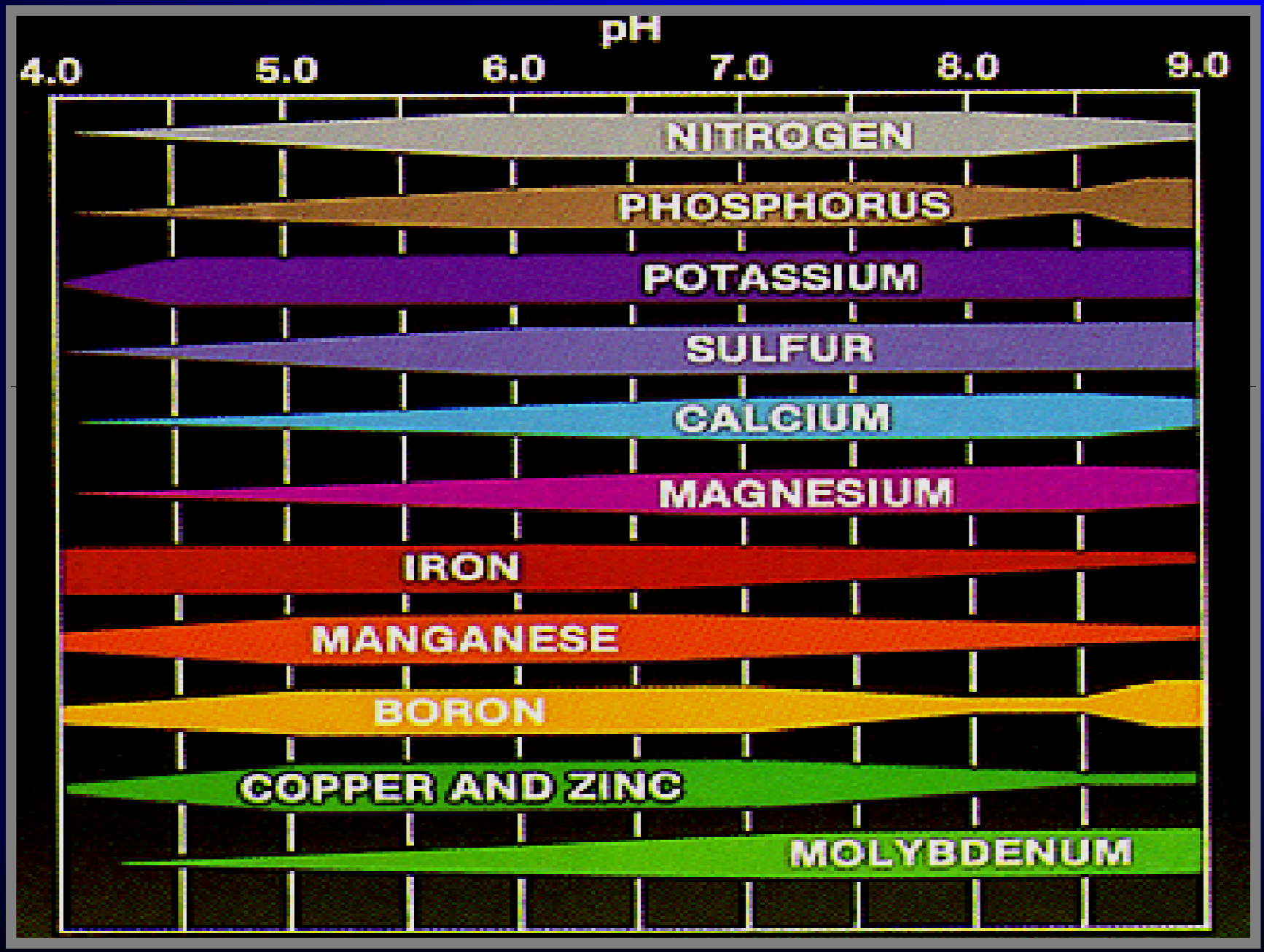
It indicates the total acidity (active + reserve) of the soil.

pH Scale for Soil Reaction



pH Effect on Nutrient Availability

Soil and Buffer pH



Fertilizer Efficiency

Soil and Buffer pH

Soil pH	% Fertilizer Efficiency			% Fertilizer Wasted
	N	P	K	
5.0	53	34	52	54
5.5	77	48	77	33
6.0	89	52	100	20
7.0	100	100	100	0

Soil pH and Herbicide Residue

- Low pH (< 5.9) soils may have persistent herbicides – group two that will begin to break down once the pH increases
- A field that has had application of these herbicides may have levels high enough to cause damage once they are limed and the pH begins to increase
- Leave suspected fields at least one year before planting sensitive crops.

- A&L performs a number of different P extractions depending on the region
- Bicarb for high calcium soils (>2000 ppm calcium)
- Bray P1 for more acidic soils

Phosphorus - P ppm	
Bicarb	Bray-P1
14 *L*	24 *M*
28 *H*	53 *VH*
7 *L*	9 *VL*
48 *VH*	102 *VH*

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 *L*	24 *M*	136 *M*	370 *H*	2550 *M*	29 *VL*	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 *H*	53 *VH*	188 *H*	210 *H*	1000 *M*	60 *L*	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 *L*	9 *VL*	94 *M*	335 *H*	1400 *M*	14 *VL*	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 *VH*	102 *VH*	136 *H*	25 *VL*	250 *VL*	10 *VL*	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO_3-N ppm	K/Mg Ratio	ENR
1	13 *H*	4.0 *M*	18 *M*	78 *VH*	2.8 *H*	1.1 *M*	1.2 *M*	1	1600	19 M	0.11	51
2	18 *VH*	2.8 *L*	6 *L*	24 *H*	0.9 *M*	1.5 *H*	1.8 *VH*	17	400	35 H	0.27	56
3	9 *M*	4.6 *M*	33 *H*	48 *H*	1.2 *H*	0.8 *M*	2.0 *VH*	1	1000	15 M	0.09	39
4	15 *H*	5.3 *H*	24 *M*	75 *VH*	1.4 *H*	1.5 *H*	1.5 *H*	8	1200	9 L	1.67	33

Potassium

- Potassium in sample 1 rated medium at 136 ppm
- Potassium in sample 4 rated high at 136 ppm
- Ratings are based on the optimum level for that nutrient in that soil type
- Sample 1 is a loam….sample 4 is a course sand

Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm
136 *M*	370 *H*	2550 *M*	29 *VL*
188 *H*	210 *H*	1000 *M*	60 *L*
94 *M*	335 *H*	1400 *M*	14 *VL*
136 *H*	25 *VL*	250 *VL*	10 *VL*

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 *L*	24 *M*	136 *M*	370 *H*	2550 *M*	29 *VL*	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 *H*	53 *VH*	188 *H*	210 *H*	1000 *M*	60 *L*	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 *L*	9 *VL*	94 *M*	335 *H*	1400 *M*	14 *VL*	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 *VH*	102 *VH*	136 *H*	25 *VL*	250 *VL*	10 *VL*	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

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4	15 *H*	5.3 *H*	24 *M*	75 *VH*	1.4 *H*	1.5 *H*	1.5 *H*	8	1200	9 L	1.67	33

Potassium

Potassium K ppm
136 M
188 H
94 M
136 H

CEC meq/100g
17.5
7.9
12.5
4.3

- 136 ppm M
- 136 ppm H
- 1st soil is a loam
- 4th soil is a coarse sand
- Soil type is determined by the C.E.C.

