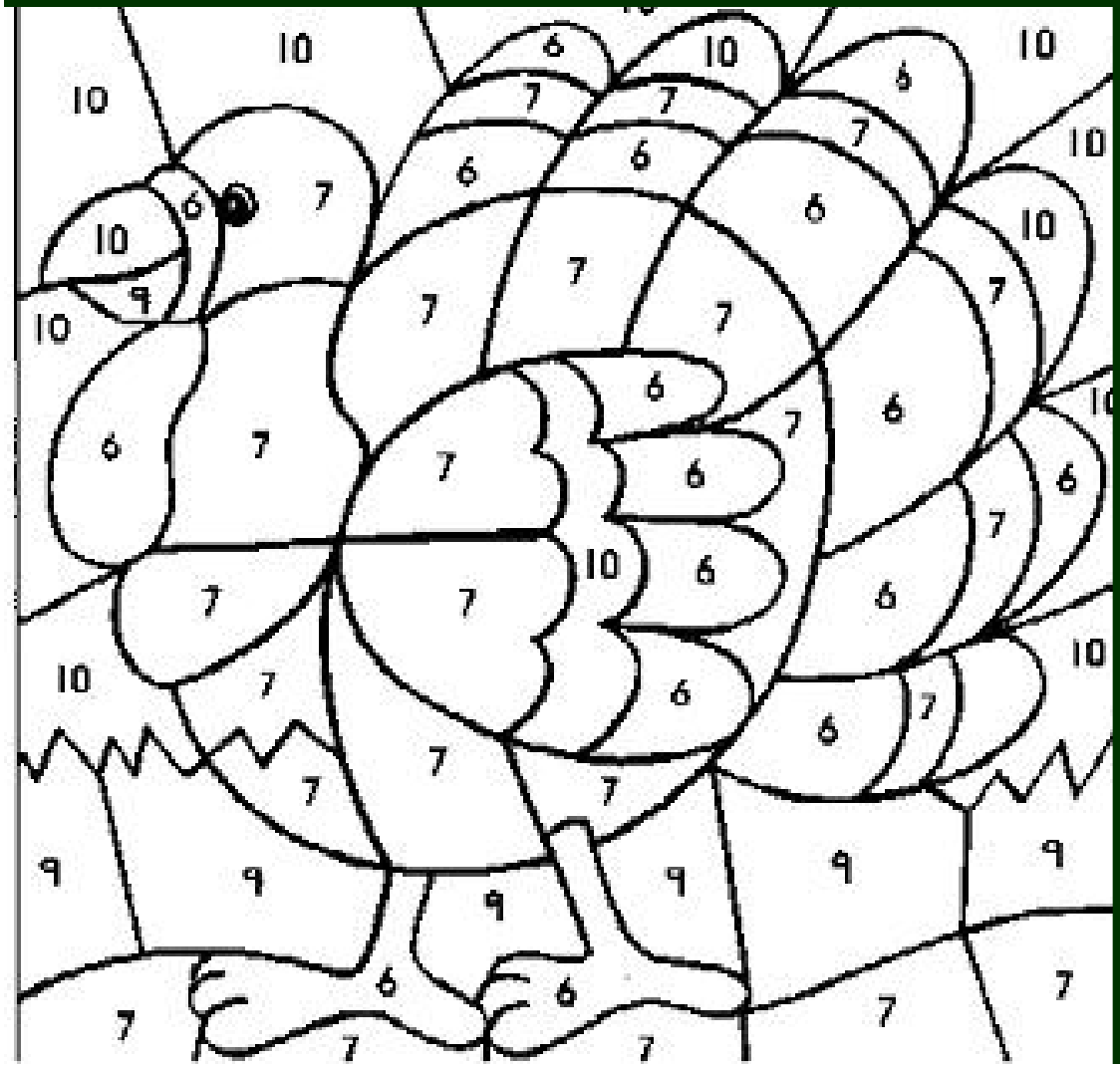
When it comes to Crop Nutrition …



…How do you know you're going down the right Track?

Unfortunately there is not a “Paint by Number”

Soil Amendment – Crop Nutrition System



It is our understanding of…

… Nutritional

Trends

Tendencies

Relationships

that is Critical in

Successfully Balancing Crop Nutrition

Four Testing Tools

Irrigation Water Analysis



Standard Soil Analysis

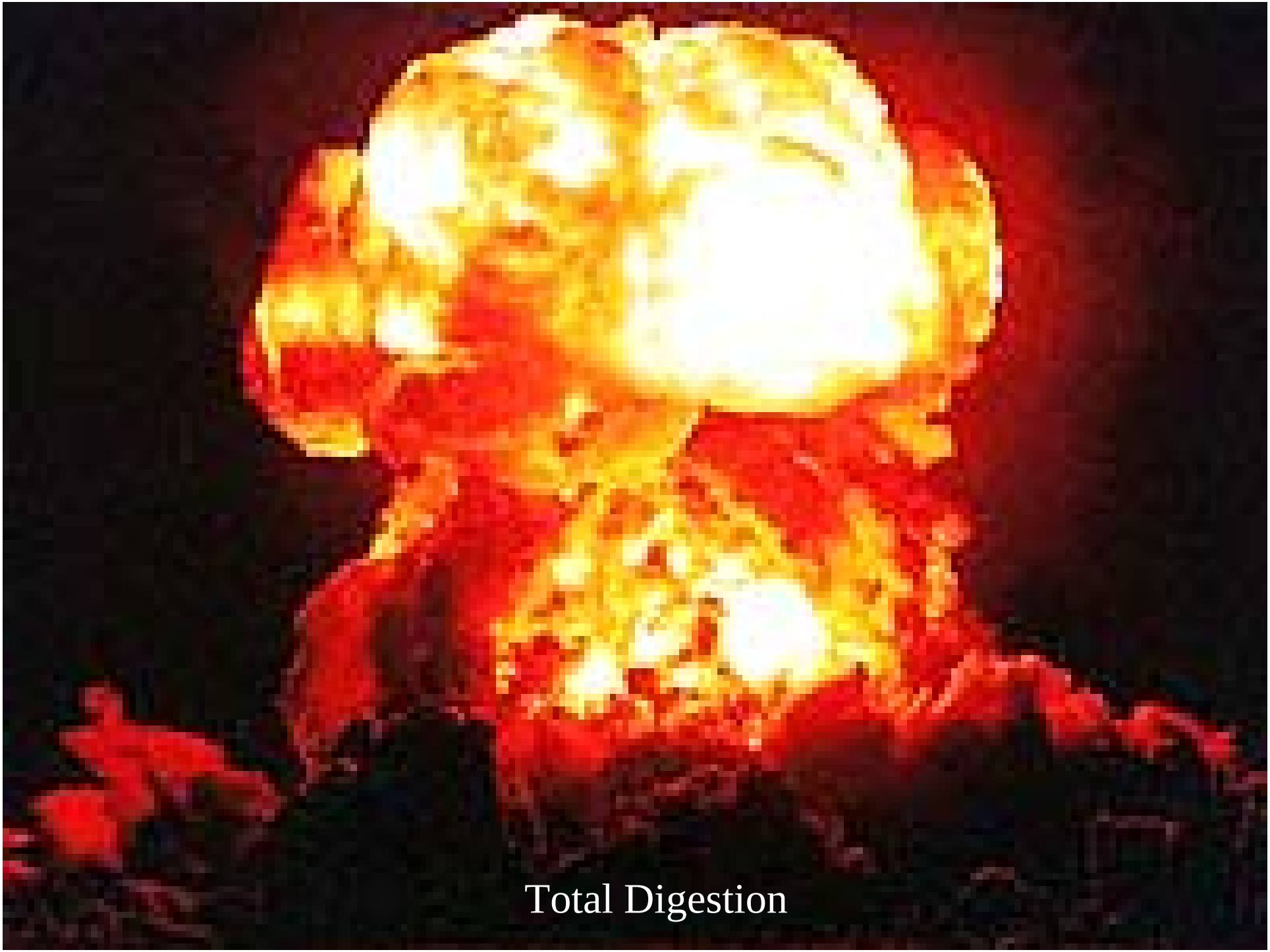
Saturated Soil Analysis

Fruitlett & Fruit Analysis

Extractions

How much Nutrient is available…

…and when?


Total Digestion

Partial Digestion (Standard Soil Analysis)





Weak Acids & Water Extractions (Saturated Soil)

SOIL BALANCE

(Using the acid extraction)

COMBINING

BCSR & SLAN

(Base Cation Saturation Level) - & - (Sufficient Levels of Available Nutrients)

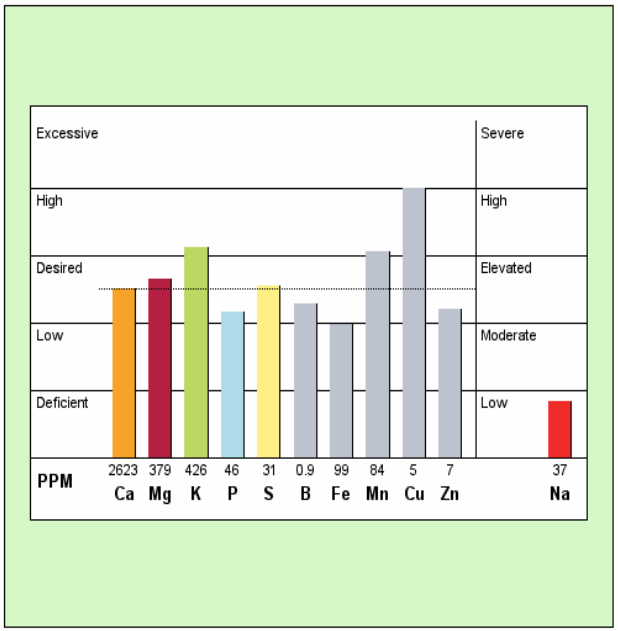
- SoilTech Incorporates the **BCSR** concept into its soils program in order to aid in the balance of the chemical, physical, and biological components of the soil.
- Calcium, magnesium (lime), potassium, hydrogen and pH are balanced according to what crop is being grown and the capacity of the soil

- SoilTech incorporates the **SLAN** concept into its soils program for the nutrients nitrogen,sulfur, phosphorus, boron, manganese, zinc, copper, and molybdenum.
- These nutrients are maintained at particular levels established by crop being grown and region it is being grown in.

Standard Soil Analysis

What's in the Bank?





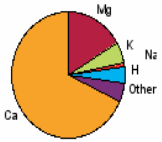
Organic Matter	2.8%
Estimated Nitrogen Release (from humus)	38.5 PPM
pH (H_2O 1:1)	6.7
Total Exchange Capacity	19.3
Available Nitrogen	
NH_3	4.8 PPM
NO_3	1.3 PPM

	Actual	Desired
B	0.9	0.8-1.2 PPM
Fe	99	100-200 PPM
Mn	84	25-80 PPM
Cu	5	0.5-3 PPM
Zn	7	5-17 PPM

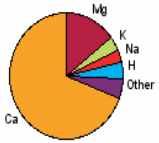
BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual
Ca	67.95%
Mg	16.36%
K	5.66%
Na	0.83%
H	4.50%
Other	4.70%

Actual Saturation



Desired Saturation

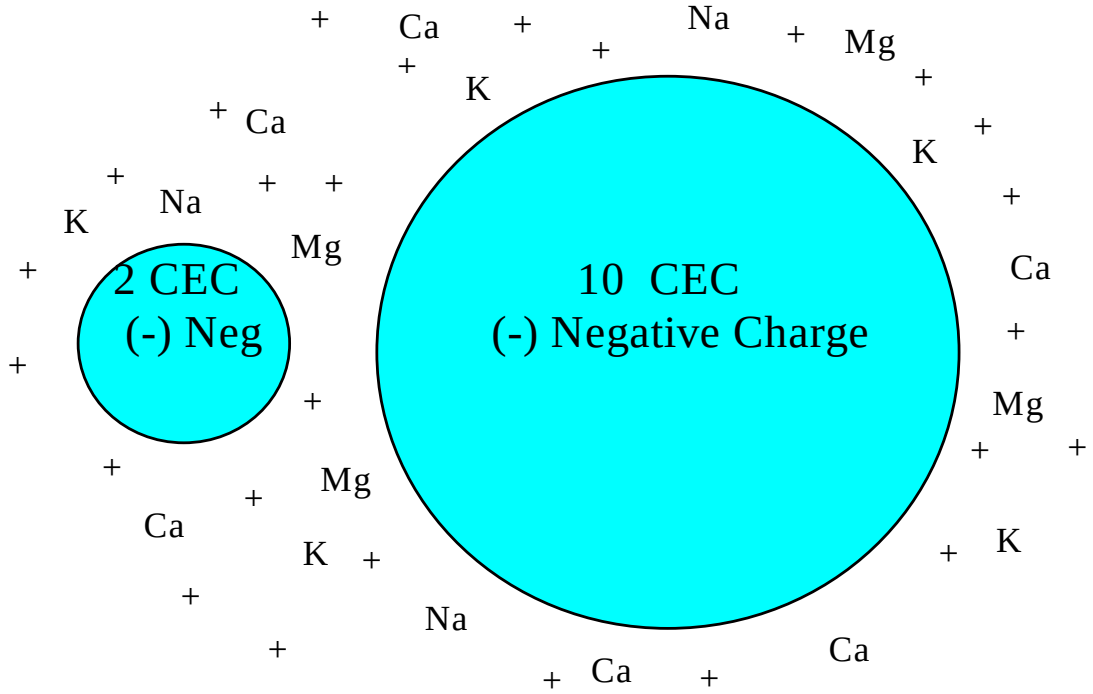


Desired	
68-72%	Ca
13-16%	Mg
3-5%	K
<3%	Na
4.50%	H
5%	Other

- **Acid Extraction Method (Melich III)**
- **Used to determine the Balance of the Base Cation Saturation Ratios (B.C.S.R.) "Balance"**
- **Predicts nutrient availability to the crop throughout the course of the growing season based on rainwater as the irrigation source.**
- **Utilize this test to show "What's in the Bank" as far as Potential Nutrient Availability and Soil Nutrient Reserves**
- **May not be a reliable test with regard to nutrient availability when irrigation water has elevated Carbonate (CO3), BiCarbonate (HCO3), and Sodium (Na) levels.**

Cation Exchange Capacity

Cation Exchange Capacity (C.E.C.) - This is the soils gas tank. This term describes the ability for each soil to attract and hold positively charged cations in the negatively charged soil colloidial complex. C.E.C. is measured in M.E. The C.E.C. ranges from 0 - 100. Example: A 2 C.E.C. soil would be like a beach sand and a 50 C.E.C. could be a heavy clay soil. ***<u>There is no good or bad C.E.C.</u>*** All the C.E.C. tells you is how big or small your soils gas tank is. The bigger it is, the farther you can go before you have to stop and fuel up.



Base Cation Saturation Ratios (BCSR)

Calcium (Ca) 68-72%

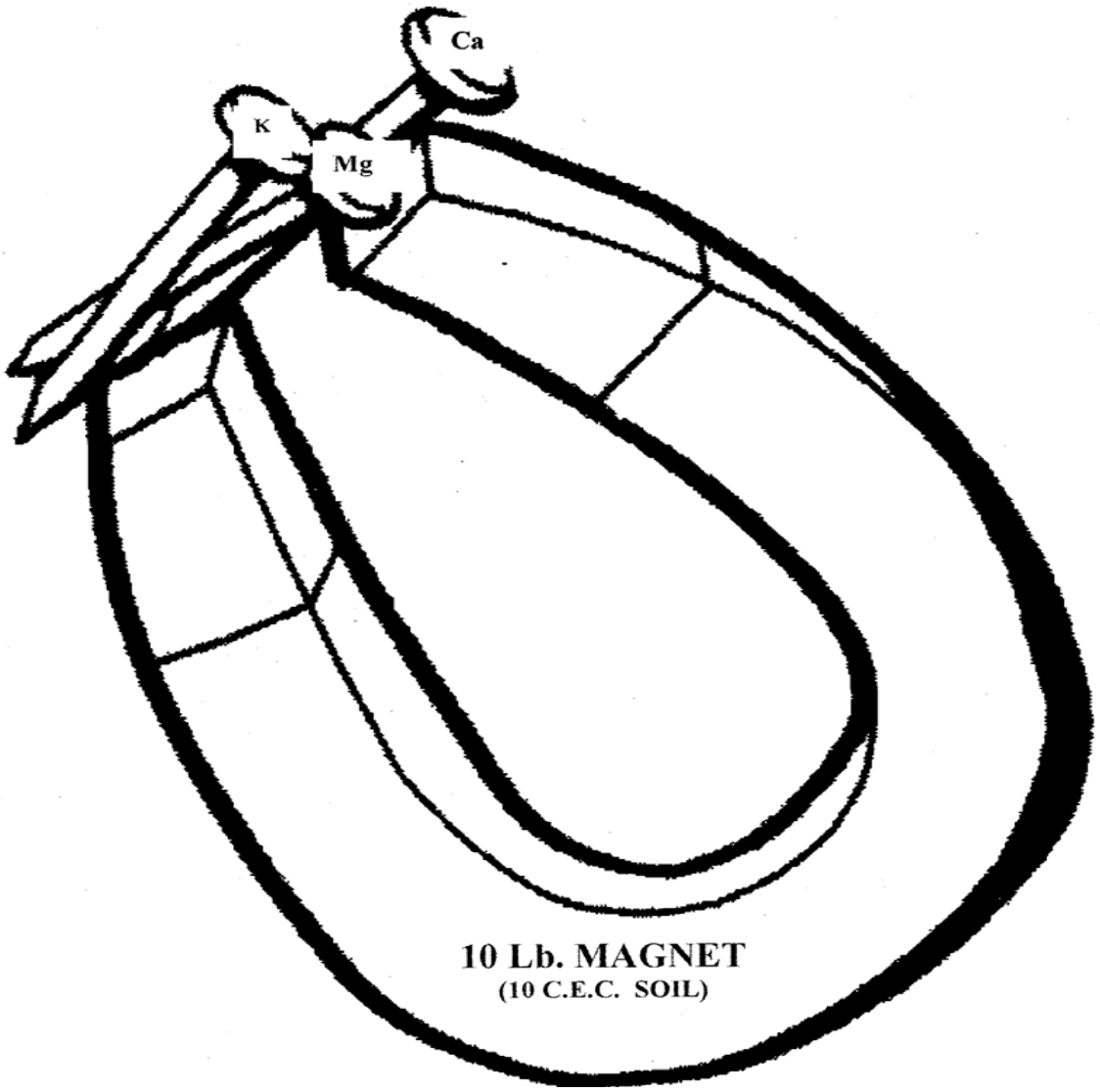
Magnesium (Mg) 13-16%

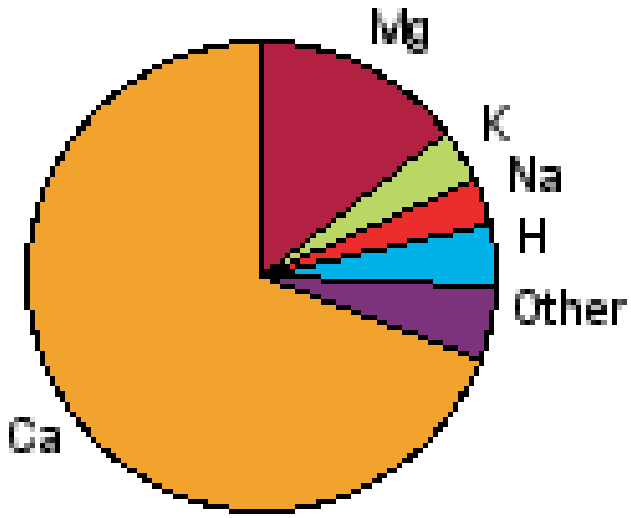
Potassium (K) 4-6 %

Sodium (Na) < 3%

Other Bases (OB) 4-5%

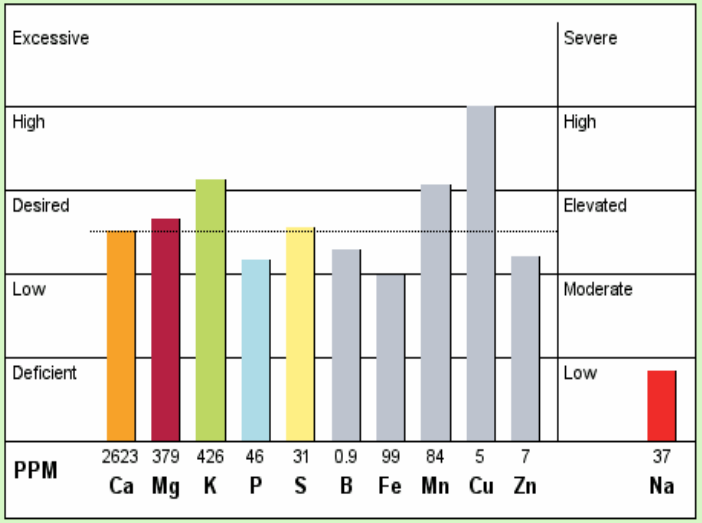
Ex. Hydrogen (H) 3-12%





Standard Soil Analysis

What's in the Bank?