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
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4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Potassium

- Cations are rated based on optimum level for their soil type
- Cations compete of exchange sites on soil particles
- Fertility programs should include build

Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm
136 *M*	370 *H*	2550 *M*	29
188 *H*	210 *H*	1000 *M*	60
94 *M*	335 *H*	1400 *M*	14
136 *H*	25 *VL*	250 *VL*	10

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
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Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO_3-N ppm	K/Mg Ratio	ENR
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2	18 *VH*	2.8 *L*	6 *L*	24 *H*	0.9 *M*	1.5 *H*	1.8 *VH*	17	400	35 H	0.27	56
3	9 *M*	4.6 *M*	33 *H*	48 *H*	1.2 *H*	0.8 *M*	2.0 *VH*	1	1000	15 M	0.09	39
4	15 *H*	5.3 *H*	24 *M*	75 *VH*	1.4 *H*	1.5 *H*	1.5 *H*	8	1200	9 L	1.67	33

CEC and Base Saturation

- Cation Exchange Capacity is the measurement of the soils ability to hold and exchange nutrients.
- The higher the CEC the greater the clay content of the soil and the greater the nutrient holding capability

CEC meq/100g
17.5
7.9
12.5
4.3

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 *L*	24 *M*	136 *M*	370 *H*	2550 *M*	29 *VL*	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 *H*	53 *VH*	188 *H*	210 *H*	1000 *M*	60 *L*	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 *L*	9 *VL*	94 *M*	335 *H*	1400 *M*	14 *VL*	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 *VH*	102 *VH*	136 *H*	25 *VL*	250 *VL*	10 *VL*	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO_3-N ppm	K/Mg Ratio	ENR
1	13 *H*	4.0 *M*	18 *M*	78 *VH*	2.8 *H*	1.1 *M*	1.2 *M*	1	1600	19 M	0.11	51
2	18 *VH*	2.8 *L*	6 *L*	24 *H*	0.9 *M*	1.5 *H*	1.8 *VH*	17	400	35 H	0.27	56
3	9 *M*	4.6 *M*	33 *H*	48 *H*	1.2 *H*	0.8 *M*	2.0 *VH*	1	1000	15 M	0.09	39
4	15 *H*	5.3 *H*	24 *M*	75 *VH*	1.4 *H*	1.5 *H*	1.5 *H*	8	1200	9 L	1.67	33

CEC and Base Saturation

- C.E.C. is a determination of soil type
- Soil ratings are based on C.E.C.
- Sands and Clays are different

CEC meq/100g	Percent Base Saturations				
	% K	% Mg	% Ca	% H	% Na
17.5	2.0	17.6	72.8	6.9	0.7
7.9	6.1	22.2	63.6	4.8	3.3
12.5	1.9	22.3	56.0	19.2	0.5
4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mmhos/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
1	13 H	4.0 M	18 M	78 VH	2.8 H	1.1 M	1.2 M	1	1600	19 M	0.11	51
2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	66
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

CEC and Base Saturation

- A General rule
- Ideal %K 3 - 5%
- Ideal % Mg 10 - 20%
- Ideal % Ca 60 - 80%
- Ideal % H 10 – 15%

Percent Base Saturations				
% K	% Mg	% Ca	% H	% Na
2.0	17.6	72.8	6.9	0.7
6.1	22.2	63.6	4.8	3.3
1.9	22.3	56.0	19.2	0.5
8.2	4.9	29.4	56.5	1.0

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
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2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Sodium.

- Sodium ppm levels are not as important as the %Na in the soil
- %Na should be less than .5% or germination and root growth could be inhibited.

Sodium Na ppm	% Na
29	0.7
60	3.3
14	0.5
10	1.0

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm Bicarb	Phosphorus - P ppm Bray-P1	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH pH	pH Buffer	CEC meq/100g	Percent Base Saturations % K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.3	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mmhos/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
1	13 H	4.0 M	18 M	78 VH	2.8 H	1.1 M	1.2 M	1	1600	19 M	0.11	51
2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Specializing in Soil and Plant Analysis

SOIL OPTIMUM LEVELS

CEC

PPM	SOIL	0 - 6	7 -15	16 - 25	25+
P	POOR	0 - 25	0 - 23	0 -18	0 - 13
	MED	26 - 55	24 - 43	19 - 33	14 - 23
	GOOD	56 - 93	44 - 83	34 - 55	24 - 43
	HIGH	94+	84+	56+	44+
K	POOR	0 - 45	0 - 60	0 - 80	0 - 100
	MED	46 - 90	61 - 120	81 - 160	101 - 200
	GOOD	91 - 180	121 - 240	161 - 320	201 - 400
	HIGH	181+	241+	321+	401+
Ca	POOR	0 -200	0 - 400	0 - 600	0 - 1000
	MED	201 - 400	401 - 800	601 - 1200	1001 - 2000
	GOOD	401 - 800	801 - 1600	1201 - 2400	2001 - 6000
	HIGH	801+	1600+	2400+	6000+
Mg	POOR	0 - 25	26 - 50	0 -75	0 - 100
	MED	26 - 50	51 - 100	76 - 150	101 - 200
	GOOD	51 - 100	101 - 200	151 - 300	201 - 600
	HIGH	101+	201 +	301+	601+

% Saturation Ranges by C..E.C.

%SATURATON CATIONS	0 - 6	7 - 15	16 - 25	25+
% K SAT	4 - 6	3 - 5	2 - 4	2 - 3
% Mg SAT	10 - 20	8 - 20	5 - 20	5 - 20
% Ca SAT	60 - 80	60 - 80	60 - 80	60 - 80

Base Saturation

- % saturation of the cations is an understanding of the predictable availability of each cation in less than ideal weather conditions

Percent Base Saturations				
% K	% Mg	% Ca	% H	% Na
2.0	17.6	72.8	6.9	0.7
6.1	22.2	63.6	4.8	3.3
1.9	22.3	56.0	19.2	0.5
8.2	4.9	29.4	56.5	1.0

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium	Magnesium	Calcium	Sodium	pH		CEC	Percent Base Saturations				
			Bicarb	Bray-P1	K ppm	Mg ppm	Ca ppm	Na ppm	pH	Buffer	meq/100g	% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mmhos/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
1	13 H	4.0 M	18 M	78 VH	2.8 H	1.1 M	1.2 M	1	1600	19 M	0.11	51
2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

- Sulfur nutrition is important
- Balance S to C to N
- For optimum production S should be High, greater than 25 ppm