Organic Matter	2.8%
Estimated Nitrogen Release (from humus)	38.5 PPM
pH (H_2O 1:1)	6.7
Total Exchange Capacity	19.3

Available Nitrogen

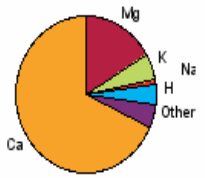
NH_3	4.8 PPM
NO_3	1.3 PPM

	Actual	Desired
B	0.9	0.8-1.2 PPM
Fe	99	100-200 PPM
Mn	84	25-80 PPM
Cu	5	0.5-3 PPM
Zn	7	5-17 PPM

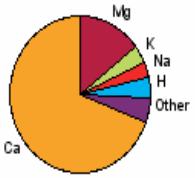
BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual
Ca	67.95%
Mg	16.36%
K	5.66%
Na	0.83%
H	4.50%
Other	4.70%

Actual Saturation



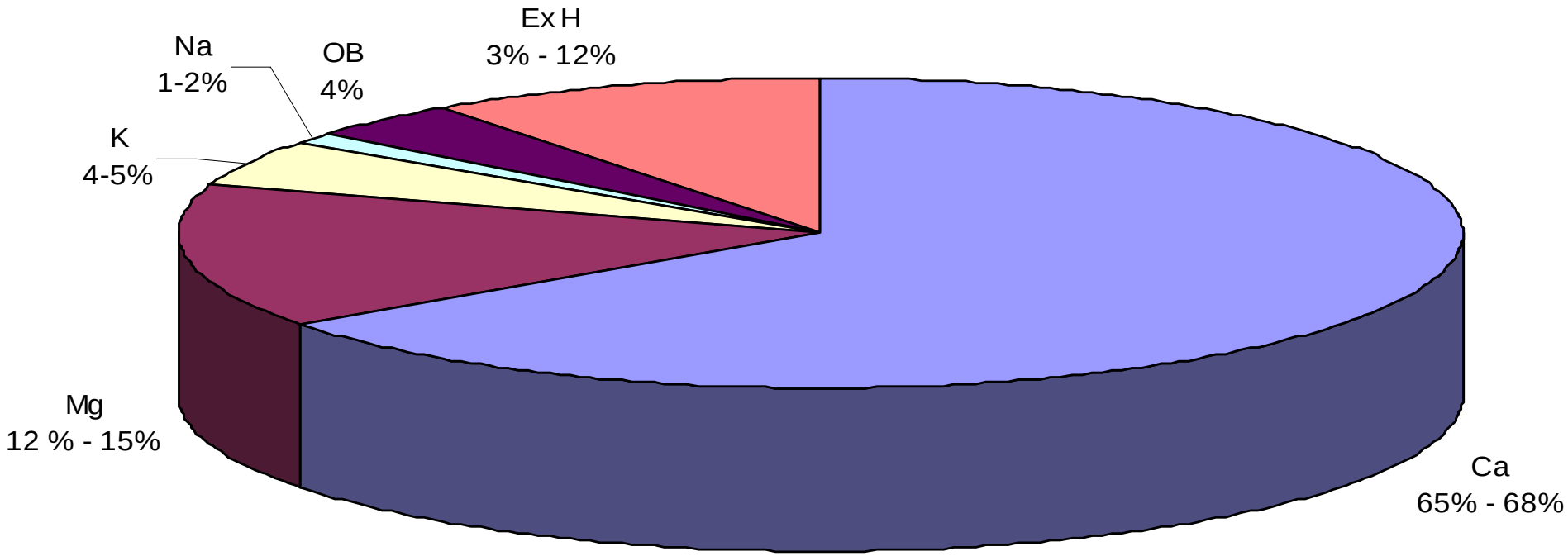
Desired Saturation

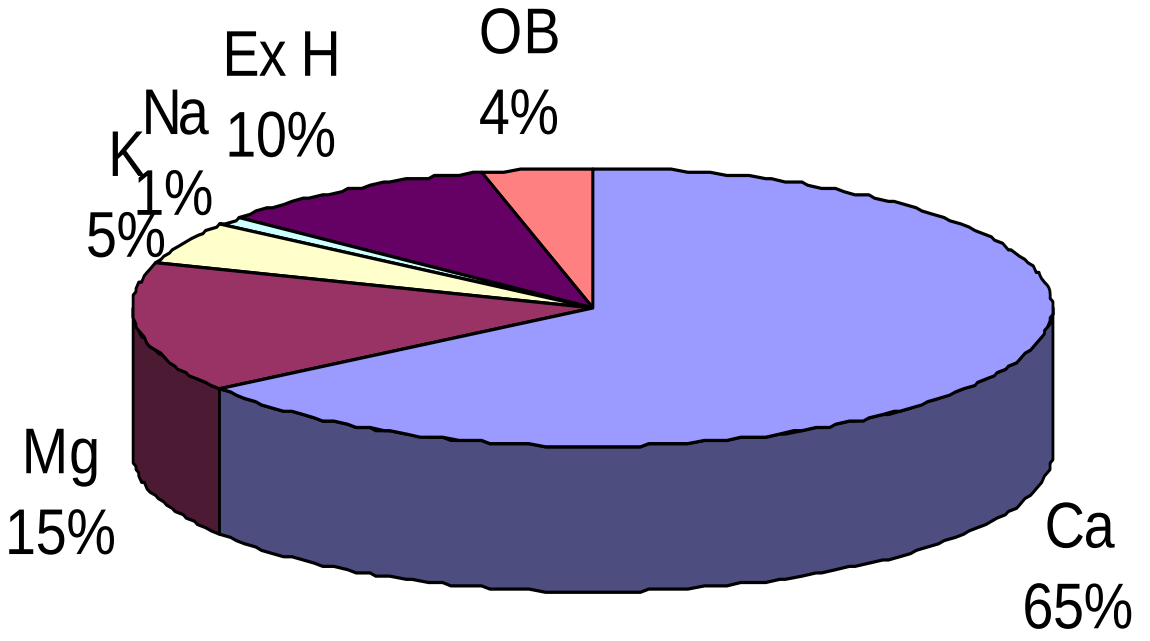


Desired	
68-72%	Ca
13-16%	Mg
3-5%	K
<3%	Na
4.50%	H
5%	Other

Ideal Base Saturation levels

- pH in the 6.2 - 6.8 Range -

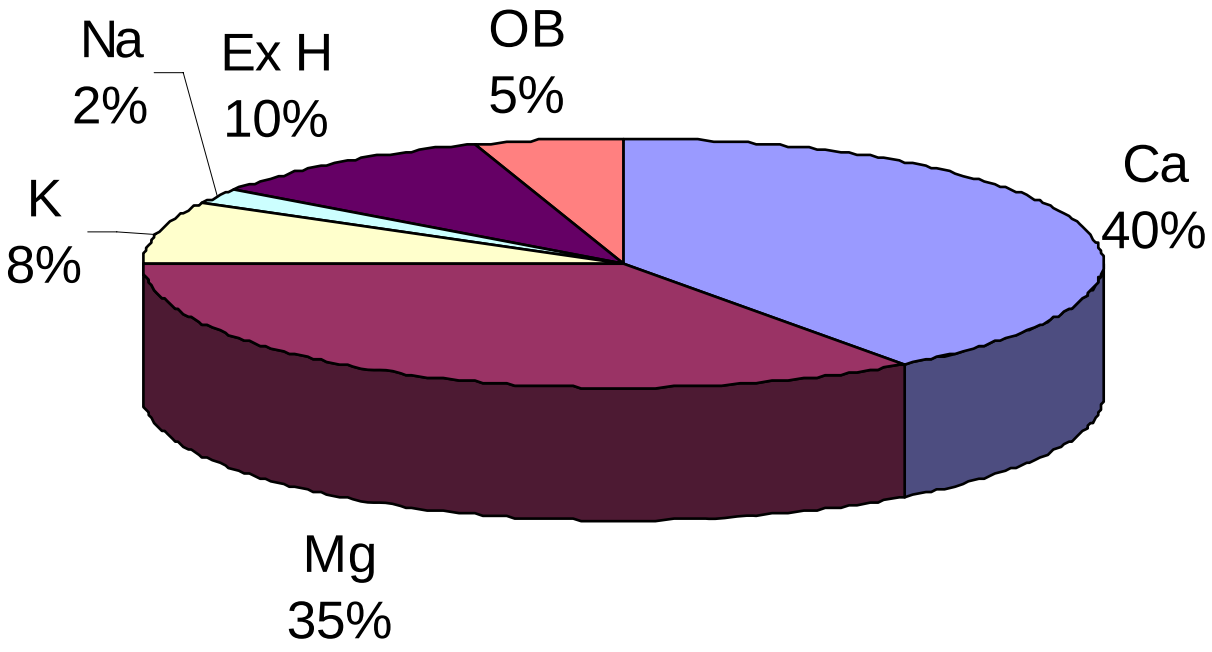




Same pH

Different

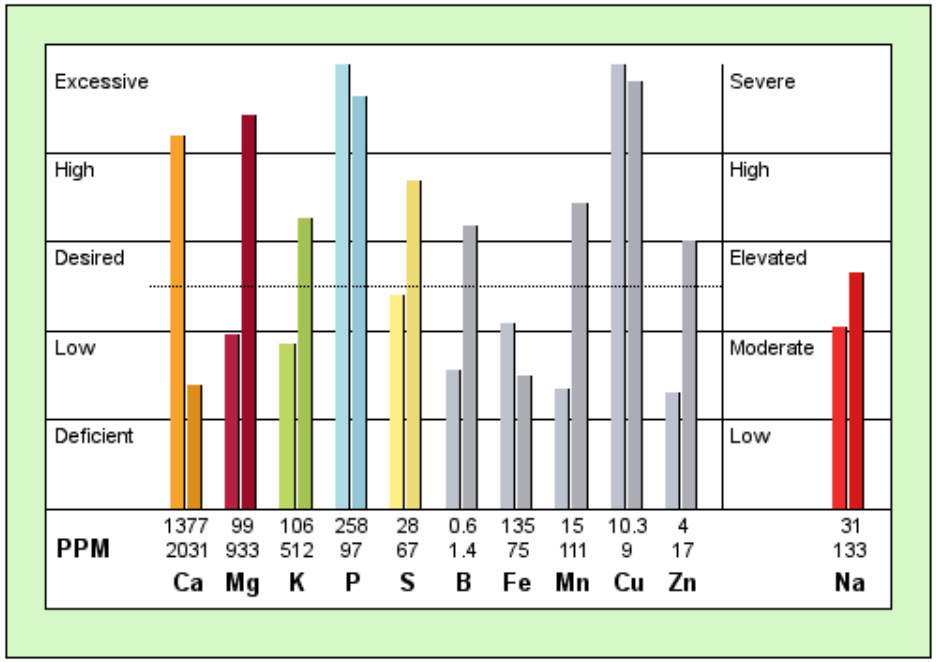
Balance



Same pH – Different Balance

Sample 1: River Block (October 20 2003)
Sample 2: Blk 16 - Granny (October 28 2003)

OVERALL NUTRIENT COMPARISON



Organic Matter (humus)	2.07% 1.1%
Estimated Nitrogen Release (from humus)	31 PPM 21 PPM
pH (H_2O 1:1)	7 7
Available Nitrogen (NH_3+NO_3)	8.4 PPM 28.8 PPM
Total Exchange Capacity	8.49 20.73

BASE SATURATION: KEY ELEMENTS

	Ideal	River Block	Blk 16 - Granny	
Ca	**68-72%**	81.10%	48.99%	**Ca**
Mg	**13-16%**	9.72%	37.51%	**Mg**
K	**3-5%**	3.20%	6.33%	**K**
Na	**<3%**	1.59%	2.79%	**Na**
H	**4.50%**	0.00%	0.00%	**H**
Other	**5%**	4.40%	4.40%	**Other**

Balancing BCSR

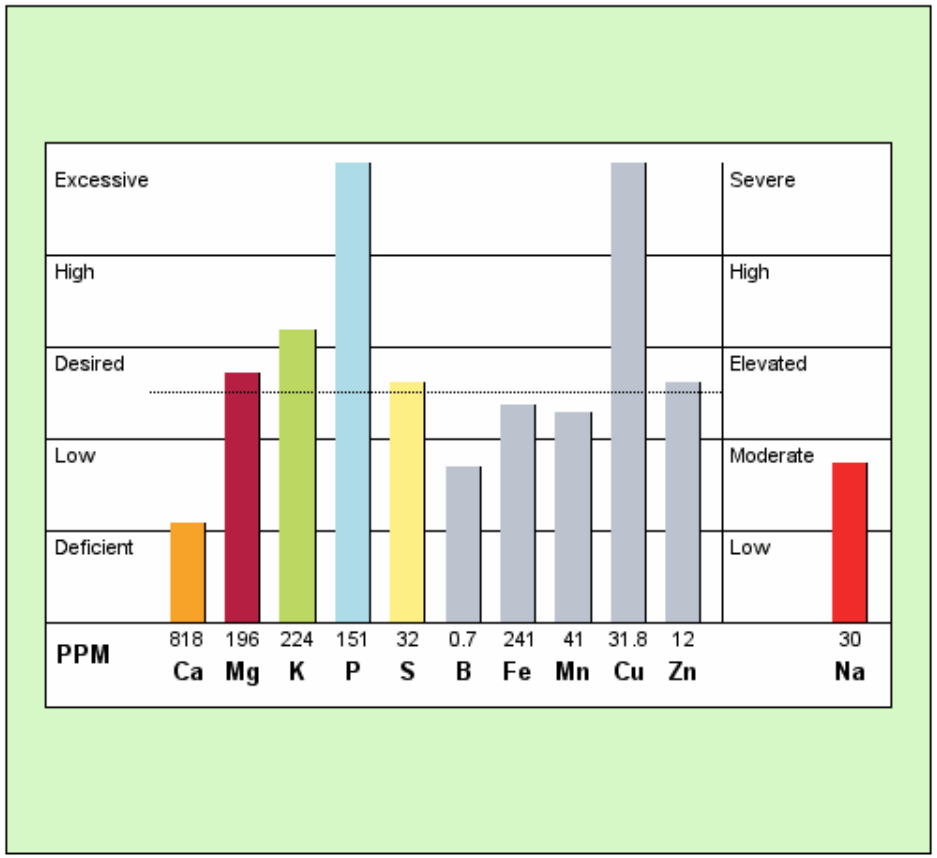
with

Conventional Soil Amendments

High Calcium Lime

- Used when there is low Ca availability but good or high levels of Magnesium. Generally, a low pH situation will exist but not always.

- Calcium 28% - 32%
- Magnesium .5% - 2.5%



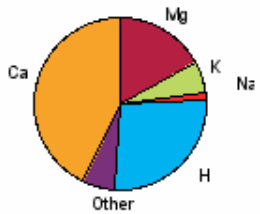
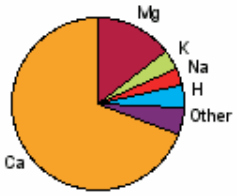
Organic Matter	1.5%
Estimated Nitrogen Release (from humus)	25 PPM
pH (H_2O 1:1)	5.6
Total Exchange Capacity	9.6

Available Nitrogen

NH_3	1.7 PPM
NO_3	18.8 PPM

	Actual	Desired
B	0.7	0.8-1.2 PPM
Fe	241	100-200 PPM
Mn	41	25-80 PPM
Cu	31.8	0.5-3 PPM
Zn	12	5-17 PPM

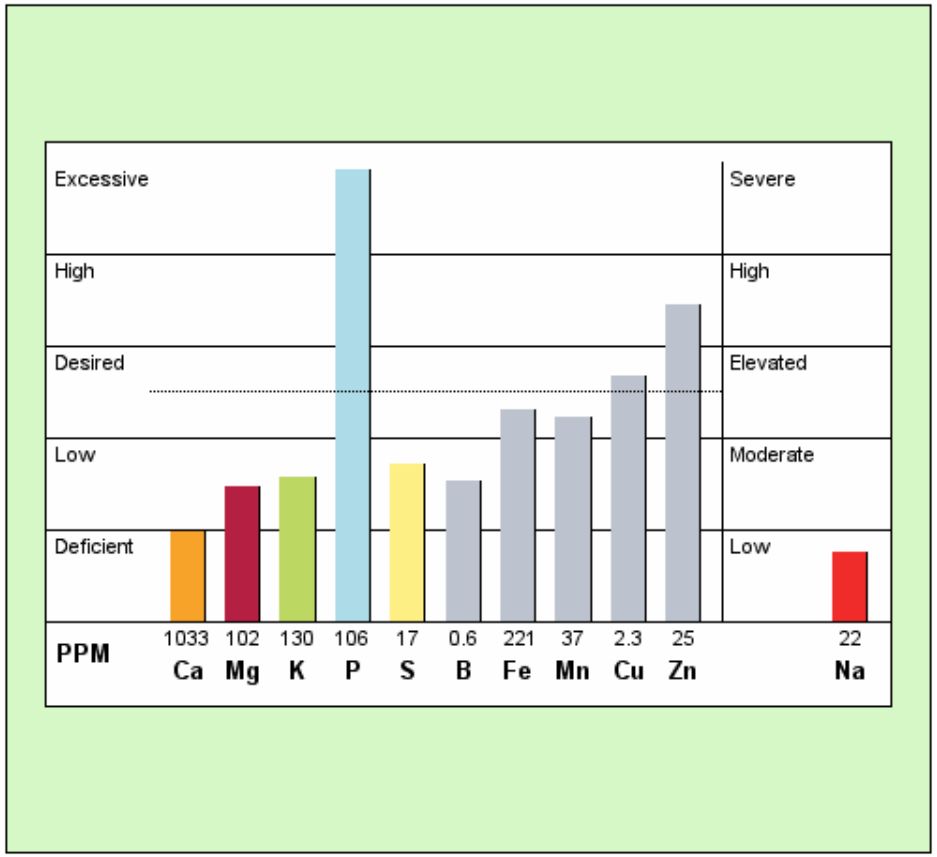
BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual	Actual Saturation	Desired Saturation	Desired	
Ca	42.52%			68-72%	Ca
Mg	16.98%			13-16%	Mg
K	5.97%			3-5%	K
Na	1.36%			<3%	Na
H	27.00%			4.50%	H
Other	6.20%			5%	Other

Dolomite Lime

- Used when there is both low Calcium and Magnesium availability. A low pH situation will almost always exist.