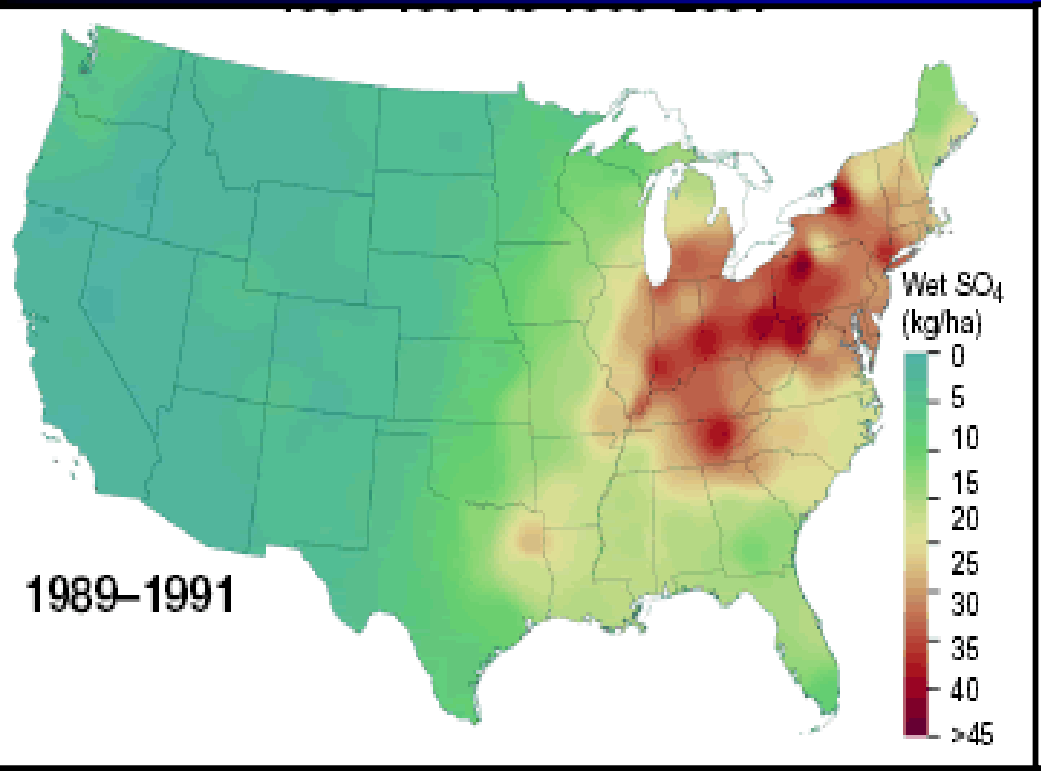
Sulfur

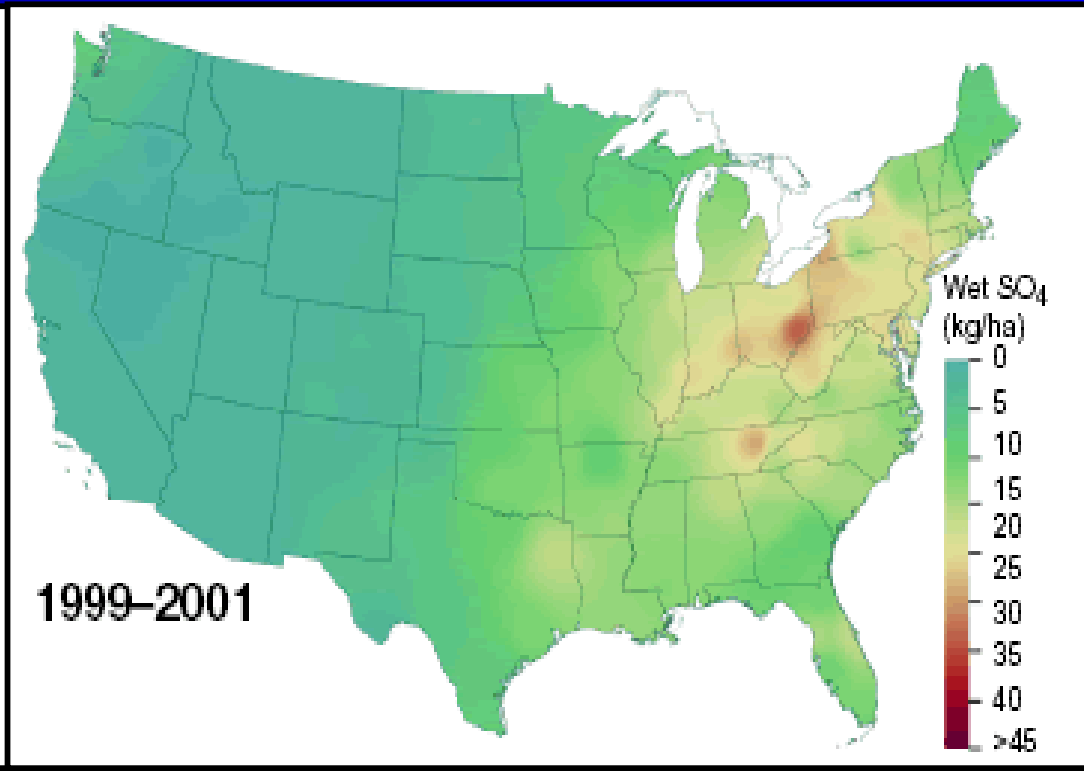
Sulfur S ppm
13 H
18 VH
9 M
15 H

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm Bicarb	Phosphorus - P ppm Bray-P1	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH pH	pH Buffer	CEC meq/100g	Percent Base Saturations % K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
1	13 H	4.0 M	18 M	78 VH	2.8 H	1.1 M	1.2 M	1	1600	19 M	0.11	51
2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Change in Sulfate Deposition





Sulfate levels from 1989 to 1991

Sulfate levels from 1999 to 2001

US EPA National Atmospheric Deposition Program

Boron

- Boron is an important element in the function of a plant
- Boron can be very toxic
- Uniform soil application is important
- Most crops require greater than 1 ppm for optimum growth and quality
- Supplement ground application with timely foliar application

Boron B ppm
1.1 M
1.5 H
0.8 M
1.5 H

C.E.C. < 18 1.5 ppm.

C.E.C. > 18 3.0 ppm.

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm Bicarb	Phosphorus - P ppm Bray-P1	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH pH	pH Buffer	CEC meq/100g	Percent Base Saturations % K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mS/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
1	13 H	4.0 M	18 M	78 VH	2.8 H	1.1 M	1.2 M	1	1600	19 M	0.11	51
2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Micronutrients

5.0

Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm
4.0 M	18 M	78 VH	2.8 H
2.8 L	6 L	24 H	0.9 M
4.6 M	33 H	48 H	1.2 H
5.3 H	24 M	75 VH	1.4 H

- Zn, Mn, Fe, Cu, are the 4 transition metals
- Each has specific functions in plant growth
- One can replace another
  - do not use shot gun approach to supplying these metals

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 L	24 M	136 M	370 H	2550 M	29 VL	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 H	53 VH	188 H	210 H	1000 M	60 L	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 VH	102 VH	136 H	25 VL	250 VL	10 VL	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts ms/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO3-N ppm	K/Mg Ratio	ENR
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2	18 VH	2.8 L	6 L	24 H	0.9 M	1.5 H	1.8 VH	17	400	35 H	0.27	56
3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Micronutrients

- Zn, Mn, Fe, Cu, are the 4 transition metals
- Each has specific functions in plant growth
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5.0 33 25 3.0

Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm
4.0 M	18 M	78 VH	2.8 H
2.8 L	6 L	24 H	0.9 M
4.6 M	33 H	48 H	1.2 H
5.3 H	24 M	75 VH	1.4 H

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm Bicarb	Phosphorus - P ppm Bray-P1	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH pH	pH Buffer	CEC meq/100g	Percent Base Saturations % K	% Mg	% Ca	% H	% Na
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3	3	2.7	7 L	9 VL	94 M	335 H	1400 M	14 VL	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
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3	9 M	4.6 M	33 H	48 H	1.2 H	0.8 M	2.0 VH	1	1000	15 M	0.09	39
4	15 H	5.3 H	24 M	75 VH	1.4 H	1.5 H	1.5 H	8	1200	9 L	1.67	33

Soluble Salts

- Soluble Salts should be less than 1.8 for mineral soils
- Fertilizer application increases soluble salts, K, Ca, NH_4^+, Na
- Sodium is also a contributor to soluble salts
- Sodium can be high enough to create growth problems and soluble salts still OK

Soluble Salts ms/cm
1.2 *M*
1.8 *VH*
2.0 *VH*
1.5 *H*

Sodium Na ppm
29
60
14
10

Sample Number	Lab Number	Organic Matter	Phosphorus - P ppm		Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	pH		CEC meq/100g	Percent Base Saturations				
			Bicarb	Bray-P1					pH	Buffer		% K	% Mg	% Ca	% H	% Na
1	1	3.9	14 *L*	24 *M*	136 *M*	370 *H*	2550 *M*	29 *VL*	6.6	6.9	17.5	2.0	17.6	72.8	6.9	0.7
2	2	4.4	28 *H*	53 *VH*	188 *H*	210 *H*	1000 *M*	60 *L*	7.2		7.9	6.1	22.2	63.6	4.8	3.3
3	3	2.7	7 *L*	9 *VL*	94 *M*	335 *H*	1400 *M*	14 *VL*	6.0	6.8	12.5	1.9	22.3	56.0	19.2	0.5
4	4	2.1	48 *VH*	102 *VH*	136 *H*	25 *VL*	250 *VL*	10 *VL*	4.9	6.8	4.3	8.2	4.9	29.4	56.5	1.0

Sample Number	Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts ms/cm	Saturation P %	Aluminum Al ppm	Nitrate Nitrogen NO_3-N ppm	K/Mg Ratio	ENR
1	13 *H*	4.0 *M*	18 *M*	78 *VH*	2.8 *H*	1.1 *M*	1.2 *M*	1	1600	19 M	0.11	51
2	18 *VH*	2.8 *L*	6 *L*	24 *H*	0.9 *M*	1.5 *H*	1.8 *VH*	17	400	35 H	0.27	56
3	9 *M*	4.6 *M*	33 *H*	48 *H*	1.2 *H*	0.8 *M*	2.0 *VH*	1	1000	15 M	0.09	39
4	15 *H*	5.3 *H*	24 *M*	75 *VH*	1.4 *H*	1.5 *H*	1.5 *H*	8	1200	9 L	1.67	33

Soluble Salts

Soluble Salts

Mmho/cm	Effects
<0.40	Non-saline
0.40-0.80	Very slightly saline
0.81- 1.20	Moderately saline
1.21 - 1.60	Saline
1.61 - 3.20	Strongly saline
>3.2	Very strongly saline

Report Number: C99221-005
Account Number: 67003

A & L Canada Laboratories Inc.
2136 Jetstream Road, London, Ontario, N5V 3P5
Telephone: (519) 457-2575 Fax: (519) 457-2664

Understanding Plant Nutrient Requirements

Potting Mix

Report Date: 19/09/01

COMPOST REPORT

Page: 1

Sample Number	Lab Number	pH	Lime Index	Total Organic Matter %	Available Organic Matter %	Phosphorus P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm
1	12041	6.5	6.7	36.5	21.90	94	326	386	4724

Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Sodium Na ppm	Nitrate-N NO_3-N ppm	Soluble Salt ms/cm	Moisture %
182	5.0	10	302	4.1	1.4	10	148	3.0	41.8

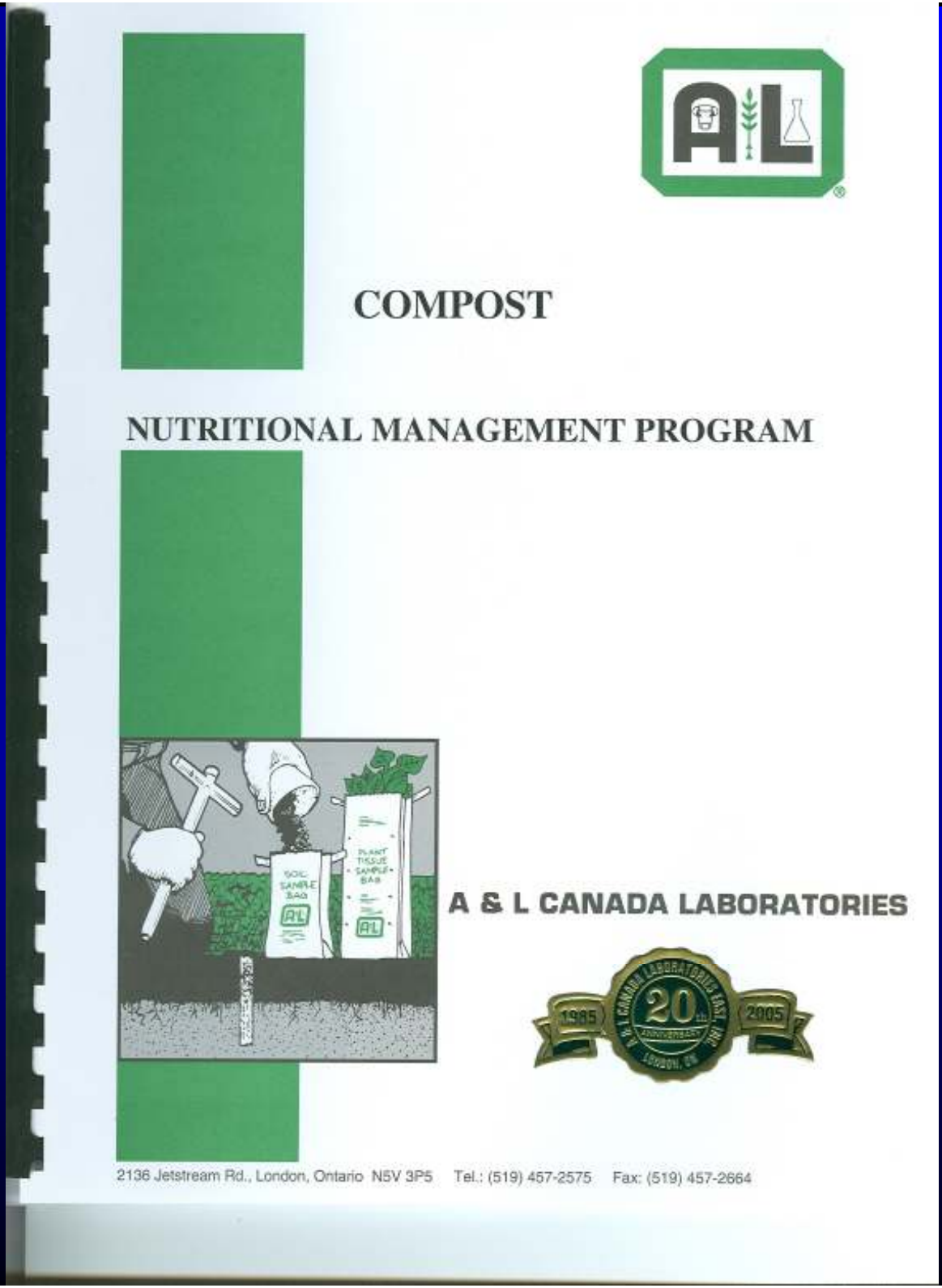
INTERPRETATION

CEC meq/100g	% BS	Percent Base Saturation % K	% Mg	% Ca	% Na	Proportional Equivalents (meq) K	Mg	Ca	Na	Cation Ratio Mg/K	Ca/Mg	C/N Ratio
27.7	100.0	3.02	11.47	85.35	0.16	0.84	3.17	23.62	0.04	4:1	7:1	
Optimum Range:		*3 - 5*	*8 - 20*	*60 - 80*		*0.5 - 1.3*				*7:1*	*5:1*	

* Crop yield is influenced by a number of factors in addition to soil fertility. No guarantee or waranty concerning crop performance is made by A & L
* Results reported on a dry weight basis.
* NO_3-N as received.

C:N 22.6

- A&L Handbook for interpretation of compost quality and intended use



Micronutrient Ranges

Very low	Low	Medium	Good	High	Very high
Manganese					
0-10	10-15	16-30	30-45	45-100	>100
Copper					
0-1.5	1.5-6	7-12	13-18	19-25	>25
Boron					
0-0.5	0.6-1.5	1.5-2.4	2.5-3	3-6	>6
Zinc					
0-2	2-3	3-5	5-8	8-10	>11
Sulfur					
0-5	5-10	10-20	20-30	30-40	>40

INTERPRETATION OF

ORGANIC SOIL AND COMPOST ANALYSIS

Our Compost Analysis was researched and developed by A&L Canada Laboratories and North Carolina State testing laboratories in cooperation with Rose Growers Inc. of the US. This analysis is specifically designed to analyze soil that contains more than just peat material. This would include composted materials, peat, and soil mixtures, greenhouse mixes, potting soil mixes, and organic material used as feedstock that may be used in the composting process.

This analysis unlike the Saturated Paste method will extract nutrients that are contained in the mineral portion of these soils and mixes which gives us a more precise interpretation of nutrient availability over the growing season. Extensive field calibration has been done to support this information.

Our Organic Analysis for lime pH is different than SMP. We use this number to calculate an acidity number using a specific buffer test developed to give a more precise value for the addition of lime material to correct pH and calcium deficiencies.

OPTIMUM pH FOR VARIOUS SOIL TYPES

SOIL CLASS	TARGET Ph
Mineral Soil	6.5
Mineral Organic Soil	5.5
Organic Soil	5.2
	(5.0-5.5)

pH requirement may vary depending on the crop that is to be grown

LIME REQUIREMENT = AC X FACTOR—RESIDUAL LIME CREDIT

1. **AC= 4(6.6 — LIME INDEX)**
2. **FACTOR = $\frac{\text{desired pH — Soil pH}}{\text{6.6 — pH of Soil}}$**

Residual credit (RC) for lime applied prior to soil test. RC is reduced by 16%/month, from the time of application to time of soil test for mineral or organic soil.