- Calcium 24% - 28%
- Magnesium 14% - 18%



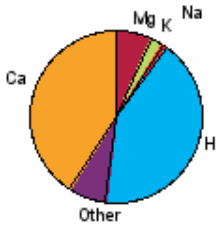
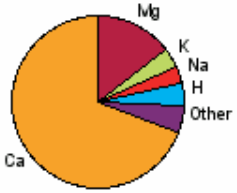
Organic Matter	1.1%
Estimated Nitrogen Release (from humus)	21.5 PPM
pH (H_2O 1:1)	5.1
Total Exchange Capacity	12.7

Available Nitrogen

NH_3	19.5 PPM
NO_3	17.3 PPM

	Actual	Desired
B	0.6	0.8-1.2 PPM
Fe	221	100-200 PPM
Mn	37	25-80 PPM
Cu	2.3	0.5-3 PPM
Zn	25	5-17 PPM

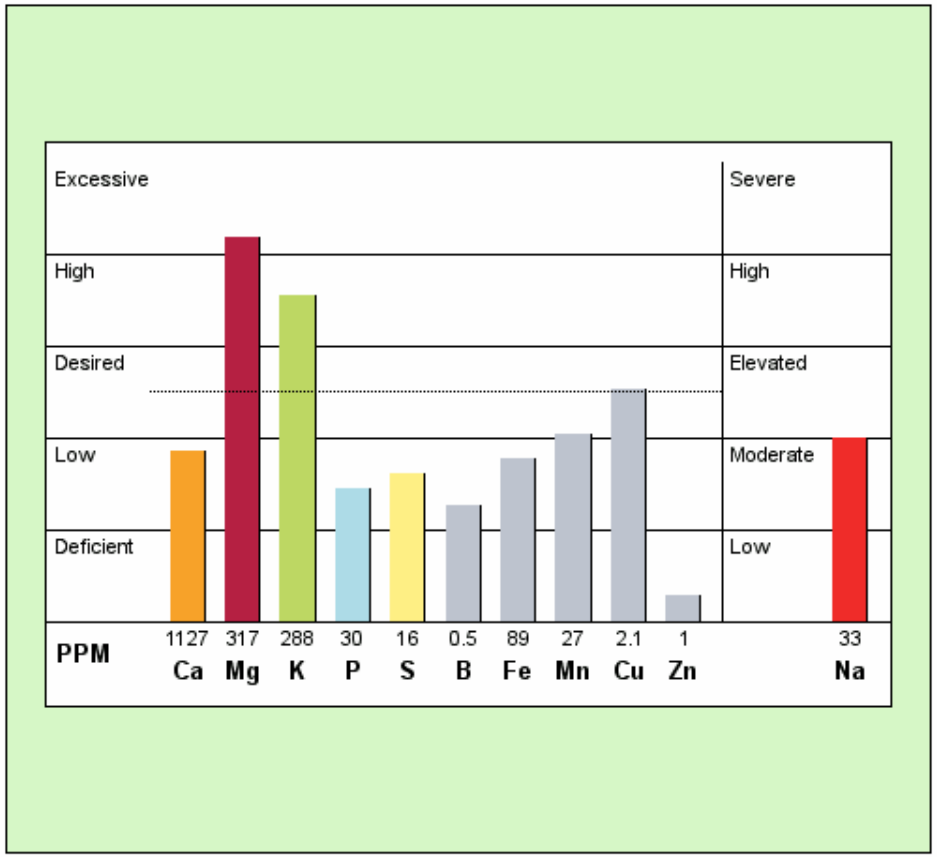
BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual	Actual Saturation	Desired Saturation	Desired	
Ca	40.70%			68-72%	Ca
Mg	6.70%			13-16%	Mg
K	2.63%			3-5%	K
Na	0.75%			<3%	Na
H	42.00%			4.50%	H
Other	7.20%			5%	Other

Gypsum (Calcium Sulfate)

- Used when the pH is in a desirable range yet there is low Calcium availability. Also very useful in high sodium situations.

- Calcium 18 - 24%
- Sulfur 14 - 18%



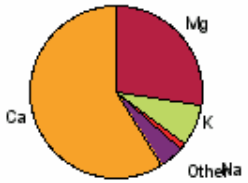
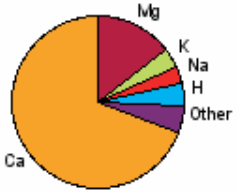
Organic Matter	1.5%
Estimated Nitrogen Release (from humus)	24.5 PPM
pH (H_2O 1:1)	7
Total Exchange Capacity	9.6

Available Nitrogen

NH_3	3.1 PPM
NO_3	1.1 PPM

	Actual	Desired
B	0.5	0.8-1.2 PPM
Fe	89	100-200 PPM
Mn	27	25-80 PPM
Cu	2.1	0.5-3 PPM
Zn	1	5-17 PPM

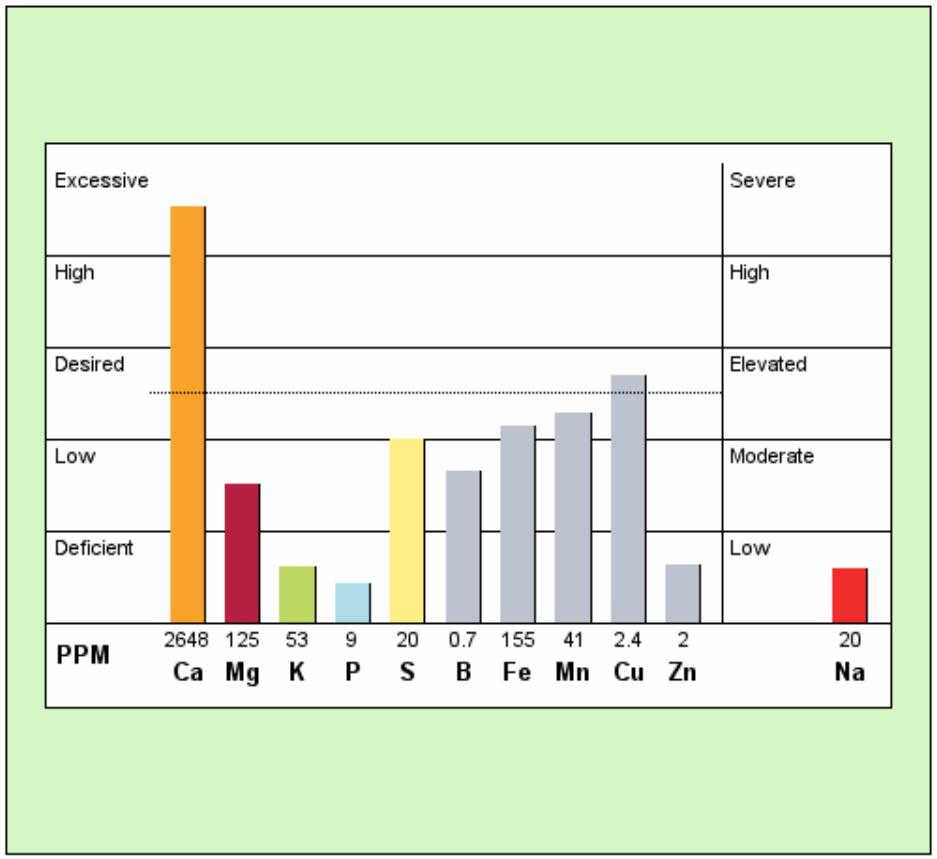
BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual	Actual Saturation	Desired Saturation	Desired	
Ca	**58.82%**			68-72%	**Ca**
Mg	**27.57%**			13-16%	**Mg**
K	**7.71%**			3-5%	**K**
Na	**1.50%**			<3%	**Na**
H	**0.00%**			4.50%	**H**
Other	**4.40%**			5%	**Other**

K-Mag

- Used when Calcium levels are excessive. Generally Magnesium and Potassium levels are low or are being suppressed by overwhelmingly High Calcium levels.

- Sulfur 22%
- Potassium 22%
- Magnesium 11%



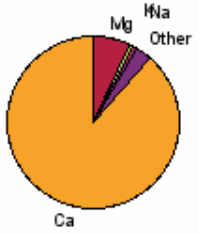
Organic Matter	0.3%
Estimated Nitrogen Release (from humus)	5.5 PPM
pH (H_2O 1:1)	8.2
Total Exchange Capacity	15
Available Nitrogen	
NH_3	1.4 PPM
NO_3	1.2 PPM

	Actual	Desired
B	0.7	0.8-1.2 PPM
Fe	155	100-200 PPM
Mn	41	25-80 PPM
Cu	2.4	0.5-3 PPM
Zn	2	5-17 PPM

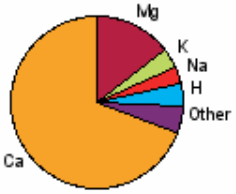
BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual
Ca	88.38%
Mg	6.95%
K	0.91%
Na	0.58%
H	0.00%
Other	3.20%

Actual Saturation



Desired Saturation



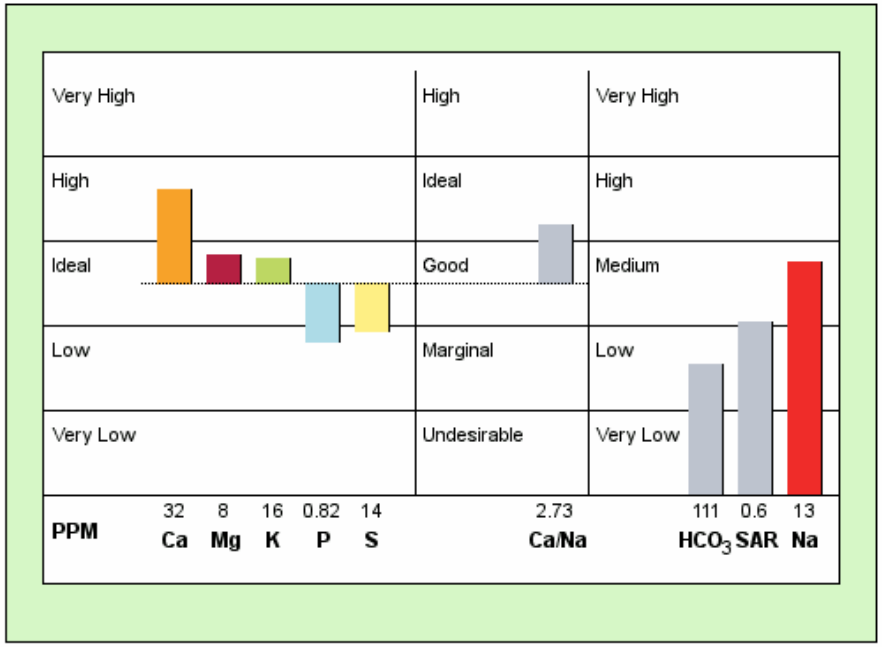
Desired	
68-72%	Ca
13-16%	Mg
3-5%	K
<3%	Na
4.50%	H
5%	Other

Saturated Soil (Paste) Analysis

What's in "Cash Flow"?



- Determines only Water Soluble Nutrients
- Evaluates effects of irrigation water on nutrient availability
- Correlates better to plant nutrient levels
- Shows the nutrients that are drawn out of the Bank – *"Cash Flow"*
- Useful in the development of a **S.L.A.N.** program for the current crop



pH
6.3

Soluble Salts
192

Cation Saturation Percent

Ca	49.36%
Mg	19.93%
K	12.66%
Na	18.05%

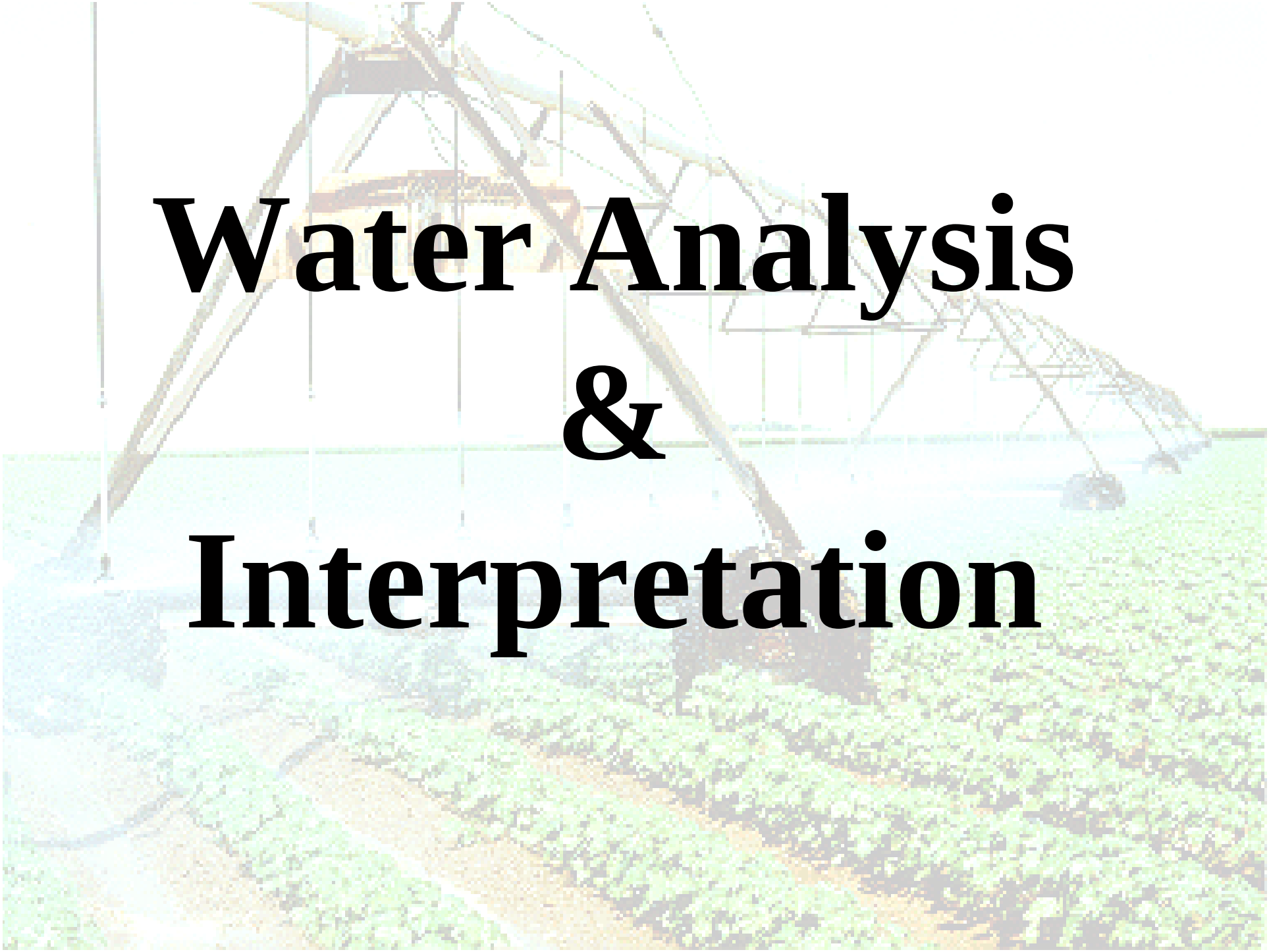
Ammonium (NH_3)
0.3 ppm
Nitrate (NO_3)
0.8 ppm

TRACE ELEMENTS

Boron	Iron	Copper	Manganese	Zinc	Chloride
0.32 PPM	1.36 PPM	0.02 PPM	0.13 PPM	0.02 PPM	13 PPM

How to utilize the Soil Solution *(Paste)* Analysis

1. To confirm trends seen on the Standard (strong acid) extraction
2. To aid in the determination of proper fertilizer blends – maintenance
3. To aid in the determination of the need for water treatment
   a. Bicarbonate levels?
   b. Sodium levels?
4. For comparative analysis – Good vs. Poor, etc.



Water Analysis & Interpretation

Irrigation Suitability Analysis

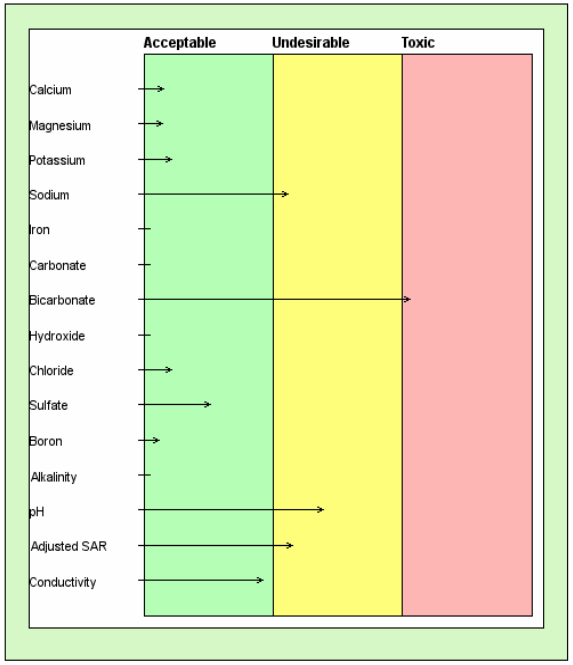
- Utilized to evaluate irrigation water's mineral components and how they effect the:
- Chemical
- Physical
- Biological
- Nutritional

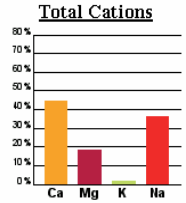
Functions in the Soil

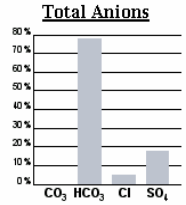
Understanding Water Quality is the first step to solving soil problems

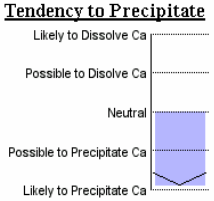
pH	7.81					
Conductivity (dS/m)	0.92					
Sodium Adsorption Ratio (SAR)	2.08					
Adjusted SAR	4.87					
Hardness (ppm)	319.19					
pHc	7.06					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	90.77	20.59	247.08	4.53	44.2%
Magnesium	(Mg)	22.33	5.06	60.72	1.84	17.95%
Potassium	(K)	6.48	1.47	17.64	0.17	1.66%
Sodium	(Na)	85.26	19.34	232.08	3.71	36.2%
Iron	(Fe)	0.35	0.08	0.96		
Total Cations					10.25	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	361.08	81.89	982.68		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	440.59	99.93	1199.16	7.22	77.63%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	16.17	3.67	44.04	0.46	4.95%
Sulfate	(SO_4)	77.86	17.66	211.92	1.62	17.42%
Total Anions					9.3	
Total Salt Concentration	(TDS)	587.52	133.25	1599		
Boron	(B)	0.1	0.02	0.24		
Cation/Anion Ratio		1.1				

SUITABILITY GRAPHS









A Little can add up to A Lot!

pH	7.71					
Conductivity (dS/m)	0.41					
Sodium Adsorption Ratio (SAR)	1.56					
Adjusted SAR	2.76					
Hardness (ppm)	128.79					
pHc	7.63					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	34.65	7.86	94.32	1.73	37.77%
Magnesium	(Mg)	10.14	2.3	27.6	0.83	18.12%
Potassium	(K)	10.21	2.32	27.84	0.26	5.68%
Sodium	(Na)	40.59	9.21	110.52	1.76	38.43%
Iron	(Fe)	< 0.3	0	0		
Total Cations					4.58	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	220	49.9	598.8		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	268.44	60.88	730.56	4.4	95.03%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	5.79	1.31	15.72	0.16	3.46%
Sulfate	(SO_4)	3.49	0.79	9.48	0.07	1.51%
Total Anions					4.63	
Total Salt Concentration	(TDS)	260.48	59.08	708.96		
Boron	(B)	0.06	0.01	0.12		
Cation/Anion Ratio		0.99				

Water Analysis

pH	7.97					
Conductivity (dS/m)	0.12					
Sodium Adsorption Ratio (SAR)	0.87	**Indexes**				
Adjusted SAR	0.64					
Hardness (ppm)	37.1					
pHc	8.66					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	10.72	2.43	29.16	0.53	39.26%
Magnesium	(Mg)	2.38	0.54	6.48	0.2	14.81%
Potassium **Cations +**	(K)	3.52	0.8	9.6	0.09	6.67%
Sodium	(Na)	12.1	2.74	32.88	0.53	39.26%
Iron	(Fe)	< 0.3	0	0		
Total Cations					1.35	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	56.5	12.81	153.72		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	68.94	15.64	187.68	1.13	88.28%
Hydroxide **Anions -**	(OH)	0	0	0		
Chloride	(Cl)	< 2	0	0	0	0%
Sulfate	(SO_4)	6.98	1.58	18.96	0.15	11.72%
Total Anions					1.28	
Total Salt Concentration	(TDS)	76.8	17.42	209.04		
Boron	(B)	< 0.05	0	0		
Cation/Anion Ratio		1.05				