INTERPRETATION OF DATA (COMPOST ANALYSIS REPORT)

Each set of results has a chart for interpretation of ppm rating. It also has a calculation of CEC and % saturation which are broad ranges across all soils The second line of values differentiate the specific type of unique properties of the compost. On the extreme right of the second line are listed the meq of the cations and ratios that are optimum.

PROPORTIONAL EQUIVALENTS (meq) COMPARISONS OF THE CATIONS

K— The optimum range for meq of K is between 0.5 - 1.5 meq/100g. Levels less than 0.5 will need K added to support plant growth. Levels greater than 1.5 may contribute to a soluble salt condition that can restrict root growth and cause plant injury.

Mg— 1.2-8 meq/100g is the ideal range. Mg to K should be 7:1 for optimum availability of each nutrient.

Ca— 8-13 meq/100g is ideal for compost. The relationship of Ca to Mg should be 5:1

Na— Levels less than 1% saturation are ideal. Root growth will be very restricted if plants are grown in material with sodium levels greater than 1%. Material with sodium greater than 1% and less than 3% should be blended or have the sodium leached out using water and gypsum.

Optimum Ranges of Cations

- K - Potassium optimum range is 3 - 5%
- Mg - Magnesium optimum range is 9 - 20%
- Ca - Calcium optimum range is 60 - 80% but this may vary depending on the crop

MEQ Comparison of the Cations

- Potassium levels must be greater than .5meq to support plant growth but less than 1.8 meq or a salt condition may occur
- K:Mg ratio should be 1:7
- Mg:Ca ratio should be 1:5, critical for potting media

Report Number: C99221-005
Account Number: 67003

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, Ontario, N5V 3P5
Telephone: (519) 457-2575 Fax: (519) 457-2664

To: GREG PATTERSON
2136 JETSTREAM ROAD
LONDON, ON N5V 3P5

For: RESEARCH FOR COMPOST
COUNCIL OF CANADA

Potting Mix

Report Date: 19/09/01

COMPOST REPORT

Page: 1

Sample Number	Lab Number	pH	Lime Index	Total Organic Matter %	Available Organic Matter %	Phosphorus P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm
1	12041	6.5	6.7	36.5	21.90	94	326	386	4724

Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Sodium Na ppm	Nitrate-N NO_3-N ppm	Soluble Salt ms/cm	Moisture %
182	5.0	10	302	4.1	1.4	10	148	3.0	41.8

INTERPRETATION

CEC meq/100g	% BS	Percent Base Saturation % K	% Mg	% Ca	% Na	Proportional Equivalents (meq) K	Mg	Ca	Na	Cation Ratio Mg/K	Ca/Mg	C/N Ratio
27.7	100.0	3.02	11.47	85.35	0.16	0.84	3.17	23.62	0.04	4:1	7:1	
Optimum Range:		*3 - 5*	*8 - 20*	*60 - 80*		*0.5 - 1.3*				*7:1*	*5:1*	

* Crop yield is influenced by a number of factors in addition to soil fertility. No guarantee or waranty concerning crop performance is made by A & L
* Results reported on a dry weight basis.
* NO_3-N as received.

C:N 22.6

- A&L Handbook for interpretation of compost quality and intended use

Compost Management

Compost Analysis for Available Nutrients and Soil Suitability Criteria and Evaluation

Note: The following pages on " Nutrient Identification" analysis, are data conceived and developed by A&L Canada Laboratories and their affiliates: specifically for the Compost Industry.
The use of this analysis is now available for those wishing not to just maintain, but to advance in the quest for quantifying the value of their compost as a growth media.

Tests Required to Monitor the Compost Process

Basic Monitoring Analysis

Temperature, Moisture, C:N Ratio, pH

Basic Monitoring Analysis Plus

Total nitrogen, Total Phosphorus, Total Potassium, pH, Organic Matter, C:N, Sodium, Moisture, Ash, Organic Carbon, Bulk Density.

Soil Suitability Testing of Compost

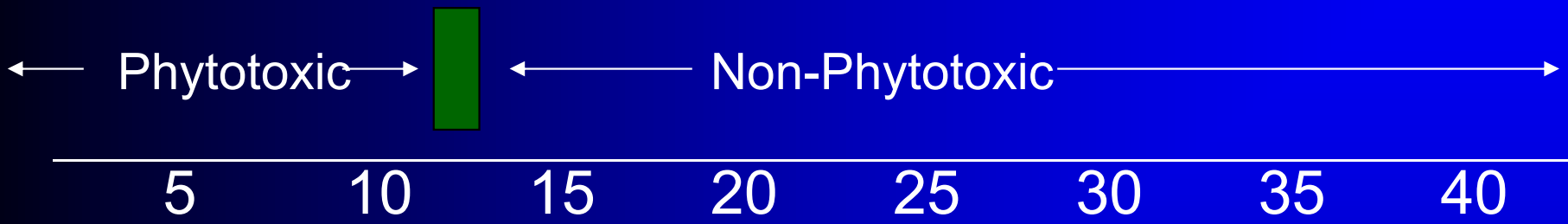
This test is the same one used for finished compost. The information on this test will help in understanding feedstock materials and blending to achieve the desired finished product.

Sampling Procedure See appendix D

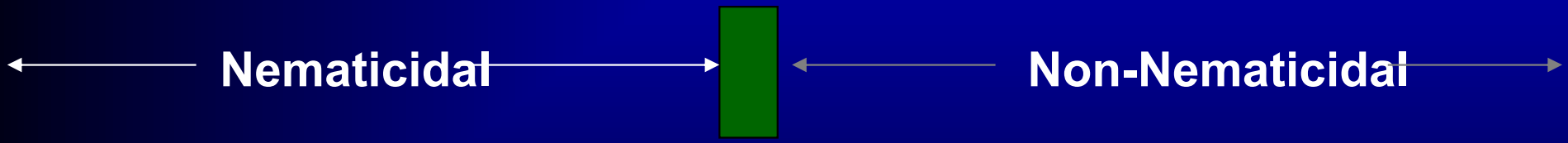
[redacted]
(table 1b)

Material High in Carbon	C/N Ratio
autumn leaves	30-80:1
straw	40-100:1
wood chips or sawdust	100-500:1
bark	100-130:1
mixed paper	150-200:1
newspaper or corrugated cardboard	560:1
Materials High in Nitrogen	
vegetable scraps	15-20:1
coffee grounds	20:1
grass clippings	15-25:1
manure	5-25:1

CARBON:NITROGEN RATIO



Carbon to Nitrogen ration must be ≤ 25 and > 12



Schematic representation of the relationship between the C:N ratio of an organic amendment, nematicidal activity and phytotoxicity. (From Rodriguez-Kabana et al, 1987)

		Soluble Salt (EC)
Very low	**0-.75**	May be used as a planting media directly, will require some nutrient addition for plant growth.
Acceptable	**.75-2.0**	May be used directly as a media for small plants and seeding.
Medium	**2.0-3.5**	May be used for transplanting potted plants and mature plants with high nutrient demand. In applications with tender plants may need to be diluted with 25 to 50% soil.
Medium high	**3.5 - 5**	Can be used for topdressing established plants or blended in as a soil amendment to gardens or soils 2-1 to 5-1.
High	**5 - 10**	Used as a soil amendment and will require diluting with existing soil depending on the use 4-1 up to 10-1 for more sensitive plantings.
Very high	**>10**	Use only at low application rates in areas of plantings that do not have salt sensitivity.

Sodium

Sodium cont'd

Only a few plant species can tolerate high sodium levels and for the most part sodium levels greater than 1% saturation in media are toxic to root systems. Sodium competes with calcium and potassium uptake and damages root tissue when in excess. A reading of greater than 1% saturation of sodium on the exchange complex causes germination and emergence problems for a number of plants. This indication of sodium availability will suggest possible damage to plant growth long before a calculated SAR may suggest problems.

Report Number: C01106-012
Account Number: 67003

A & L CANADA LABORATORIES EAST, INC.

2136 Jetstream Road • London, Ontario N5V 3P5 • Tel: 519/457-2575 Fax: 519/457-2664

To: GREG PATTERSON
2136 JETSTREAM ROAD
LONDON, ON N5V 3P5

For:

Premium Potting Soil ?

Report Date: 20/04/01

COMPOST REPORT

Sample Number	Lab Number	pH	Lime Index	Total Organic Matter %	Available Organic Matter %	Phosphorus P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm
1	13042	6.0	6.2	16.8	10.08	184	459	331	2392

Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Sodium Na ppm	Nitrate-N NO_3-N ppm	Soluble Salt ms/cm	Moisture %
36	5.0	68	210	1.5	1.0	65	80	1.6	34.2

INTERPRETATION

CEC	Percent Base Saturation					Proportional Equivalents (meq)				Cation Ratio		C/N Ratio
meq/100g	% BS	% K	% Mg	% Ca	% Na	K	Mg	Ca	Na	Mg/K	Ca/Mg	
17.7	91.0	6.63	15.34	67.4	1.59	1.18	2.72	11.96	0.28	2:1	4:1	21.7
Optimum Range:		*3 - 5*	*8 - 20*	*60 - 80*		*0.5 - 1.3*				*7:1*	*5:1*	

* Crop yield is influenced by a number of factors in addition to soil fertility. No guarantee or waranty concerning crop performance is made by A & L
* Results reported on a dry weight basis. * NO_3-N as received.

A&L Canada is a laboratory accredited by Standards Council of Canada / CAEAL and OMAFRA.

Relationship between Conductivity (EC) and Degree of Salinity in Mineral soils

	Soil Texture			
Degree of salinity	Courser to Loamy Sand	Loamy Fine Sand to Loam	Silt Loam to Clay Loam	Silty clay Loam to Clay
	dSm-1			
Non-Saline	0-1.1	0-1.2	0-1.31	0-1.4
Slightly Saline	1.2-2.4	1.3-2.4	1.4-2.5	1.5-2.8
Moderately Saline	2.5-4.4	2.5-4.7	2.6-5.0	2.9-5.7
Strongly saline	4.5-8.9	4.8-9.4	5.1-10.0	5.8-11.4
Very Strongly Saline	>9.0	>9.5	>10.1	>11.5

Relationship between Conductivity (EC) and Degree of Salinity in all soils using Saturated Paste

	Soil Texture
Degree of salinity	All soils by Saturated Paste
	dSm-1
Non-Saline	0.0-2.0
Slightly Saline	2.1-4.0
Moderately Saline	4.1-8.0
Strongly saline	8.1-16.0
Very Strongly Saline	>16.0

Determination of Soluble Salts (EC) in organic soils and soilless media

	Soil Texture
Degree of salinity	All soils by Saturated Paste
	dSm-1
Low	0-0.75
Acceptable	0.75-2.0
Optimum	2.0-3.5
Very High	3.5-5.0
High	>5.0

- Compost stability

A & L Canada Laboratories Inc.
2136 Jetstream Road, London, ON, N5V 3P5 Tel: (519) 457-2575 Fax: (519) 457-2664

Compost Analysis Proficiency Testing Program

CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	UNIT	DETECTION LIMIT	METHOD REFERENCE
Faecal Coliform	<1000	cfu/g	5	Spread Plating
Salmonella	negative	P/A/10.0g		Presence/Abesence
Compost Stability Index	8	---	0.01	TMECC.05.08
Respiration-CO2-C/g OM/day	0.10	mgCO2	0.01	TMECC.05.05-B
Respiration - CO2-C/g TS/day	0.10	mgCO2	0.01	TMECC.05.08-B
Total Inert Materials	BDL*	%	0.10	Gravimetric
Total Sharp Inert Materials (> 3.0mm)	BDL*	%	0.01	Gravimetric
Total Plastic Inert Materials	BDL*	%	0.01	Gravimetric
C:N Ratio	27.50	---	--	Combustion/LOI
Moisture	49.40	%	0.10	Moisture @ 105C

BDL - Below detectable levels

Maturity Index: 8- Inactive, highly mature compost, very well aged.

Results Authorized By:

Robert J. Deakin, C.Chem
Laboratory Director

A & L Canada is a Laboratory Accredited by Standards Council of Canada / CAEAL and OMAFRA

A&L Canada Laboratories Inc.

2136 Jetstream Road · London, Ontario · N5V 3P5 · (519) 457-2575

Compost Summary Report

CQA Product Quality Test Requirements

Sample I.D.#	Recommended Product Use	PH	C/N ratio	Moisture	Particle size	Soluble Salts	Maturity Index
789 (Mar. 15/06)	* Landscaping/Soil Amendment	7.6	18:1	41.3 %	3/8 in.	3.8 ms/cm	8 (Slovita)

suited for general landscaping, and soil mix blending purposes due to its texture and rich mineral properties. The suggested use is merely a guide for interpretation on what the best end use may be.

Comments:

Heavy Metals: The results of our testing indicate the sample identified as **789, Mar. 15, 06** meets the current Ontario type A compost standards for maximum allowable trace metal content in compost.

Microbiological: The results of our testing indicate this sample meets the Ontario type A compost standards for maximum allowable microbiological levels.

Compost Quality Requirements: *The results of our testing indicate that this product is slightly coarser textured compost (3/8 in.), with some evidence of sodium. Based on the properties, suggested uses would meet criteria for soil amendment and soil mix blending and light topdressing end-uses purposes with precautionary restrictions. The precautionary exceptions being the proportion of sodium (%Na), which if used in too heavy a proportion could cause some problems with sensitive species. The recommended maximum allowable level of sodium for landscaping and soil amendment purposes is 2.0% Na in the final soil mix. This compost is 3/8 in. particle sized texture, and very rich in available potassium, calcium, and zinc, which make it ideal for soil enriching, and amendment. If used, as part of a soil mix amendment would recommend a minimum of 5 parts soil blended to this compost.

Table 05.08-1 Compost Stability Index—Ranges indicate relative compost stability for various test methods. The level of microbial activity in a sample is based primarily upon results of respiration monitoring; however, the index assumes optimized moisture, temperature, and nutrient status that favor microbial activity, and insignificant concentrations toxins and other compounds that inhibit microbial respiration.

SOUR OM 05.08-A	*CO_2-C 05.08-B*	*DEWAR 05.08-D*	*SOLVITA® 05.08-E*	*BAC OC 05.08-F*	*STABILITY RATING*	*GENERAL CHARACTERISTICS*
< 12	< 2	V	7 – 8	< 2	very stable	▪ well cured compost ▪ no continued decomposition ▪ no odors ▪ no potential for VFA phytotoxicity and odor
12 – 36	2 – 8	IV	5 – 6	2 – 4	stable	▪ cured compost ▪ odor production not likely ▪ limited potential for VFA phytotoxicity and odor ▪ minimal impact on soil carbon and nitrogen dynamics
36 – 84	8 – 15	III	3 – 4	4 – 12	moderately unstable, raw compost	▪ uncured compost ▪ minimal odor production ▪ moderate to high potential for VFA phytotoxicity ▪ moderate potential for negative impact on soil carbon and nitrogen dynamics
84 – 144	15 – 40	II	2	12 – 40	raw compost, or raw organic products	▪ uncured compost ▪ odor production likely ▪ high potential for VFA phytotoxicity and odor ▪ high potential for negative impact on soil carbon and nitrogen dynamics
> 144	> 40	I	1	> 40	raw feedstocks, unstabilized material	▪ raw, extremely unstable material ▪ odor production expected ▪ probable VFA phytotoxicity with most materials ▪ negative impact on soil carbon and nitrogen dynamics expected ▪ generally not recommended for use as compost

Degree of stability

REPORTING UNITS:
SOUR OM : mg O_2 g^{-1} OM d^{-1}; *CO_2-C :* mg CO_2-C g^{-1} OM d^{-1}; *Dewar and Solvita® :* refer to respective indices; *BAC OM* : mg CO_2-C g^{-1} OC d^{-1}. It is not recommended to report a respirometry test result as the sole measure of compost stability.