Is the Water a…

Dissolver

or a

Depositor ?

pHc



Dissolver

Generally causes a
Low pH soil



pHc of 8.4 is Neutral

Generally causes a
High pH soil



Depositor

Light Weight – “Dissolving Water ”

pH	7.36					
Conductivity (dS/m)	0.09					
Sodium Adsorption Ratio (SAR)	0.42					
Adjusted SAR	0					
Hardness (ppm)	17.72					
pHc	9.56					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	3.42	0.78	9.36	0.17	33.33%
Magnesium	(Mg)	2.1	0.48	5.76	0.17	33.33%
Potassium	(K)	< 0.6	0	0	0	0%
Sodium	(Na)	4.02	0.91	10.92	0.17	33.33%
Iron	(Fe)	< 0.3	0	0		
Total Cations					0.51	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	20.65	4.68	56.16		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	25.2	5.72	68.64	0.41	73.21%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	3.4	0.77	9.24	0.1	17.86%
Sulfate	(SO_4)	2.47	0.56	6.72	0.05	8.93%
Total Anions					0.56	
Total Salt Concentration	(TDS)	56.96	12.92	155.04		

pHc above 8.4

Low TDS (Salt Concentration Less than 100 ppm)

Low Bicarbonate (Less than 100 ppm)

Low Cations

“HUNGRY”

To Dissolve Salts

Depositing Water

pH	8.06					
Conductivity (dS/m)	0.5					
Sodium Adsorption Ratio (SAR)	0.53					
Adjusted SAR	1.01					
Hardness (ppm)	222.88					
pHc	7.5					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	48.89	11.09	133.08	2.44	45.95%
Magnesium	(Mg)	24.36	5.52	66.24	2	37.66%
Potassium	(K)	3.05	0.69	8.28	0.08	1.51%
Sodium	(Na)	18.17	4.12	49.44	0.79	14.88%
Iron	(Fe)	< 0.3	0	0		
Total Cations					5.31	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	213.75	48.48	581.76		
Carbonate	(CO_3)	10.26	2.33	27.96	0.34	6.38%
Bicarbonate	(HCO_3)	239.95	54.42	653.04	3.93	73.73%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	12.77	2.9	34.8	0.36	6.75%
Sulfate	(SO_4)	33.54	7.61	91.32	0.7	13.13%
Total Anions					5.33	
Total Salt Concentration	(TDS)	320	72.58	870.96		
Boron	(B)	0.09	0.02	0.24		
Cation/Anion Ratio		1				

pHc Below 8.4

Higher TDS (Salt Concentration above 100 pm)

More Cations (ppm)

•High Bicarbonate (above 120 ppm)

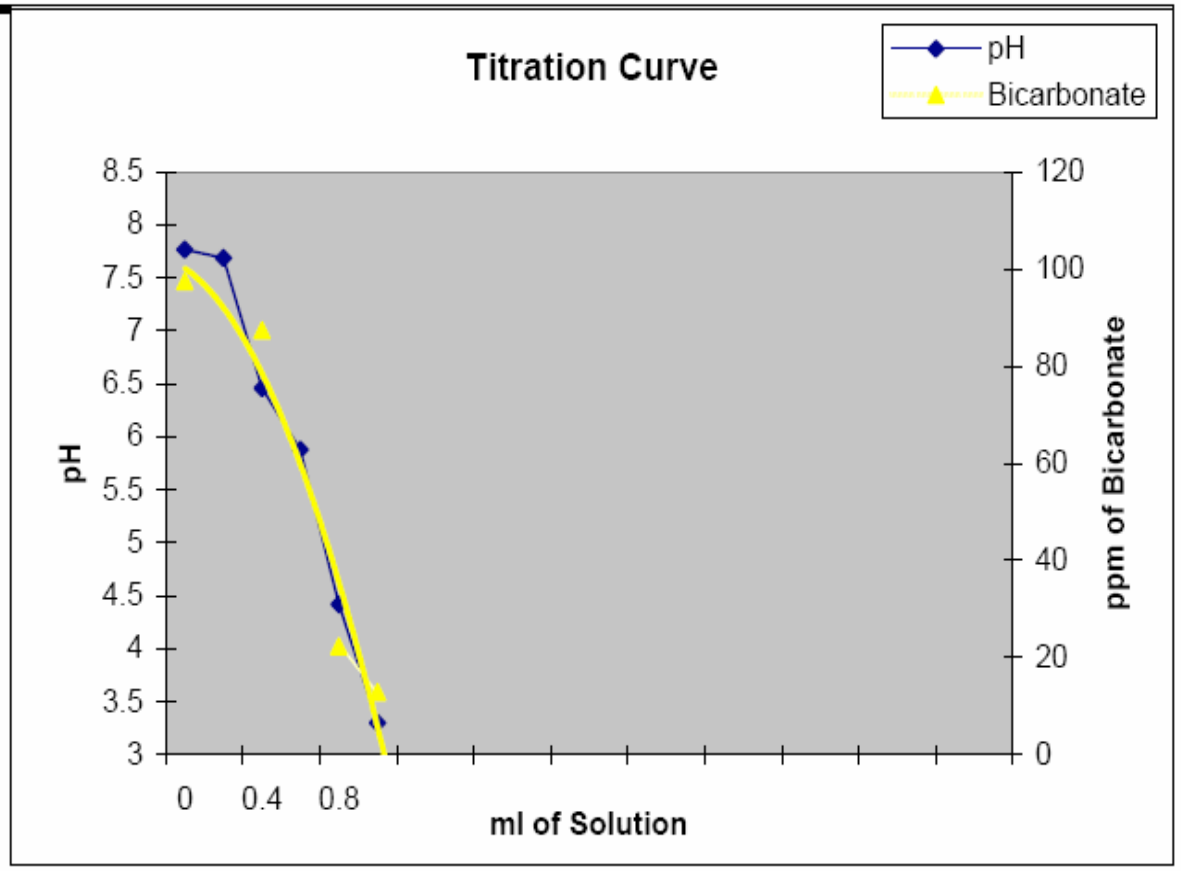
Dumps Salts into Soil Profile



The Effects of Bicarbonate (HCO3)

- **Displacement of Soluble Calcium (the electrostatic glue)**
- **Heavy Crusting & Sealing**
- **Excessive Water Use**
- **Build up of excessive Salts**
- **Increased pH**
- **Inefficient use of available nutrients**

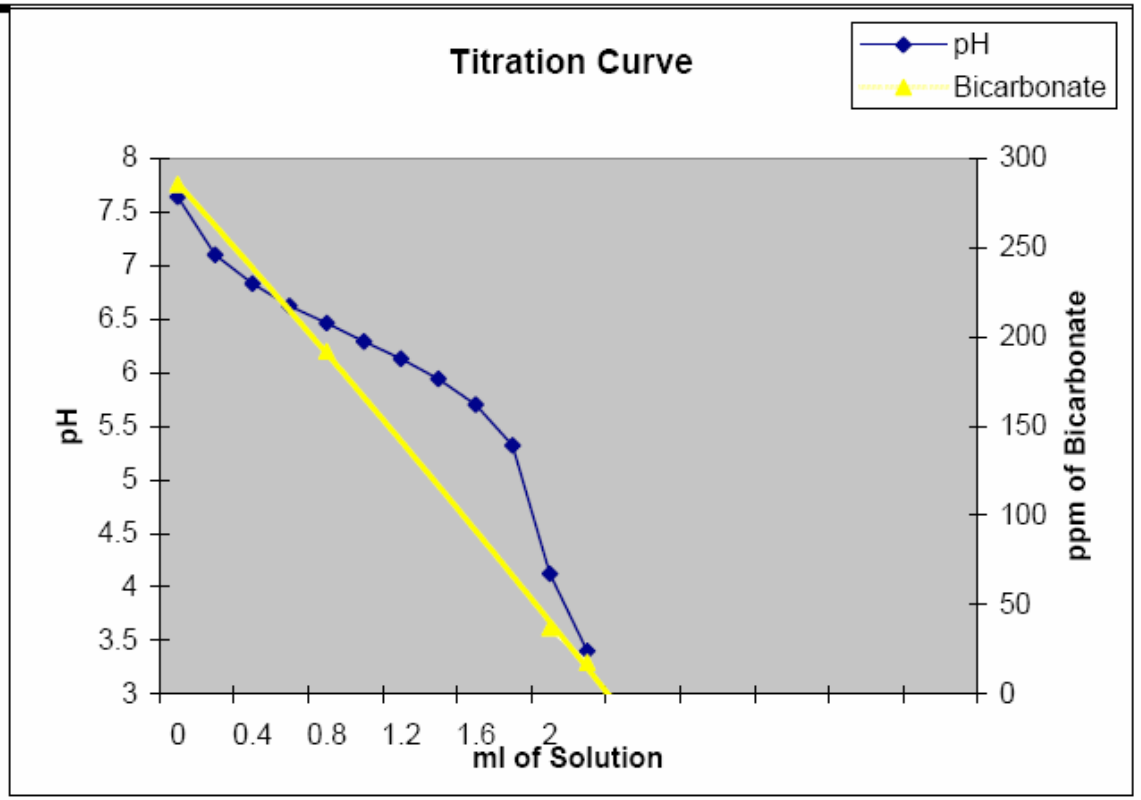
ml of 5% (95%) Sulfuric Acid	pH	Bicarbonate ppm
0	7.77	97.52
0.2	7.69	
0.4	6.46	87.36
0.6	5.88	
0.8	4.42	22.35
1	3.3	12.87



* 750 ml of water titrated

Estimated amount of 93% Sulfuric added to 1000 gallons of supplied water to lower pH to 6.46	0.35	ounces/1000 gal
Estimated amount of 93% Sulfuric added to 1000 gallons of supplied water to lower pH to 3.30	8.7	ounces/1000 gal

ml of 5% (95%) Sulfuric Acid	pH	Bicarbonate ppm
0	7.64	285.22
0.2	7.1	
0.4	6.83	
0.6	6.62	
0.8	6.46	191.94
1	6.29	
1.2	6.13	
1.4	5.94	
1.6	5.7	
1.8	5.32	
2	4.12	36.91
2.2	3.4	17.45



* 750 ml of water titrated

Estimated amount of 93% Sulfuric added to 1000 gallons of supplied water to lower pH to 6.46	6.96	ounces/1000 gal
Estimated amount of 93% Sulfuric added to 1000 gallons of supplied water to lower pH to 3.40	19.15	ounces/1000 gal

Water Analysis – High Sodium



pH	8.47					
Conductivity (dS/m)	0.53					
Sodium Adsorption Ratio (SAR)	14.18					
Adjusted SAR	13.41					
Hardness (ppm)	16.83					
pHc	8.45					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	4.54	1.03	12.36	0.23	3.54%
Magnesium	(Mg)	1.17	0.26	3.12	0.1	1.54%
Potassium	(K)	18.29	4.15	49.8	0.47	7.24%
Sodium	(Na) →	130.91	29.69	356.28	5.69	87.67%
Iron	(Fe)	0.38	0.09	1.08		
Total Cations					6.49	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	263.63	59.79	717.48		
Carbonate	(CO_3)	25.32	5.74	68.88	0.84	→ 14.74%
Bicarbonate	(HCO_3)	270.21	61.28	735.36	4.43	→ 77.72%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	15.32	3.47	41.64	0.43	7.54%
Sulfate	(SO_4)	< 0.8	0	0	0	0%
Total Anions					5.7	
Total Salt Concentration	(TDS)	337.28	76.5	918		
Boron	(B)	0.12	0.03	0.36		
Cation/Anion Ratio		1.14				

Good Quality Irrigation Water

pH	7.97					
Conductivity (dS/m)	0.12					
Sodium Adsorption Ratio (SAR)	0.87					
Adjusted SAR	0.64					
Hardness (ppm)	37.1					
pHc	8.66					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	10.72	2.43	29.16	0.53	39.26%
Magnesium	(Mg)	2.38	0.54	6.48	0.2	14.81%
Potassium	(K)	3.52	0.8	9.6	0.09	6.67%
Sodium	(Na)	12.1	2.74	32.88	0.53	39.26%
Iron	(Fe)	< 0.3	0	0		
Total Cations					1.35	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	56.5	12.81	153.72		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	68.94	15.64	187.68	1.13	88.28%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	< 2	0	0	0	0%
Sulfate	(SO_4)	6.98	1.58	18.96	0.15	11.72%
Total Anions					1.28	
Total Salt Concentration	(TDS)	76.8	17.42	209.04		
Boron	(B)	< 0.05	0	0		
Cation/Anion Ratio		1.05				

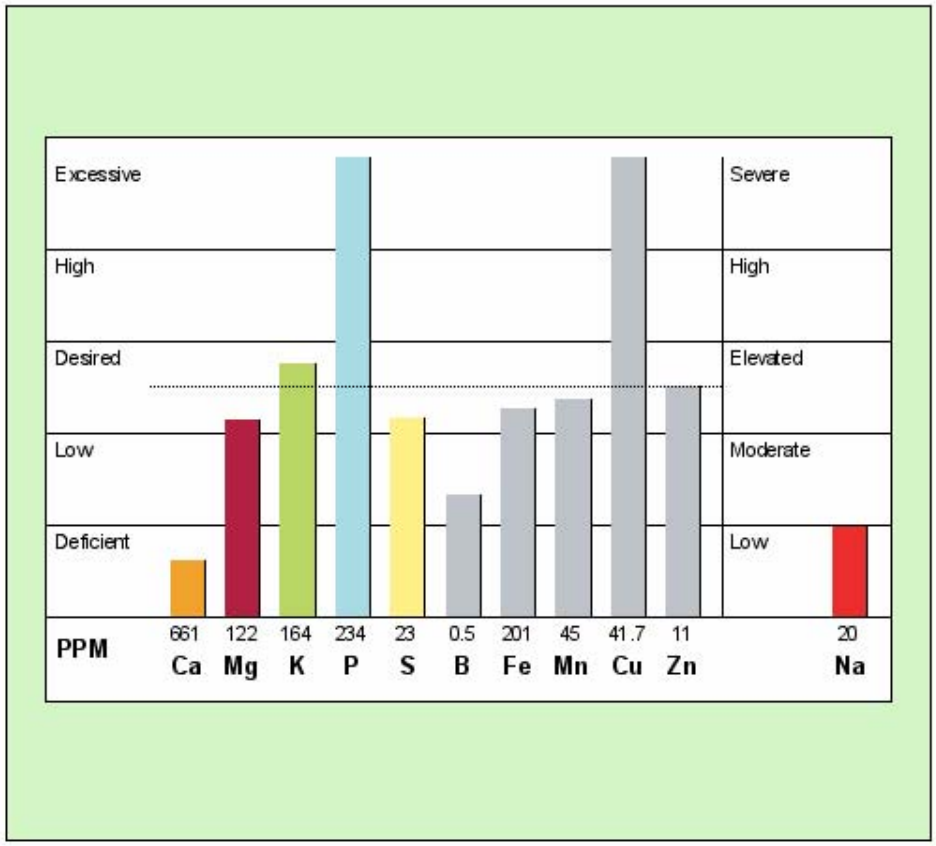
End of Part I

Dissolving Water / Soil Interaction

SUMMARY: Heater blk

pH	7.22					
Conductivity (dS/m)	0.06					
Sodium Adsorption Ratio (SAR)	0.39					
Adjusted SAR	0.08					
Hardness (ppm)	21.99					
pHc	9.19					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	5.64	1.28	15.36	0.28	43.75%
Magnesium	(Mg)	1.79	0.4	4.8	0.15	23.44%
Potassium	(K)	1.08	0.24	2.88	0.03	4.69%
Sodium	(Na)	4.11	0.93	11.16	0.18	28.13%
Iron	(Fe)	< 0.3	0	0		
Total Cations					0.64	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	29.68	6.73	80.76		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	36.22	8.21	98.52	0.59	89.39%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	< 2	0	0	0	0%
Sulfate	(SO_4)	3.33	0.75	9	0.07	10.61%
Total Anions					0.66	
Total Salt Concentration	(TDS)	37.12	8.42	101.04		
Boron	(B)	< 0.05	0	0		
Cation/Anion Ratio		0.96				

OVERALL NUTRIENT STATUS: Heater

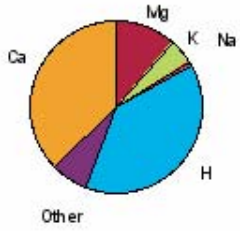


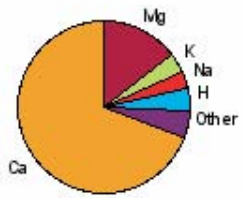
Organic Matter	2%
Estimated Nitrogen Release (from humus)	29.5 PPM
pH (H_2O 1:1)	5.2
Total Exchange Capacity (M.E./100g)	8.94
Available Nitrogen	
NH_3	3.1 PPM
NO_3	2 PPM
Phosphate	
Bray II	167 PPM

	Actual	Desired
B	0.5	0.8-1.2 PPM
Fe	201	100-200 PPM
Mn	45	25-80 PPM
Cu	41.7	0.5-3 PPM
Zn	11	5-17 PPM
Al	1159	

BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual	Actual Saturation	Desired Saturation	Desired	
Ca	**36.97%**			68-72%	**Ca**
Mg	**11.37%**			13-16%	**Mg**
K	**4.70%**			3-5%	**K**
Na	**0.97%**			<3%	**Na**
H	**39.00%**			4.50%	**H**
Other	**7.00%**			5%	**Other**



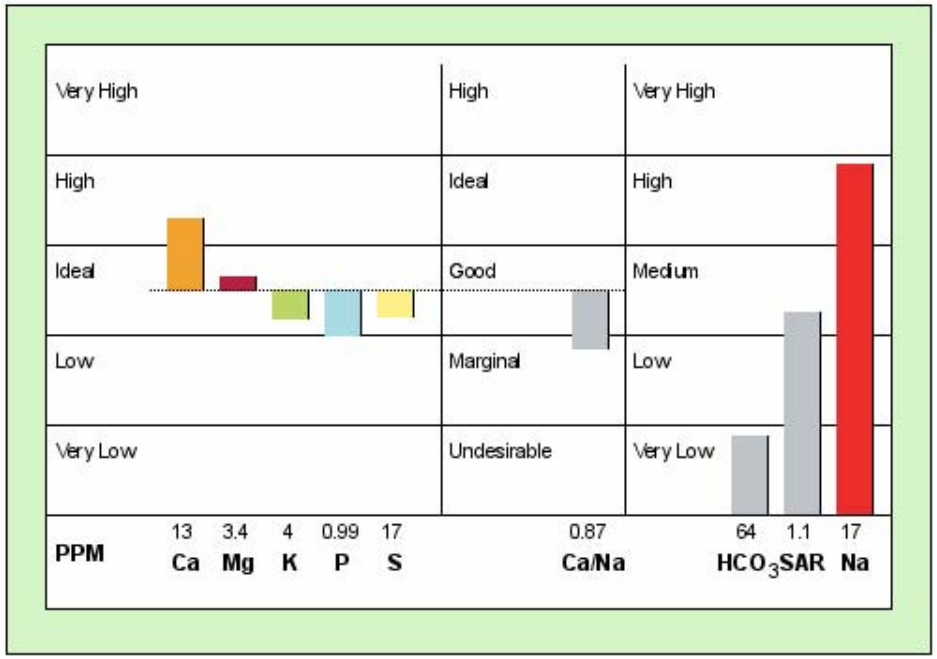


SATURATED SOIL ANALYSIS

Client:

Date of Analysis: March 15, 2005

SATURATED SOIL ANALYSIS: Heater



pH
5.3

Soluble Salts
96 PPM

Cation Saturation Percent

Ca 36.30%
Mg 15.98%
K 5.87%
Na 41.85%

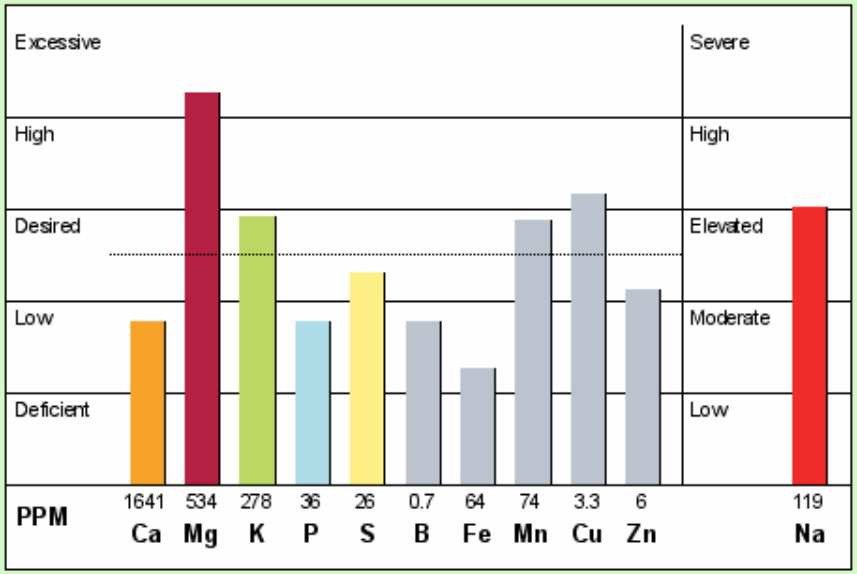
Ammonium (NH_3)
0.3 ppm
Nitrate (NO_3)
2.2 ppm

TRACE ELEMENTS

Boron	Iron	Copper	Manganese	Zinc	Chloride
0.21 PPM	2.37 PPM	0.06 PPM	0.12 PPM	0.04 PPM	6 PPM

Depositing Water / Soil Interaction

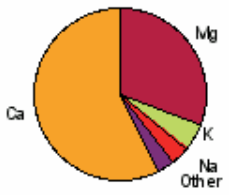
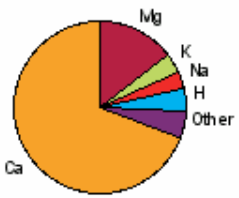
pH	8.04					
Conductivity (dS/m)	0.57					
Sodium Adsorption Ratio (SAR)	1.06					
Adjusted SAR	2.11					
Hardness (ppm)	210.13					
pHc	7.4					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	54.07	12.26	147.12	2.7	45.84%
Magnesium	(Mg)	18.12	4.11	49.32	1.49	25.3%
Potassium	(K)	6.74	1.53	18.36	0.17	2.89%
Sodium	(Na)	35.15	7.97	95.64	1.53	25.98%
Iron	(Fe)	< 0.3	0	0		
Total Cations					5.89	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	251.72	57.09	685.08		
Carbonate	(CO_3)	18.8	4.26	51.12	0.63	10.24%
Bicarbonate	(HCO_3)	268.93	60.99	731.88	4.41	71.71%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	10.72	2.43	29.16	0.3	4.88%
Sulfate	(SO_4)	38.82	8.8	105.6	0.81	13.17%
Total Anions					6.15	
Total Salt Concentration	(TDS)	366.08	83.03	996.36		
Boron	(B)	< 0.05	0	0		
Cation/Anion Ratio		0.96				



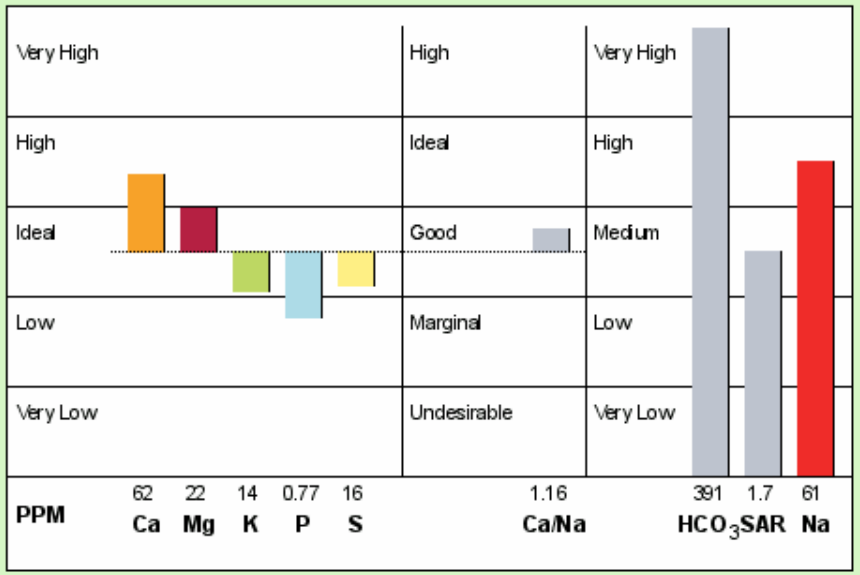
Organic Matter	1.8%
Estimated Nitrogen Release (from humus)	27.5 PPM
pH (H_2O 1:1)	8
Total Exchange Capacity (M.E./100g)	14.37
Available Nitrogen	
NH_3	2.7 PPM
NO_3	2.6 PPM
Phosphate	
Bray II	88 PPM

	Actual	Desired
B	0.7	0.8-1.2 PPM
Fe	64	100-200 PPM
Mn	74	25-80 PPM
Cu	3.3	0.5-3 PPM
Zn	6	5-17 PPM
Al	479	

BASE SATURATION PERCENTAGES: KEY ELEMENTS

	Actual	Actual Saturation	Desired Saturation	Desired	
Ca	57.10%			68-72%	Ca
Mg	30.97%			13-16%	Mg
K	4.96%			3-5%	K
Na	3.60%			<3%	Na
H	0.00%			4.50%	H
Other	3.40%			5%	Other

SATURATED SOIL ANALYSIS:



pH
7.9

Soluble Salts
454 PPM

Cation Saturation Percent

Ca 39.11%
Mg 22.60%
K 4.53%
Na 33.76%

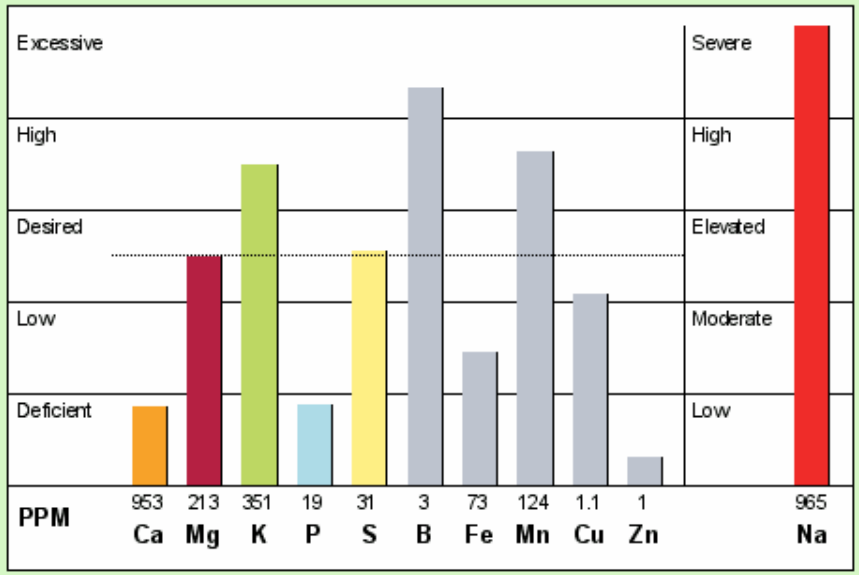
Ammonium (NH_3)
0.2 ppm
Nitrate (NO_3)
4.7 ppm

TRACE ELEMENTS

Boron	Iron	Copper	Manganese	Zinc	Chloride
0.17 PPM	0.41 PPM	0.02 PPM	0.02 PPM	< 0.01 PPM	17 PPM

High Sodium Water / Soil Interaction

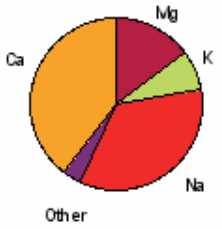
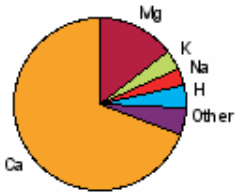
pH	8.04					
Conductivity (dS/m)	0.68					
Sodium Adsorption Ratio (SAR)	15.1					
Adjusted SAR	11.87					
Hardness (ppm)	19.22					
pHc	8.61					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	6.28	1.42	17.04	0.31	4.41%
Magnesium	(Mg)	0.73	0.17	2.04	0.06	0.85%
Potassium	(K)	5.3	1.2	14.4	0.14	1.99%
Sodium	(Na)	150.06	34.03	408.36	6.52	92.75%
Iron	(Fe)	< 0.3	0	0		
Total Cations					7.03	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	135.09	30.64	367.68		
Carbonate	(CO_3)	6.84	1.55	18.6	0.23	3.66%
Bicarbonate	(HCO_3)	150.93	34.23	410.76	2.47	39.27%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	36.08	8.18	98.16	1.02	16.22%
Sulfate	(SO_4)	123.41	27.99	335.88	2.57	40.86%
Total Anions					6.29	
Total Salt Concentration	(TDS)	437.76	99.28	1191.36		
Boron	(B)	3.09	0.7	8.4		
Cation/Anion Ratio		1.12				



Organic Matter	1.5%
Estimated Nitrogen Release (from humus)	25 PPM
pH (H_2O 1:1)	7.8
Total Exchange Capacity (M.E./100g)	12.07
Available Nitrogen	
NH_3	12.5 PPM
NO_3	68.7 PPM
Phosphate	
Bray II	124 PPM

	Actual	Desired
B	3	0.8-1.2 PPM
Fe	73	100-200 PPM
Mn	124	25-80 PPM
Cu	1.1	0.5-3 PPM
Zn	1	5-17 PPM
Al	328	

BASE SATURATION PERCENTAGES: KEY ELEMENTS

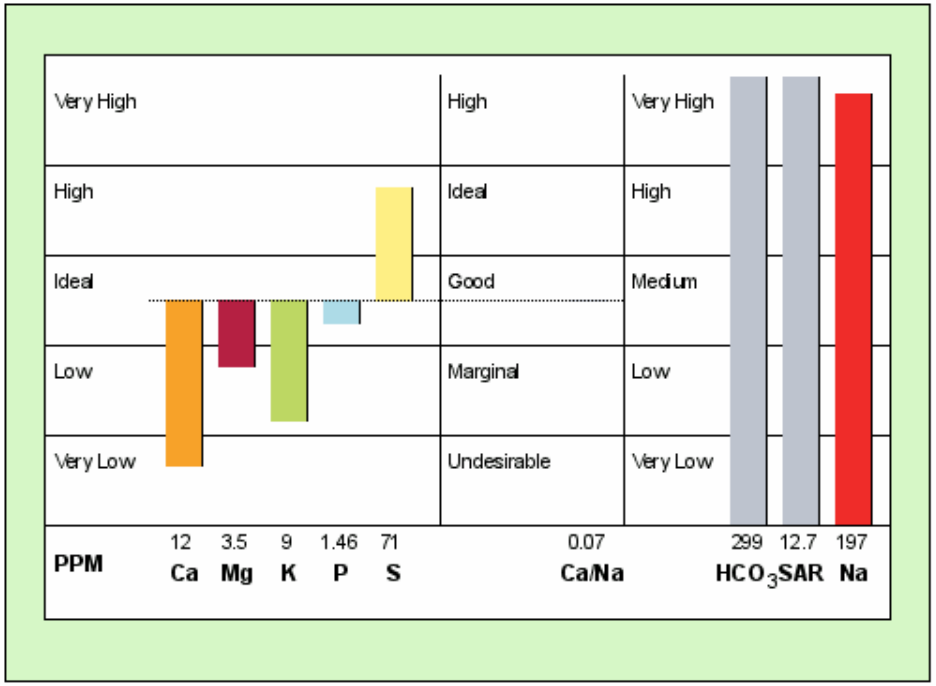
	Actual	Actual Saturation	Desired Saturation	Desired	
Ca	39.48%			68-72%	Ca
Mg	14.71%			13-16%	Mg
K	7.46%			3-5%	K
Na	34.76%			<3%	Na
H	0.00%			4.50%	H
Other	3.60%			5%	Other

SoilTech
NORTHWEST, INC.

SATURATED SOIL ANALYSIS

Client:
Request Submitted By:
Date of Analysis: April 14, 2004

SATURATED SOIL ANALYSIS: Paisley Pivot



pH
7.6

Soluble Salts
794 PPM

Cation Saturation Percent

Ca	6.39%
Mg	2.97%
K	2.28%
Na	88.36%

Ammonium (NH_3)
0.2 ppm
Nitrate (NO_3)
1.6 ppm

TRACE ELEMENTS

Boron	Iron	Copper	Manganese	Zinc	Chloride
5.12 PPM	2.23 PPM	0.07 PPM	0.07 PPM	0.05 PPM	78 PPM

Water Treatment

Before & After Example

SUMMARY BeforTrtmnt (Injection Rate Suggestions)

pH	8.47					
Conductivity (dS/m)	0.53					
Sodium Adsorption Ratio (SAR)	14.18					
Adjusted SAR	13.41					
Hardness (ppm)	16.83					
pHc	8.45					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	4.54	1.03	12.36	0.23	3.54%
Magnesium	(Mg)	1.17	0.26	3.12	0.1	1.54%
Potassium	(K)	18.29	4.15	49.8	0.47	7.24%
Sodium	(Na)	130.91	29.69	356.28	5.69	87.67%
Iron	(Fe)	0.38	0.09	1.08		
Total Cations					6.49	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	263.63	59.79	717.48		
Carbonate	(CO_3)	25.32	5.74	68.88	0.84	14.74%
Bicarbonate	(HCO_3)	270.21	61.28	735.36	4.43	77.72%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	15.32	3.47	41.64	0.43	7.54%
Sulfate	(SO_4)	< 0.8	0	0	0	0%
Total Anions					5.7	
Total Salt Concentration	(TDS)	337.28	76.5	918		
Boron	(B)	0.12	0.03	0.36		
Cation/Anion Ratio		1.14				

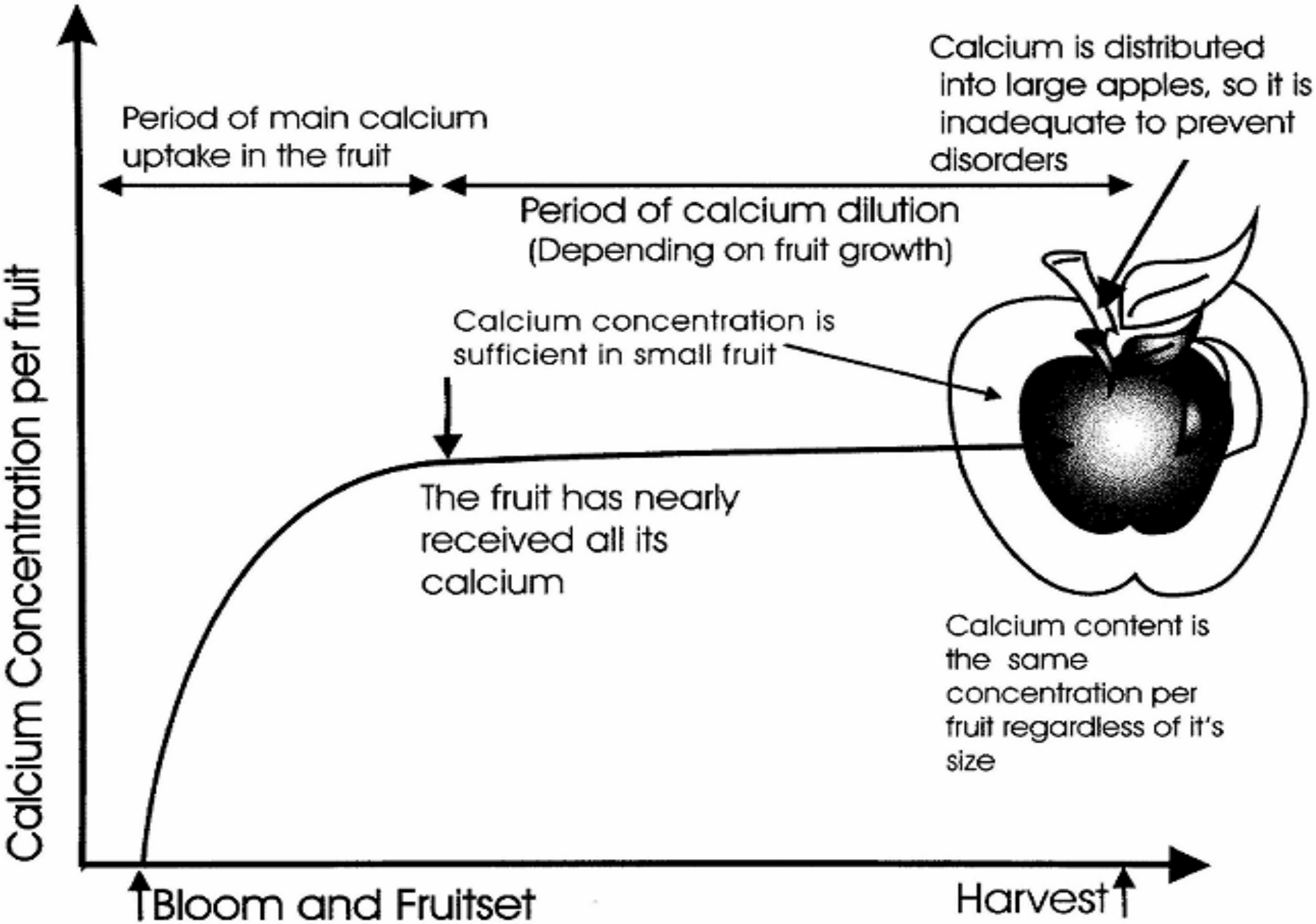
SUMMARY: AfterTrtmnt (Injection Rate Suggestions)

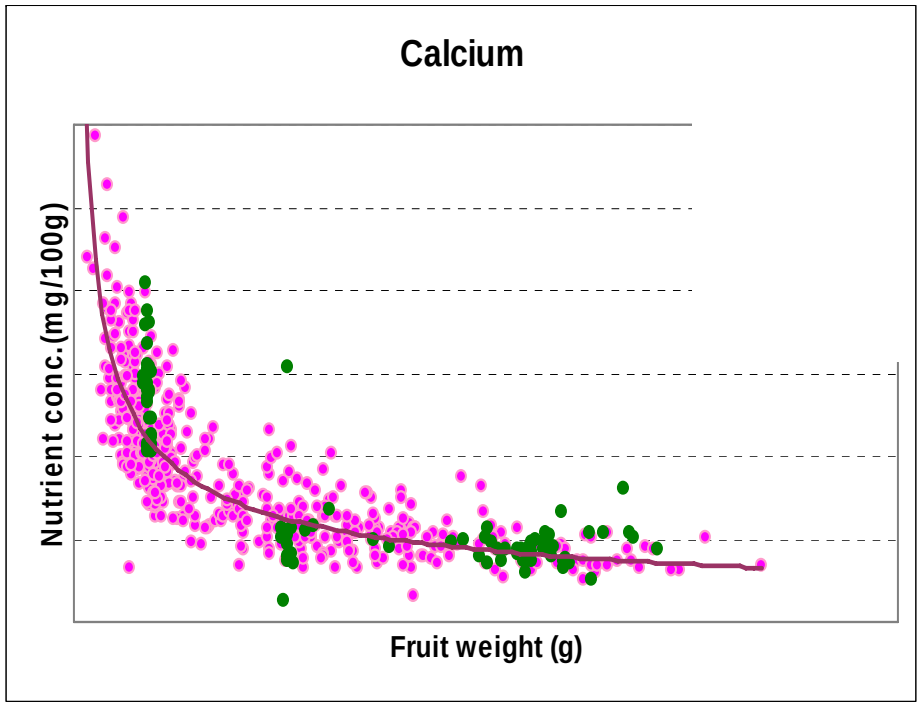
pH	6.11					
Conductivity (dS/m)	0.65					
Sodium Adsorption Ratio (SAR)	14.21					
Adjusted SAR	1.46					
Hardness (ppm)	13.28					
pHc	9.3					
		ppm	**lbs / acre inch**	**lbs / acre foot**	**meq/l**	**% of Total Cations**
Calcium	(Ca)	3.64	0.83	9.96	0.18	3.15%
Magnesium	(Mg)	0.84	0.19	2.28	0.07	1.23%
Potassium	(K)	16.72	3.79	45.48	0.43	7.53%
Sodium	(Na)	115.66	26.23	314.76	5.03	88.09%
Iron	(Fe)	0.41	0.09	1.08		
Total Cations					5.71	**% of Total Anions**
Total Alkalinity	(as $CaCO_3$)	46.06	10.45	125.4		
Carbonate	(CO_3)	0	0	0	0	0%
Bicarbonate	(HCO_3)	56.21	12.75	153	0.92	15.46%
Hydroxide	(OH)	0	0	0		
Chloride	(Cl)	12.25	2.78	33.36	0.35	5.88%
Sulfate	(SO_4)	224.84	50.99	611.88	4.68	78.66%
Total Anions					5.95	
Total Salt Concentration	(TDS)	418.56	94.93	1139.16		
Boron	(B)	0.11	0.02	0.24		
Cation/Anion Ratio		0.96				