Heavy metal vs micro-nutrient

Heavy metal **Micro-nutrient**

More Research required

- Mercury
- Lead
- Cobalt
- Selenium

- Iron
- Manganese
- Molybdenum
- Nickel
- Zinc

A & L CANADA LABORATORIES EAST, INC.
2136 Jetstream Road • London, Ontario N5V 3P5 • Tel: 519/457-2575 Fax: 519/457-2664

10/2

Certificate of Analysis

Client: Greg Patterson
Account#: 67003
Project: Compost Research

Report#: C99221-005
Sample Matrix: Compost
Date of Report: Aug. 30, 1999

Method I.D. Environmental Parameters

PARAMETERS	SAMPLE ID / RESULTS (ppm)	MAC	MDL
	Sample # 4	ug/g	ug/g
Cadmium	*< 2.00*	*3.00*	*2.00*
Chromium	*7.80*	*50.0*	*1.00*
Cobalt	*2.60*	*25.0*	*1.00*
Copper	*50.9*	*60.0*	*1.00*
Lead	*19.2*	*150.0*	*2.00*
Molybdenum	*2.50*	*2.00*	*2.00*
Nickel	*6.40*	*60.0*	*1.00*
Zinc	*150.0*	*500.0*	*1.00*

Results Authorized By: _____

Robert J. Deakin
Laboratory Director

Report Number: C99296-001
Account Number: 67003

A & L CANADA LABORATORIES EAST, INC.

2136 Jetstream Road • London, Ontario N5V 3P5 • Tel: 519/457-2575 Fax: 519/457-2664

To: GREG PATTERSON
2136 JETSTREAM ROAD
LONDON, ON N5V 3P5

For: RESEARCH

Report Date: 10/20/99

COMPOST REPORT

Sample Number	Lab Number	pH	Lime Index	Organic Matter %	Phosphorus P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm
TWM	1	7.7		39.7	524	1981	618	10000

Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Sodium Na ppm	Nitrate-N NO_3-N ppm	Soluble Salt ms/cm	Moisture %
371	30.6	34	161	2.8	2.1	476	15	3.1	56.1

INTERPRETATION

CEC	Percent Base Saturation					Proportional Equivalents (meq)				Cation Ratio	
meq/100g	% BS	% K	% Mg	% Ca	% Na	K	Mg	Ca	Na	Mg/K	Ca/Mg
88.6	70.2	5.73	5.73	56.41	2.34	5.08	5.08	50.00	2.07	1:1	10:1
Optimum Range:		*3 - 5*	*8 - 20*	*60 - 80*		*0.5 - 1.3*				*7:1*	*5:1*

* NO_3-N as received.

C:N RATIO 30.7

Micronutrient Ranges

Very low	Low	Medium	Good	High	Very high
Manganese					
0-10	10-15	16-30	30-45	45-100	>100
Copper					
0-1.5	1.5-6	7-12	13-18	19-25	>25
Boron					
0-0.5	0.6-1.5	1.5-2.4	2.5-3	3-6	>6
Zinc					
0-2	2-3	3-5	5-8	8-10	>11
Sulfur					
0-5	5-10	10-20	20-30	30-40	>40

Typical Mineral Concentrations

Parameter	Concentration %
Total Nitrogen	0.6
Total Phosphorus	0.25
Total Potassium	0.20
Total Calcium	3.0
Total Magnesium	0.3

Report Number: 1308-023
Account Number: 98056

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, Ontario, N5V 3P5
Telephone: (519) 457-2575 Fax: (519) 457-2664

To:

Attn:

Report Date: 11/28/2011

COMPOST REPORT

Sample Number	Lab Number	pH	Lime Index	Available Organic Matter %	Phosphorus P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm
1	7768	5.4	5.9	58.1	296	1115	182	1471

Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Sodium Na ppm	Nitrate-N NO_3-N ppm	Soluble Salt ms/cm	Nitrogen (Total) (%)	Moisture %
89	5.4	16	115	0.5	1.2	523	2	3.7		

INTERPRETATION

CEC	Percent Base Saturation					Proportional Equivalents (meq)				Cation Ratio		C/N Ratio
meq/100g	% BS	% K	% Mg	% Ca	% Na	K	Mg	Ca	Na	Mg/K	Ca/Mg	
16.8	83.3	17.03	8.92	43.82	13.55	2.86	1.50	7.36	2.27	1:1	5:1	
Optimum Range:		*3 - 5*	*8 - 20*	*60 - 80*		*0.5 - 1.3*				*7:1*	*5:1*	

CQA

* Crop yield is influenced by a number of factors in addition to soil fertility. No guarantee or waranty concerning crop performance is made by A & L
* Results reported on a dry weight basis.

REPORT NO.
C11308-7000
ACCOUNT NUMBER
98056

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, ON, N5V 3P5 Tel: (519) 457-2575 Fax: (519) 457-2664

Compost Analysis Proficiency Testing Program

CERTIFICATE OF ANALYSIS

PROJECT NO:
PO#: MCCD01591
LAB NUMBER: 308702
SAMPLE ID: ASP 11/02/11

SAMPLE MATRIX:COMPOST
DATE RECEIVED:11/02/2011
DATE REPORTED:11/28/2011
PAGE:2

PARAMETER	RESULT	UNIT	DETECTION LIMIT	METHOD REFERENCE
Fecal Coliform	<3	MPN/g		TMECC.07.01
Salmonella	<3	MPN/4g		TMECC.07.02
Total Inert Materials	0.10	%	0.01	TMECC.03.08
Total Sharp Inert Materials (> 3.0mm)	BDL*	%	0.01	TMECC.03.08
Total Plastic Inert Materials	0.10	%	0.01	TMECC.03.08
OM @ 550 deg C	76.52	%	0.10	LOI@550C
Moisture	55.90	%	0.10	TMECC.03.09
C:N Ratio	21:1			TMECC.05.02
Sieve 2 Inch (% Passing)	100.00	%	0.10	ASTMD422
Sieve 1 Inch (% Passing)	97.40	%	0.10	ASTMD422
Sieve 1/2 Inch (% Passing)	75.90	%	0.10	ASTMD422
Sieve 3/8 Inch (% Passing)	62.50	%	0.01	ASTMD422
Sieve 1/4 Inch (% Passing)	40.70	%	0.01	ASTMD422
Compost Stability Index	8	---		TMECC.05.08-B
Respiration-CO2-C/g OM/day	BDL*	mgCO2	0.01	TMECC.05.08-B
Respiration - CO2-C/g TS/day	BDL*	mgCO2	0.01	TMECC.05.08-B

REPORT NO.
C11308-7000
ACCOUNT NUMBER
98056

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, ON, N5V 3P5 Tel: (519) 457-2575 Fax: (519) 457-2664

Compost Analysis Proficiency Testing Program

CERTIFICATE OF ANALYSIS

PROJECT NO:
PO#: MCCD01591
LAB NUMBER: 308701
SAMPLE ID: ASP 11/02/11

SAMPLE MATRIX:COMPOST
DATE RECEIVED:11/02/2011
DATE REPORTED:11/28/2011
PAGE:1

PARAMETER	RESULT	UNIT	DETECTION LIMIT	METHOD REFERENCE
Arsenic	2.50	ug/g	1.00	TMECC.04.13
Cadmium	BDL*	ug/g	1.00	TMECC.04.06
Chromium	14.65	ug/g	1.00	TMECC.04.06
Cobalt	BDL*	ug/g	1.00	TMECC.04.06
Copper	34.20	ug/g	1.00	TMECC.04.06
Lead	29.05	ug/g	1.00	TMECC.04.06
Mercury	BDL*	ug/g	0.10	TMECC.04.13A
Molybdenum	BDL*	ug/g	2.00	TMECC.04.06
Nickel	5.80	ug/g	1.00	TMECC.04.06
Selenium	BDL*	ug/g	1.00	TMECC.04.13
Zinc	66.25	ug/g	1.00	TMECC.04.06

BDL - Below detectable levels
Results reported on a dry weight basis

Results Authorized By:

A&L Canada Laboratories Inc.

2136 Jetstream Road · London, Ontario · N5V 3P5 · (519) 457-2575

ed: November 14, 2011

CQA Product Quality Test Requirements

Sample I.D.#	Recommended Product Use	PH	C/N ratio	Moisture	Particle size	Soluble Salts	Maturity Index
Dartmouth Compost ASP (Nov.2, 2011)	* Landscaping/Soil Amendment, Mulching	5.4	21:1	55.9 %	1/2 in.	3.7 ms./cm	8 (Slovita) <0.01 mg CO_2 C/g O.M./day

Recommendations for product use are only a suggestion based on the analysis that was performed on this material. This compost material indicates mature properties and overall based on the physical and chemical properties would be primarily suited for general landscaping, soil mix blending, and mulching due to its medium to coarse texture. The suggested use is meant only as a guide for interpretation on what the best end use may be.

Comments:

Heavy Metals: The results of our testing indicate the sample identified as "Dartmouth Compost ASP (Nov.2, 2011)" meets the current CCME type A compost standards for maximum allowable trace metal content in compost.

Microbiological: The results of our testing indicate this sample meets the current CCME type A compost standards for maximum allowable microbiological levels.

Compost Quality Requirements: *The results of our testing indicate that this product is a medium to coarse textured mature compost (76 %+ 1/2 in.), with rich mineral properties, which would meet criteria for soil amendment, blending and light topdressing end-uses purposes with precautionary restrictions. The precautionary exceptions being the proportion of sodium (%Na), which if used in too heavy a proportion could cause some problems with sensitive species. The recommended maximum allowable level of sodium for landscaping and soil amendment purposes is 2.0% available Na in the final soil mix. This compost has approximately 14.0 % available sodium, which is above our maximum recommended guidelines. The sodium levels of this compost sample though higher is suitable for agricultural broadcast field applications and are made to

Report Number: 1196-035
Account Number: 00897

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, Ontario, N5V 3P5
Telephone: (519) 457-2575 Fax: (519) 457-2664

Report Date: 7/29/2011

COMPOST REPORT

Page: 1

Sample Number	Lab Number	pH	Lime Index	Available Organic Matter %	Phosphorus P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm
1	7274	8.3	6.9	19.5	269	2581	955	9000

Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Sodium Na ppm	Nitrate-N NO_3-N ppm	Soluble Salt ms/cm	Nitrogen (Total) (%)	Moisture %
35	19.5	51	205	4.2	10.5	114	18	1.7	1.35	

INTERPRETATION

CEC		Percent Base Saturation				Proportional Equivalents (meq)				Cation Ratio		C/N Ratio
meq/100g	% BS	% K	% Mg	% Ca	% Na	K	Mg	Ca	Na	Mg/K	Ca/Mg	
60.0	100.0	11.04	13.10	75.04	0.83	6.62	7.85	45.00	0.50	1:1	6:1	
Optimum Range:		*3 - 5*	*8 - 20*	*60 - 80*		*0.5 - 1.3*				*7:1*	*5:1*	

CQA

* Crop yield is influenced by a number of factors in addition to soil fertility. No guarantee or waranty concerning crop performance is made by A & L
* Results reported on a dry weight basis.

REPORT NO.
C11196-7008
ACCOUNT NUMBER
00897

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, ON, N5V 3P5 Tel: (519) 457-2575 Fax: (519) 457-2664

Compost Analysis Proficiency Testing Program

PROJECT NO:
PO#: MW-PC5433
LAB NUMBER: 196716
SAMPLE ID: PC12JL

SAMPLE MATRIX:COMPOST
DATE RECEIVED:07/14/2011
DATE REPORTED:07/29/2011
PAGE:2

PARAMETER	RESULT	UNIT	DETECTION LIMIT	METHOD REFERENCE
Fecal Coliform	7	MPN/g		TMECC.07.01
Salmonella	<3	MPN/4g		TMECC.07.02
Total Inert Materials	0.16	%	0.01	TMECC.03.08
Total Sharp Inert Materials (> 3.0mm)	BDL*	%	0.01	TMECC.03.08
Total Plastic Inert Materials	0.16	%	0.01	TMECC.03.08
OM @ 550 deg C	34.13	%	0.10	LOI@550C
Moisture	43.90	%	0.10	TMECC.03.09
C:N Ratio	18:1			TMECC.05.02
Sieve 2 Inch (% Passing)	100.00	%	0.10	ASTMD422
Sieve 1 Inch (% Passing)	100.00	%	0.10	ASTMD422
Sieve 1/2 Inch (% Passing)	100.00	%	0.10	ASTMD422
Sieve 3/8 Inch (% Passing)	81.20	%	0.01	ASTMD422
Sieve 1/4 Inch (% Passing)	65.20	%	0.01	ASTMD422
Compost Stability Index	8	---		TMECC.05.08-B
Respiration-CO2-C/g OM/day	0.20	mgCO2	0.01	TMECC.05.08-B
Respiration - CO2-C/g TS/day	0.10	mgCO2	0.01	TMECC.05.08-B

BDL - Below detectable levels

REPORT NO.
C11196-7008
ACCOUNT NUMBER
00897

A & L Canada Laboratories Inc.

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Compost Analysis Proficiency Testing Program

PROJECT NO:
PO#: MW-PC5433
LAB NUMBER: 196715
SAMPLE ID: PC12JL

SAMPLE MATRIX:COMPOST
DATE RECEIVED:07/14/2011
DATE REPORTED:07/29/2011
PAGE:1

PARAMETER	RESULT	UNIT	DETECTION LIMIT	METHOD REFERENCE
Arsenic	2.30	ug/g	1.00	TMECC.04.13
Cadmium	BDL*	ug/g	1.00	TMECC.04.06
Chromium	16.75	ug/g	1.00	TMECC.04.06
Cobalt	BDL*	ug/g	1.00	TMECC.04.06
Copper	24.25	ug/g	1.00	TMECC.04.06
Lead	10.40	ug/g	1.00	TMECC.04.06
Mercury	BDL*	ug/g	0.10	TMECC.04.13A
Molybdenum	BDL*	ug/g	2.00	TMECC.04.06
Nickel	4.65	ug/g	1.00	TMECC.04.06
Selenium	BDL*	ug/g	1.00	TMECC.04.13
Zinc	63.45	ug/g	1.00	TMECC.04.06

BDL - Below detectable levels

A&L Canada Laboratories Inc.

2136 Jetstream Road · London, Ontario · N5V 3P5 · (519) 457-2575

To:

CQA Repor
Results for

CQA Product Quality Test Requirements

Sample I.D.#	Recommended Product Use	PH	C/N ratio	Moisture	Particle size	Soluble Salts	Maturity Index
Pickering LYW Compost PC12JL (July 14, 2011)	* Landscaping/Soil Amendment, light topdressing	8.3	18:1	43.9 %	3/8 in.	1.7 ms./cm	8 (Slovita) 0.20 mg CO_2 C/g O.M./day

Recommendations for product use are only a suggestion based on the analysis that was performed on this material. This compost material indicates mature properties and overall based on the physical and chemical properties would be primarily suited for general landscaping, soil mix blending, and light topdressing due to its fine texture. The suggested use is meant only as a guide for interpretation on what the best end use may be.

Comments:

Heavy Metals: The results of our testing indicate the sample identified as "Pickering LYW Compost PC12JL (July 14, 2011)" meets the current Ontario type A compost standards for maximum allowable trace metal content in compost.

Microbiological: The results of our testing indicate this sample meets the current Ontario type A compost standards for maximum allowable microbiological levels.

Compost Quality Requirements: *The results of our testing indicate that this product is a fine to medium textured mature compost (81 %+ 3/8 in.), with rich mineral properties, which would meet criteria for soil amendment, blending and light topdressing end-uses purposes with precautionary restrictions. The precautionary exceptions being the proportion of sodium (%Na), which if used in too heavy a proportion could cause some problems with sensitive species. The recommended maximum allowable level of sodium for landscaping and soil amendment purposes is 2.0% available Na in the final soil mix. This compost has approximately 0.83 % available sodium, which is low and should not present a problem with growing plants. The compost is rich in available potassium, calcium, and zinc, which make it ideal for soil enriching, and

Thank You

Greg Patterson C.C.A.
President A&L Canada Laboratories
www.alcanada.com