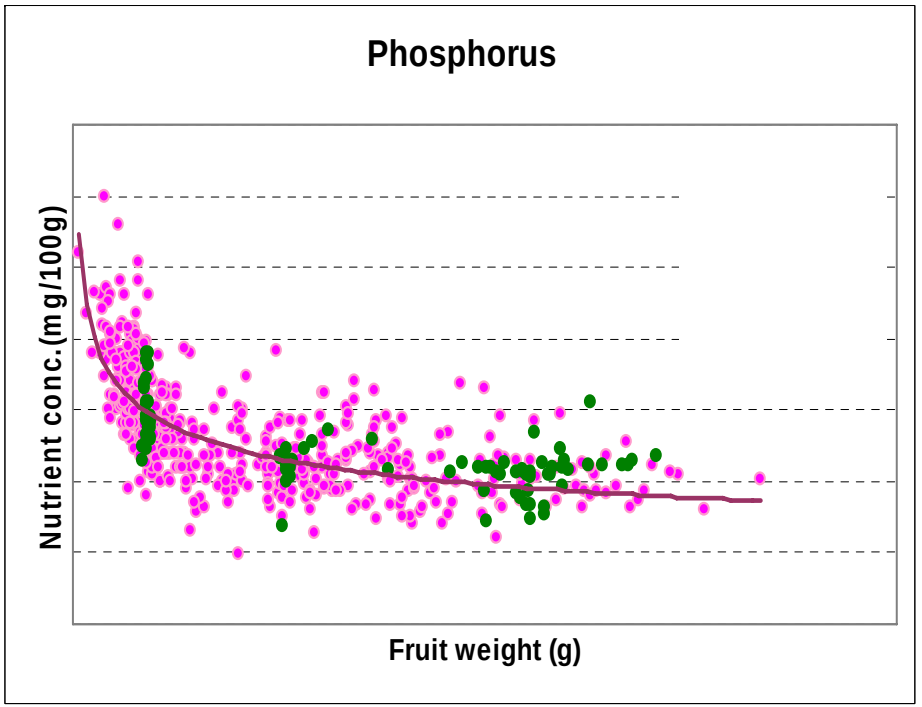
Fruit Analysis

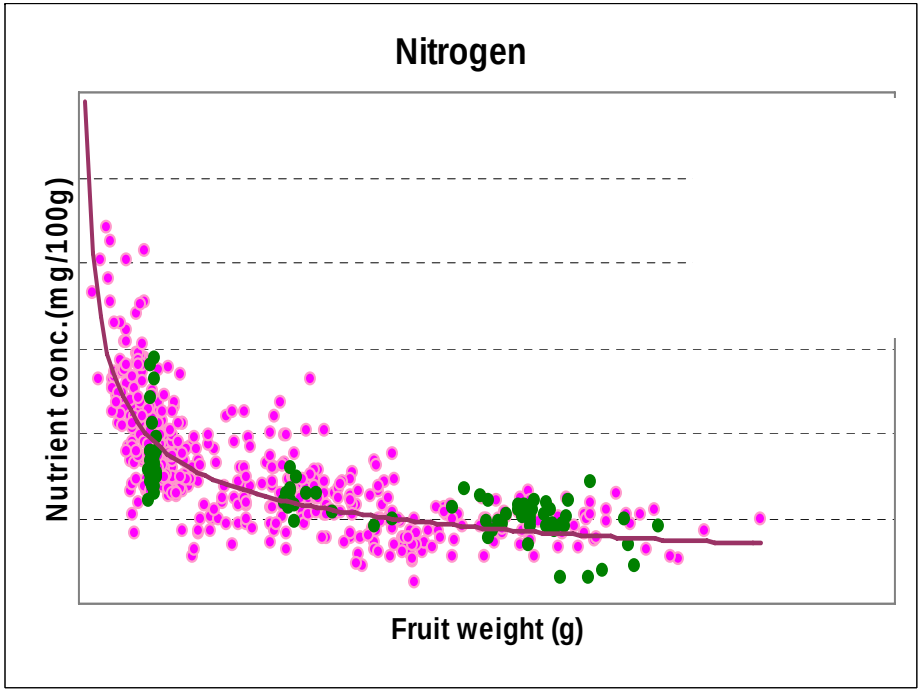


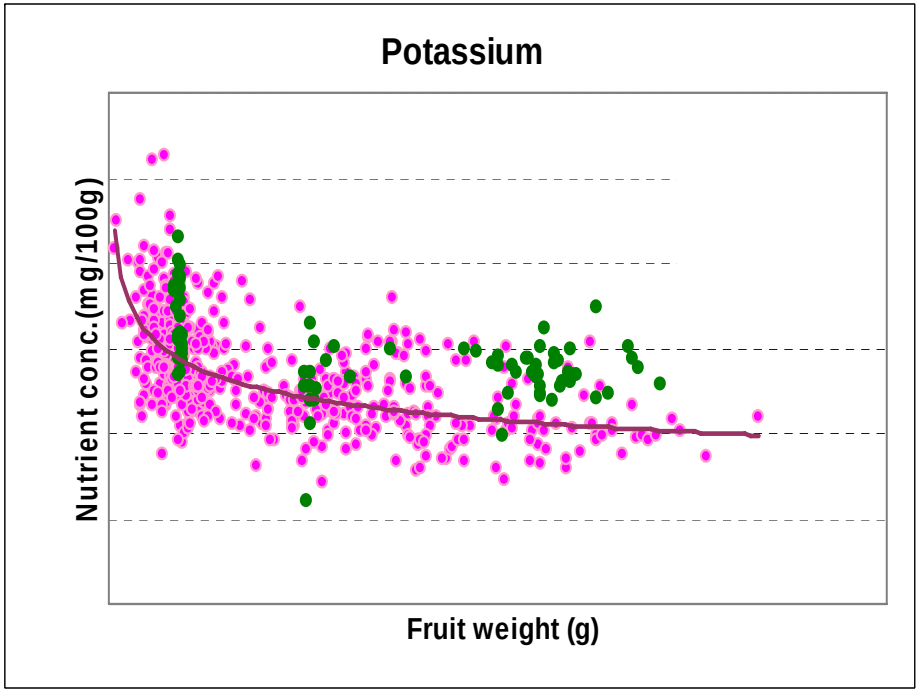
Using Fruit Mineral Analysis to Identify Trends in Fruit Quality


Calcium is distributed into large apples, so it is inadequate to prevent disorders
Period of main calcium uptake in the fruit
Period of calcium dilution
(Depending on fruit growth)
Calcium concentration is sufficient in small fruit
The fruit has nearly received all its calcium
Calcium content is the same concentration per fruit regardless of it's size
Calcium Concentration per fruit
Bloom and Fruitset
Harvest


Calcium
Nutrient conc.(mg/100g)
Fruit weight (g)


Phosphorus
Nutrient conc.(mg/100g)
Fruit weight (g)


Nitrogen
Nutrient conc.(mg/100g)
Fruit weight (g)


Potassium
Nutrient conc.(mg/100g)
Fruit weight (g)

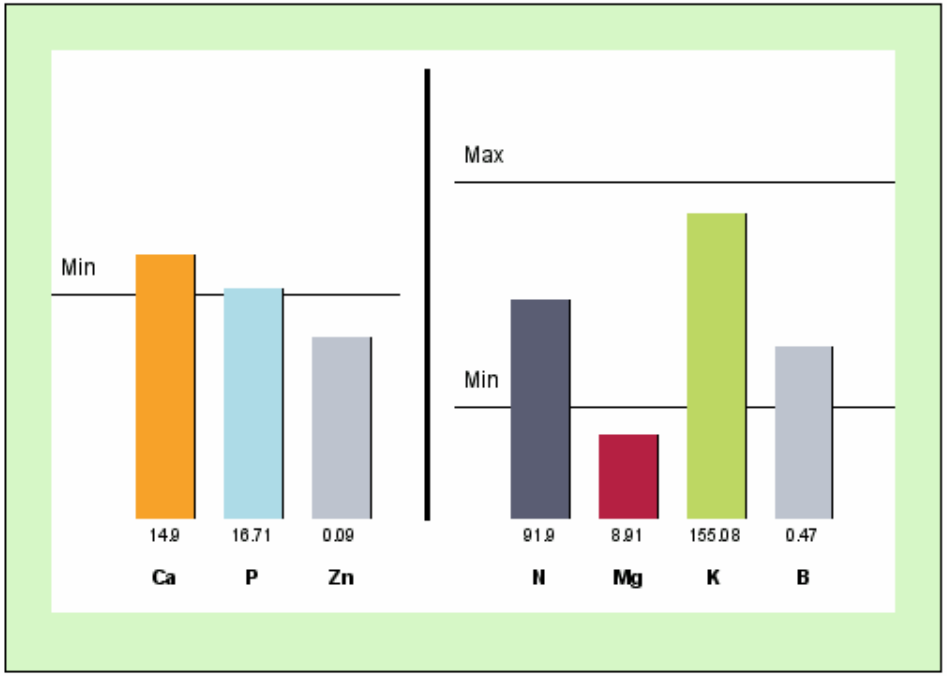
Early Season Fruit Analysis (ESFRU)

- Samples should be taken when fruit reaches 30-50 Grams (2-3 ounces) or about golf ball size. Sampling should be done at end of cell division process (roughly 30 days after petal fall) for accurate analysis!
- 20 to 25 fruit-lets should make up the sample
- Fruitletts should be roughly the same size taken at eye level in the orchard.
- Samples should be randomly selected by alternatively each tree by picking north side first sample, second tree south side, third tree east side and fourth tree west side. Continue the process over again until you have enough fruit for sample.
- Sampling area should be uniform, sample poor growing areas separately from good growing areas.
- Package sample,include worksheet and send to Lab.

Early Season Fruit Analysis

EARLY APPLE NUTRIENT STATUS:

	mg / 100g
Nitrogen	91.9
Phosphorus	16.71
Calcium	14.9
Magnesium	8.91
Potassium	155.08
Boron	0.47
Manganese	< 0.1
Copper	0.1
Zinc	0.09
Iron	0.14
Molybdenum	< 0.02



Weight & Moisture

Average Weight	36.23 g
Moisture	86.81 %

Nutrient Ratios

Mg + K / Ca	11
N / Ca	6.17



Fruit @ Harvest Analysis

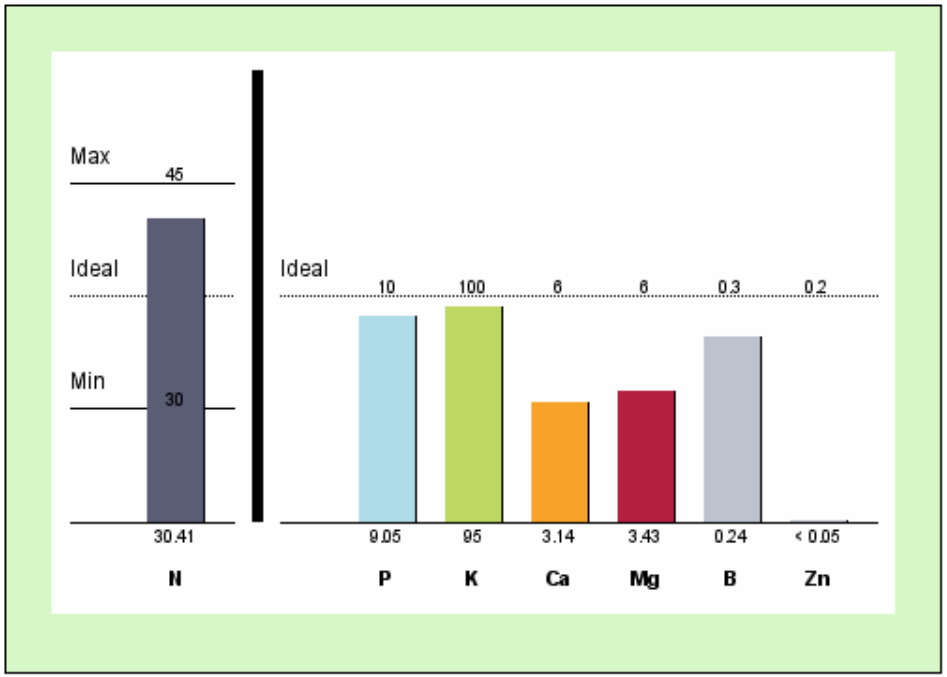
- Samples should be taken 1-2 weeks prior to harvest. If the fruit is not sampled at harvest, fruit can also be accurately tested as it is brought out of long term storage.
- 8-18 fruit should make up the sample
- Fruit should be roughly the same size.
- If possible, samples should be associated with as specific an area as possible so that the analysis can be associated with other analysis performed on (in) the same area.
- Sampling area should be uniform, sample poor fruit separately from good fruit (etc.).
- Package sample include worksheet and send to Lab

Target fruit mineral composition at harvest (mg/100g fresh fruit)

- Calcium.....above 5
- K + Mg / Ca.....below 30 (Most varieties)
- Potassium.....<150 (see above), >130 (for taste quality)
- Magnesium.....below 5
- N / Ca.....below 14
- Nitrogen.....<70(see above), >50 (for taste quality)
- Phosphorus.....above 10 (but varies with variety)
- Boron.....0.2 to 0.6
- Zinc……0.05

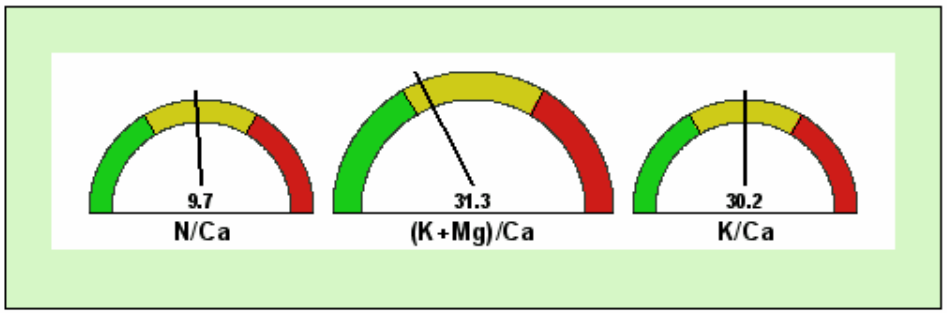
Fruit @ Harvest Analysis

	mg / 100g
Nitrogen	30.41
Phosphorus	9.05
Calcium	3.14
Magnesium	3.43
Potassium	95
Boron	0.24
Manganese	< 0.1
Copper	< 0.05
Zinc	< 0.05
Iron	< 0.1
Molybdenum	< 0.02



Weight & Moisture

Average Weight	240.34 g
Moisture	84.99 %



Nutrient Ratios

Mg + K / Ca	31.31
N / Ca	9.68

2005

An Interesting Early Fruit Analysis Year

Early Fruit – General ’04 vs ’05 30 – 50 gms.

Calcium Down 24.95%

Phosphorus Down 3.73%

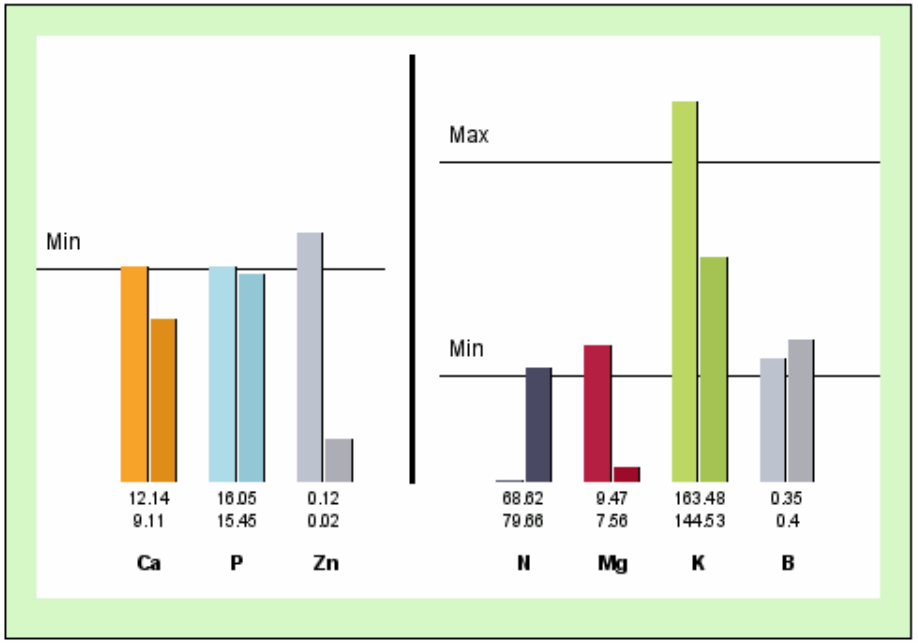
Zinc Down 83.3%

Nitrogen Up 13.85%

Magnesium Down 20.1%

Potassium Down 11.6%

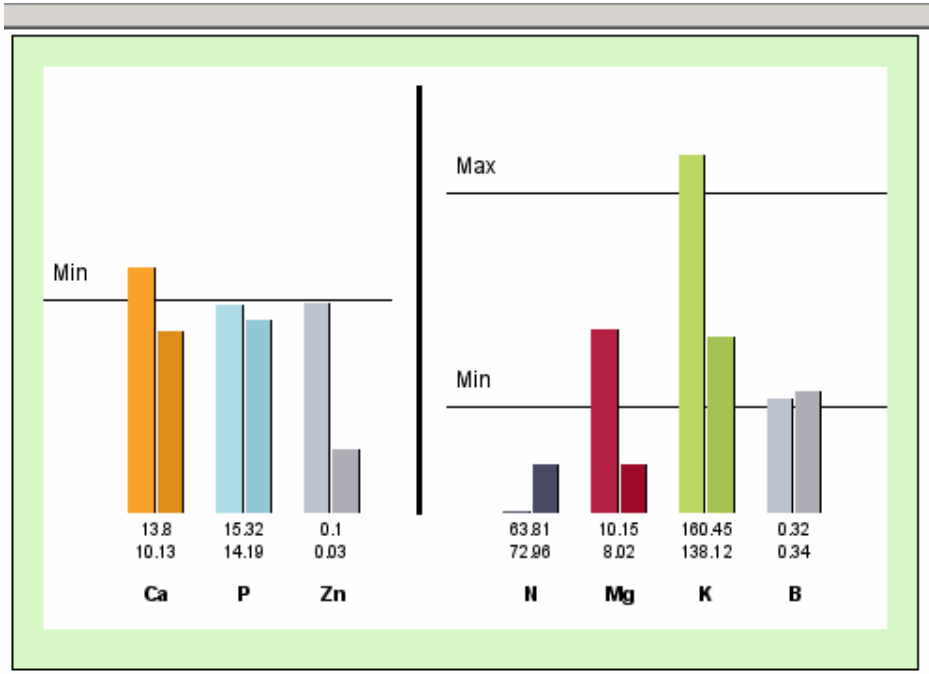
Boron Up 12.5 %



		Early 2004 Apple - General 07/13/05	Early 2005 Apple - General 07/13/05	
Nitrogen	(N)	68.62	79.66	mg/100g
Phosphorus	(P)	16.05	15.45	mg/100g
Calcium	(Ca)	12.14	9.11	mg/100g
Magnesium	(Mg)	9.47	7.56	mg/100g
Potassium	(K)	163.48	144.53	mg/100g
Boron	(B)	0.35	0.4	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.12	0.02	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		39.78	40.11	g
Moisture		86.38%	85.88%	
Mg + K / Ca		14.25	16.69	
N / Ca		5.65	8.74	

Early Fruit – Gala ’04 vs. ’05 30 – 50 gms.

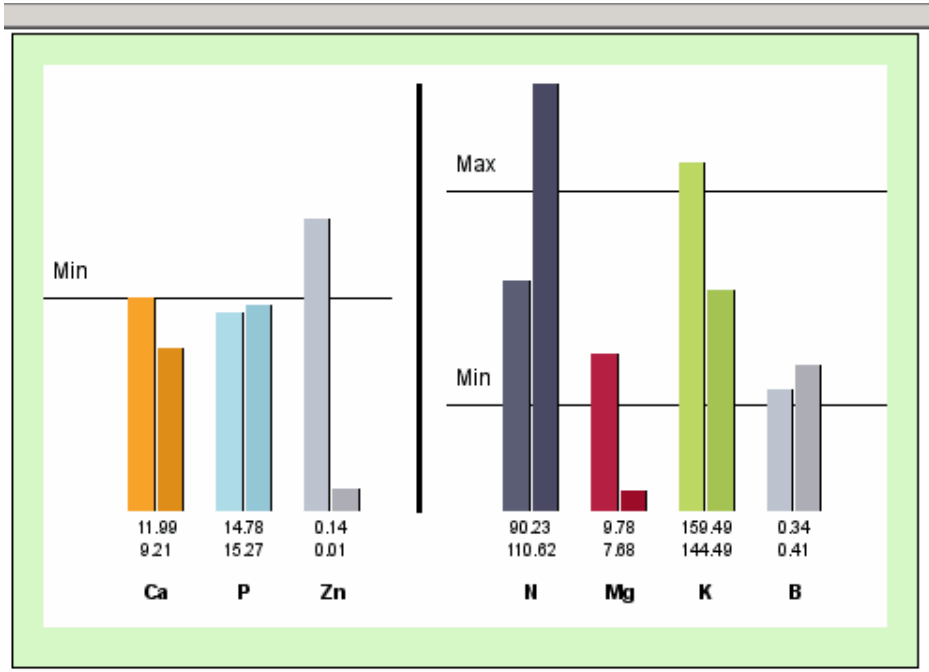
Calcium Down	26.6 %
Phosphorus Down	7.4%
Zinc Down	70.0%
Magnesium Down	21.0%
Potassium Down	13.9%
Nitrogen Up	12.5%
Boron Up	5.8%



		04 ESFRU Gala Gala 07/13/05	05 ESFRU Gala Gala 07/14/05	
Nitrogen	(N)	63.81	72.96	mg/100g
Phosphorus	(P)	15.32	14.19	mg/100g
Calcium	(Ca)	13.8	10.13	mg/100g
Magnesium	(Mg)	10.15	8.02	mg/100g
Potassium	(K)	160.45	138.12	mg/100g
Boron	(B)	0.32	0.34	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.1	0.03	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		40.37	40.97	g
Moisture		85.27%	85.35%	
Mg + K / Ca		12.36	14.43	
N / Ca		4.62	7.2	

Early Fruit -Granny Smith ’04 vs.’05 30–50 gms.

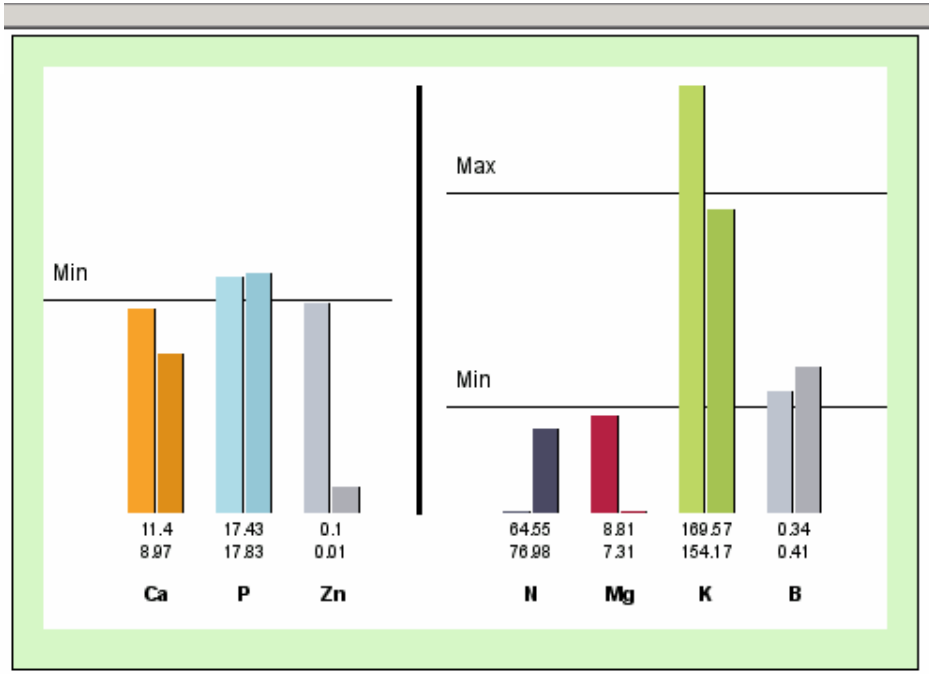
Calcium Down	23.2%
Phosphorus Up	3.2%
Zinc Down	92.8%
Nitrogen Up	18.4%
Magnesium Down	21.4%
Potassium Down	9.4%
Boron Up	17.0%



		04 ESFRU Granny Granny Smith 07/13/05	05 ESFRU Granny Granny Smith 07/14/05	
Nitrogen	(N)	90.23	110.62	mg/100g
Phosphorus	(P)	14.78	15.27	mg/100g
Calcium	(Ca)	11.99	9.21	mg/100g
Magnesium	(Mg)	9.78	7.68	mg/100g
Potassium	(K)	159.49	144.49	mg/100g
Boron	(B)	0.34	0.41	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.14	0.01	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		40.04	39.6	g
Moisture		87.62%	86.92%	
Mg+K/Ca		14.12	16.52	
N/Ca		7.53	12.01	

Early Fruit – Fuji ’04 vs. ’05 30 – 50 gms.

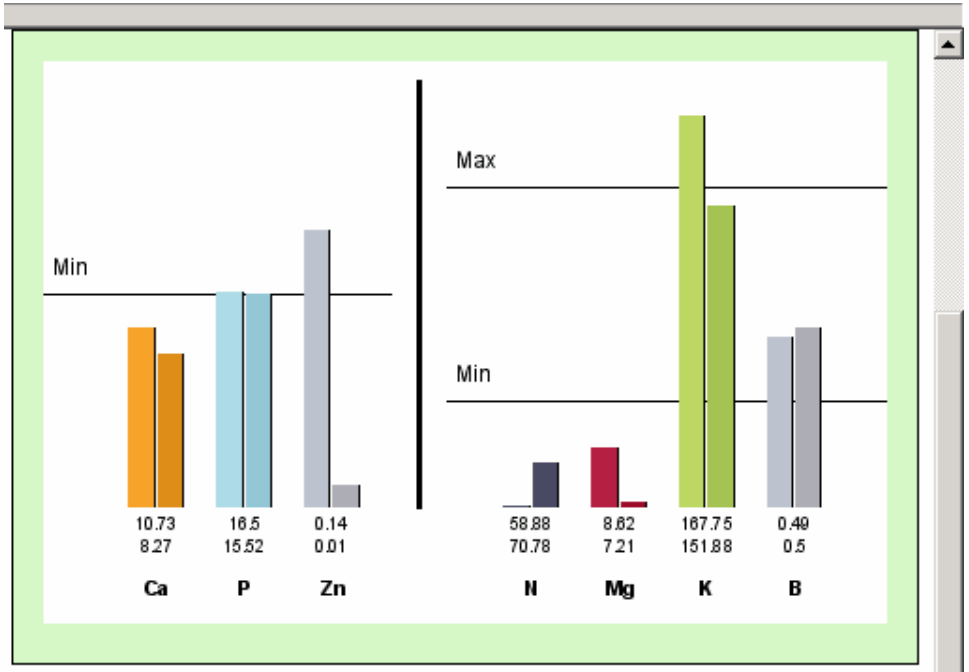
Calcium Down	21.3%
Phosphorus Up	2.2%
Zinc Down	90.0%
Nitrogen Up	16.1%
Magnesium Down	17.0%
Potassium Down	9.0%
Boron Up	17.0%



		04 ESFRU Fuji Fuji 07/13/05	05 ESFRU Fuji Fuji 07/14/05	
Nitrogen	(N)	64.55	76.98	mg/100g
Phosphorus	(P)	17.43	17.83	mg/100g
Calcium	(Ca)	11.4	8.97	mg/100g
Magnesium	(Mg)	8.81	7.31	mg/100g
Potassium	(K)	169.57	154.17	mg/100g
Boron	(B)	0.34	0.41	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.1	0.01	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		40.42	40.13	g
Moisture		86.38%	85.9%	
Mg + K / Ca		15.65	18	
N / Ca		5.66	8.58	

Early Fruit – Goldens ’04 vs. ’05 30 – 50 gms.

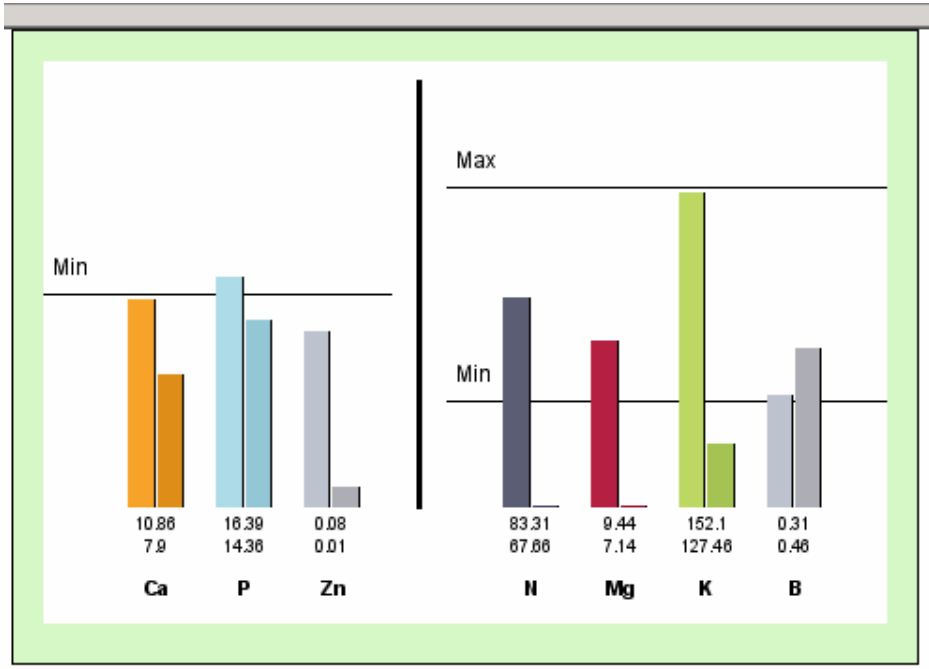
Calcium Down	22.9%
Phosphorus Down	5.9%
Zinc Down	92.9%
Nitrogen Up	16.8%
Magnesium Down	16.4%
Potassium Down	9.5%
Boron Up	2.0%



		04 ESFRU Golden Golden 07/13/05	05 ESFRU Golden Golden 07/14/05	
Nitrogen	(N)	58.88	70.78	mg/100g
Phosphorus	(P)	16.5	15.52	mg/100g
Calcium	(Ca)	10.73	8.27	mg/100g
Magnesium	(Mg)	8.62	7.21	mg/100g
Potassium	(K)	167.75	151.88	mg/100g
Boron	(B)	0.49	0.5	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.14	0.01	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		35.8	43.46	g
Moisture		87.03%	85.74%	
Mg + K / Ca		16.44	19.24	
N / Ca		5.49	8.56	

Early Fruit – Red Del. ’04 vs. ’05 30 – 50 gms.

Calcium Down	27.3%
Phosphorus Down	12.4%
Zinc Down	87.5%
Nitrogen Down	18.0%
Magnesium Down	24.4%
Potassium Down	16.2%
Boron Up	32.6%



		04 ESFRU RedDel. Red Del 07/13/05	05 ESFRU RedDel. Red Del 07/14/05	
Nitrogen	(N)	83.31	67.66	mg/100g
Phosphorus	(P)	16.39	14.36	mg/100g
Calcium	(Ca)	10.86	7.9	mg/100g
Magnesium	(Mg)	9.44	7.14	mg/100g
Potassium	(K)	152.1	127.46	mg/100g
Boron	(B)	0.31	0.46	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.08	0.01	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		45.93	35.54	g
Moisture		86.7%	81.09%	
Mg + K / Ca		14.87	17.04	
N / Ca		7.67	8.56	

Early Fruit – Braeburn ’04 vs. ’05 30 – 50 gms.

Calcium Down 19.4%

Phosphorus Down 10.5%

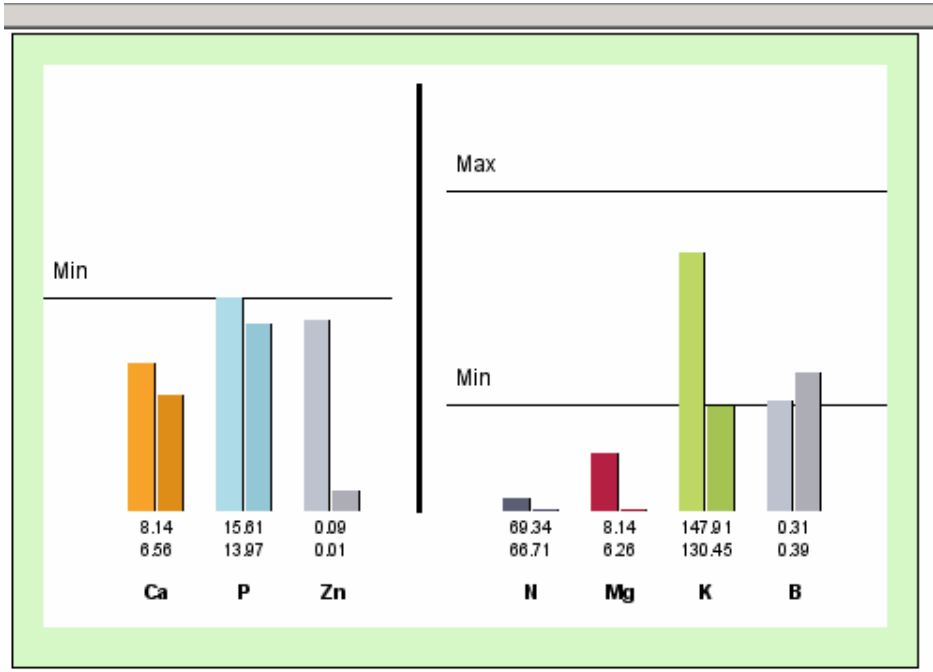
Zinc Down 88.9%

Nitrogen Down 3.8%

Magnesium Down 23.1%

Potassium Down 11.8%

Boron Up 20.5%



		04 ESFRU Braebrn Braeburn 07/13/05	05 ESFRU Braebrn Braeburn 07/14/05	
Nitrogen	(N)	69.34	66.71	mg/100g
Phosphorus	(P)	15.61	13.97	mg/100g
Calcium	(Ca)	8.14	6.56	mg/100g
Magnesium	(Mg)	8.14	6.26	mg/100g
Potassium	(K)	147.91	130.45	mg/100g
Boron	(B)	0.31	0.39	mg/100g
Manganese	(Mn)	0	0	mg/100g
Copper	(Cu)	0	0	mg/100g
Zinc	(Zn)	0.09	0.01	mg/100g
Iron	(Fe)	0	0	mg/100g
Molybdenum	(Mo)	0	0	mg/100g
Average Weight		41.54	39.34	g
Moisture		88.15%	86.24%	
Mg + K / Ca		19.17	20.84	
N / Ca		8.52	10.17	

Early Season Fruit Analysis

Overview and Comments on Analysis Results for 2005 season

This years Early Season Fruit Analysis results have been nothing short of "Heart Stopping" upon initial review. In the 8 years that I have followed these samples closely we have yet to see results similar to the results this season. The 2004 season was very similar to seasons past and because of this I have run comparative analysis between the '04 and '05 seasons to illustrate the trend that we are seeing this year('05).

The general trend this season (*with a few exceptions*) finds Calcium, Zinc, Magnesium, and Potassium levels considerably lower than previous years. Nitrogen and Boron are trending slightly higher overall. Phosphorus is overall unchanged. This pattern (again with few exceptions) is Industry Wide. We attribute the cooler, wetter weather pattern we experienced in April and May of this year, as contributing to poor nutrient uptake of the fruit during the critical cell division period.

Although the overall trends aren't desirable, there may be some hidden positives in the data. First, Magnesium and Potassium Levels are generally lower. The Mg+K/Ca ratio at harvest is a very important indicator of fruit quality. If Mg and K levels remain low and if Calcium levels can be preserved, there is a better chance of the Mg+K/Ca ratio coming back below 28 – 30:1 and the chance of better quality fruit at harvest. Second, many varieties have Nitrogen levels that are not excessive, and by not over applying nitrogen the N/Ca ratio (*another critical @ harvest indicator*) may remain at acceptable levels (below 14:1 @ harvest).

Review the following data. Compare it to what you are seeing with data you have collected.

Be sure to read the "Remember" and the "Suggestions" slide after you have looked at the data.

If you need help in any way please Give Kraig (509) 529-1860 a call.

NORTHWEST, INC.

Remember…

1. Calcium is demanded (nutrient sink) where cell division is taking place.

2. Foliar Calcium is applied to keep terminal growth (*where cell division is taking place*) from "robbing" Calcium from the fruit.

3. The "Risk of Deficiency at Harvest" is based on nothing being done (*no foliar Calcium program, etc.)* during the rest of the season. Critical Ratios at harvest can be affected in a positive way by reacting to the Early season fruit analysis with effective foliar products.

4. A balanced approach to soil fertility is critical. What is done (*or not done*) this fall with regard to soil fertility can have a significant impact on next years fruit. Take soil, water, and paste, and tissue samples starting August 1st so proper soil and water amendments can be adjusted with maximum effectiveness for next year's crop. Pull fruit @ harvest samples as soon as 2 weeks prior to harvest to evaluate the potential "Legs" of the fruit as well as an aid in determining soil and water amendment needs.

SOILTECH NORTHWEST, INC.

SUGGESTIONS

1. Continue with and be consistent in the applications of foliar Calcium for the remainder of this season. Everything one can do to keep calcium from being robbed out of the fruit is critical.

2. Be very cautious about additional applications of Nitrogen from this point forward. Although fruit may be large, additional nitrogen may negatively affect the N/Ca ratio in the fruit @ Harvest.

3. Be very cautious about additional applications of foliar potassium (K) from this point forward. Additional foliar potassium (K) may negatively affect the Mg+K/Ca ratio in the fruit @ Harvest.

Scott NORTHWEST, INC.

Highs & Lows

Examples from 2005

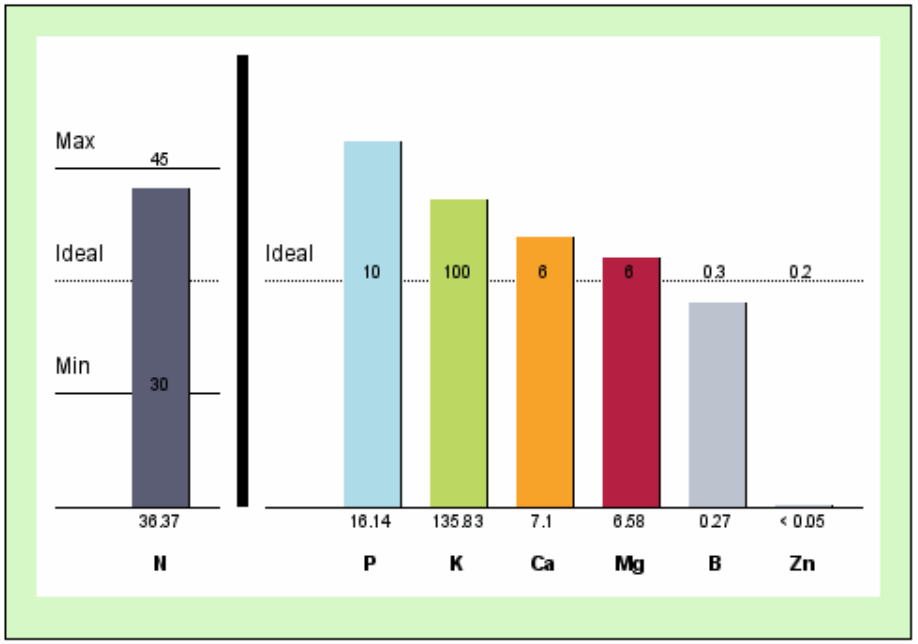
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client:
Request Submitted By:
Date of Analysis: September 28, 2005

NUTRIENT STATUS: (Fuji)

	mg / 100g
Nitrogen	36.37
Phosphorus	16.14
Calcium	7.1
Magnesium	6.58
Potassium	135.83
Boron	0.27
Manganese	< 0.1
Copper	0.38
Zinc	< 0.05
Iron	< 0.1
Molybdenum	< 0.02

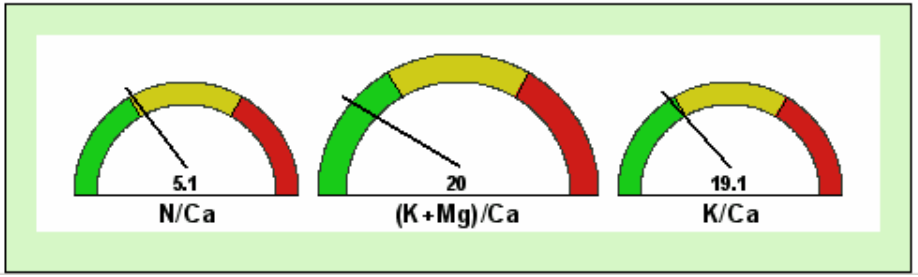


Weight & Moisture

Average Weight	222.82 g
Moisture	80.29 %

Nutrient Ratios

Mg + K / Ca	20.05
N / Ca	5.12





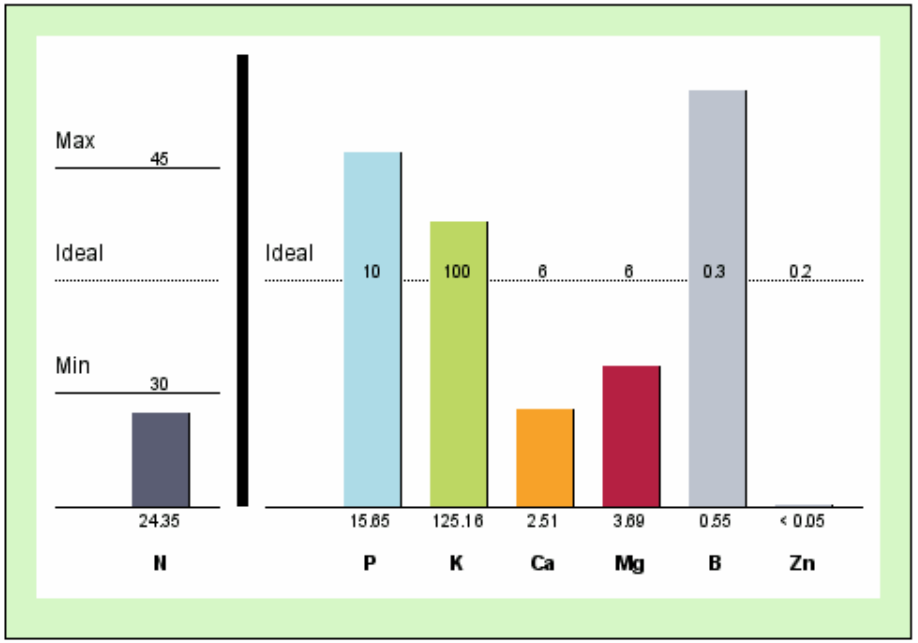
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client:
Request Submitted By:
Date of Analysis: September 23, 2005

NUTRIENT STATUS: **(Fuji)**

	mg / 100g
Nitrogen	24.35
Phosphorus	15.65
Calcium	2.51
Magnesium	3.69
Potassium	125.16
Boron	0.55
Manganese	< 0.1
Copper	< 0.05
Zinc	< 0.05
Iron	< 0.1
Molybdenum	< 0.02

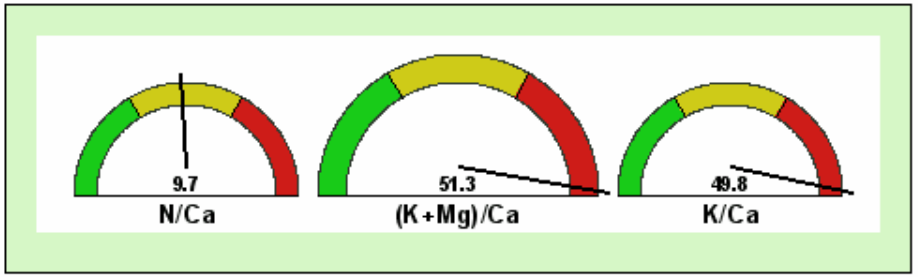


Weight & Moisture

Average Weight	249.13 g
Moisture	83.73 %

Nutrient Ratios

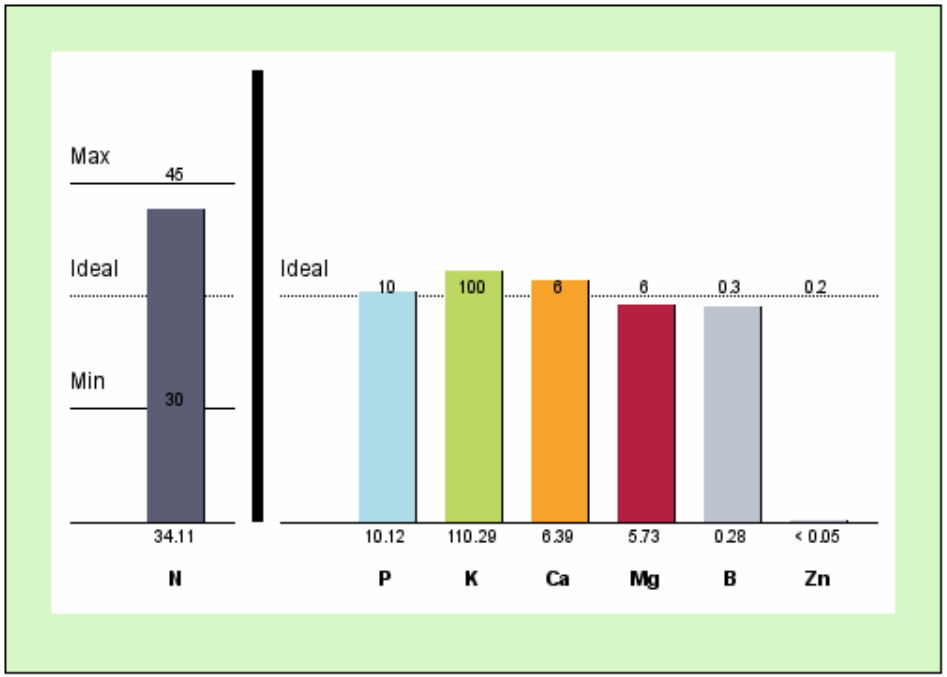
Mg + K / Ca	51.27
N / Ca	9.69





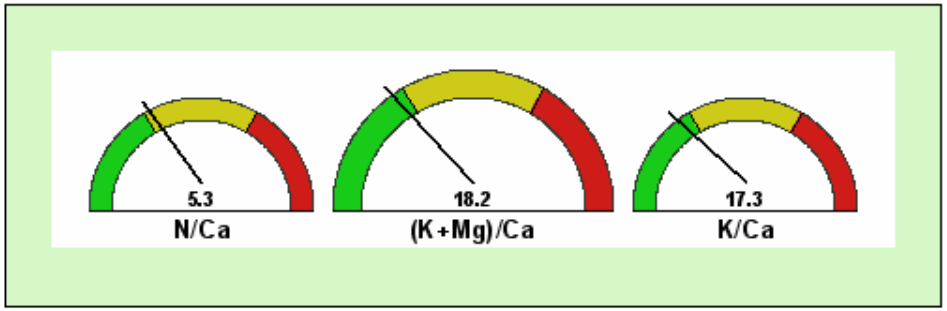
NUTRIENT STATUS: Main (Royal Gala)

	mg / 100g
Nitrogen	34.11
Phosphorus	10.12
Calcium	6.39
Magnesium	5.73
Potassium	110.29
Boron	0.28
Manganese	< 0.1
Copper	< 0.05
Zinc	< 0.05
Iron	< 0.1
Molybdenum	< 0.02



Weight & Moisture

Average Weight	180.12 g
Moisture	84.65 %



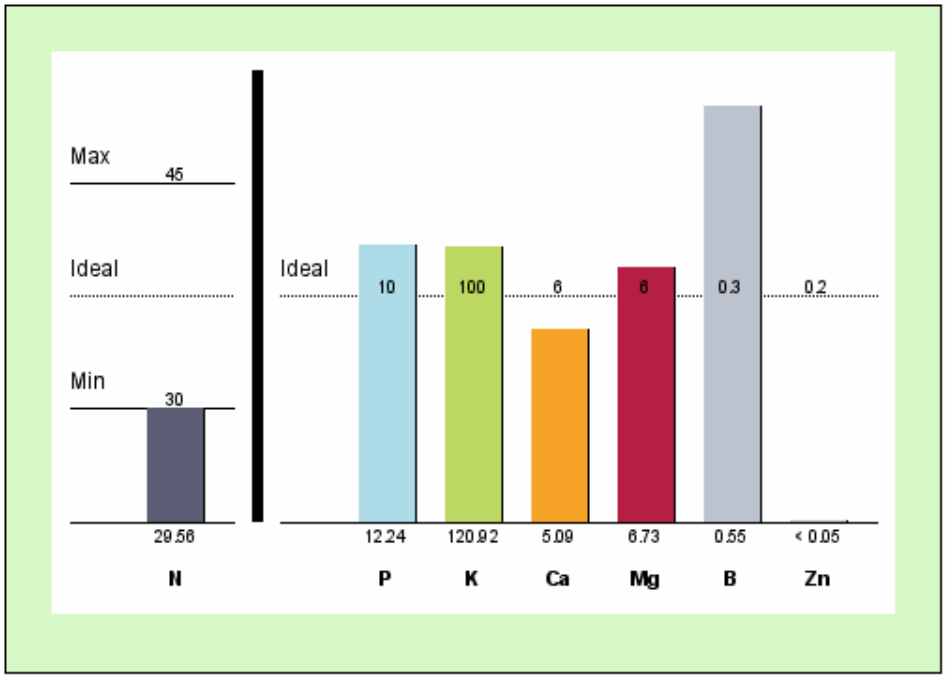
Nutrient Ratios

Mg + K / Ca	18.17
N / Ca	5.34



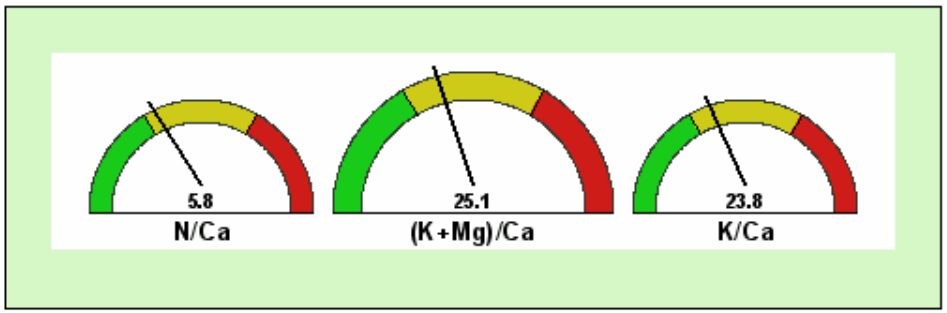
NUTRIENT STATUS: Organic (Royal Gala)

	mg / 100g
Nitrogen	29.56
Phosphorus	12.24
Calcium	5.09
Magnesium	6.73
Potassium	120.92
Boron	0.55
Manganese	< 0.1
Copper	< 0.05
Zinc	< 0.05
Iron	< 0.1
Molybdenum	< 0.02



Weight & Moisture

Average Weight	178.69 g
Moisture	85.01 %



Nutrient Ratios

Mg + K / Ca	25.09
N / Ca	5.81

2005
FRUIT @ HARVEST
AVERAGES

SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client:	SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By:	Klicker, Kraig
Date of Analysis:	January 13, 2006

NUTRIENT STATUS: **05 All@Hvst Avg. (Apple - General)**

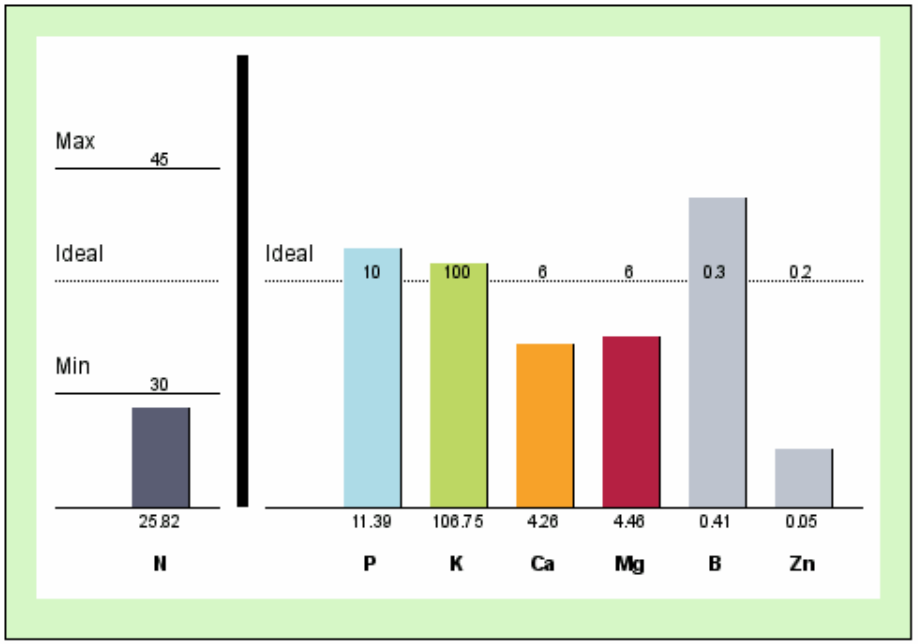
	mg / 100g
Nitrogen	25.82
Phosphorus	11.39
Calcium	4.26
Magnesium	4.46
Potassium	106.75
Boron	0.41
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

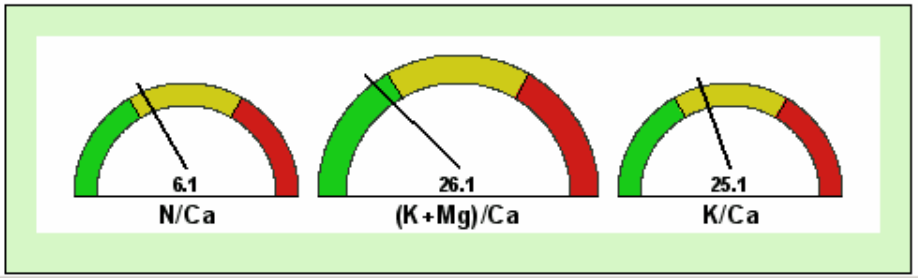
Weight & Moisture

Average Weight	234.67 g
Moisture	83.63 %

Nutrient Ratios

Mg + K / Ca	26.11
N / Ca	6.06





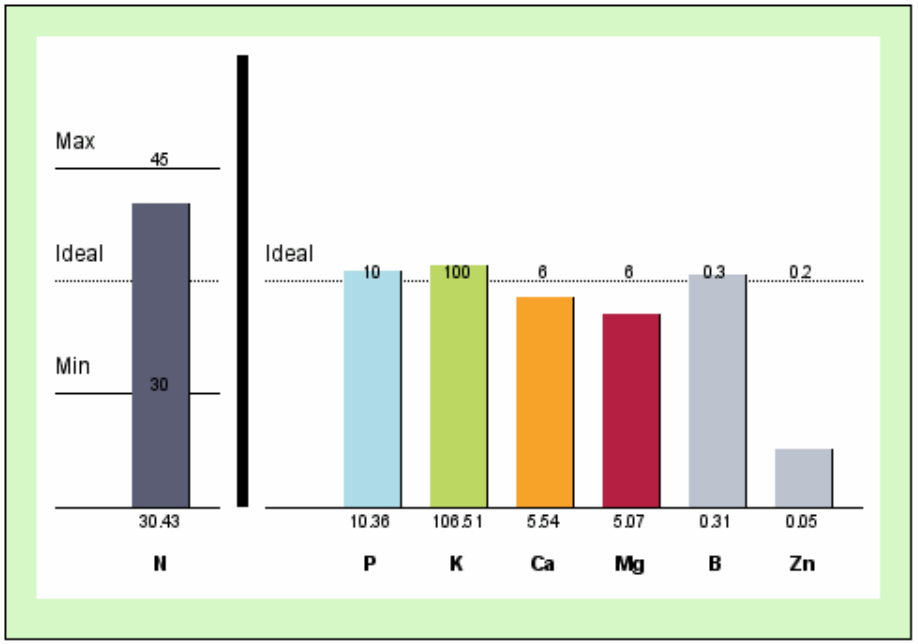
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client:	SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By:	Klicker, Kraig
Date of Analysis:	January 13, 2006

NUTRIENT STATUS: 05 Gala@Hvst Avg (Gala)

	mg / 100g
Nitrogen	30.43
Phosphorus	10.36
Calcium	5.54
Magnesium	5.07
Potassium	106.51
Boron	0.31
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

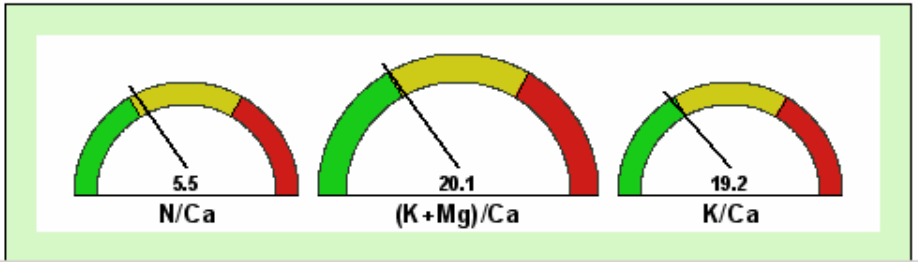


Weight & Moisture

Average Weight	214.52 g
Moisture	84.33 %

Nutrient Ratios

Mg + K / Ca	20.14
N / Ca	5.49



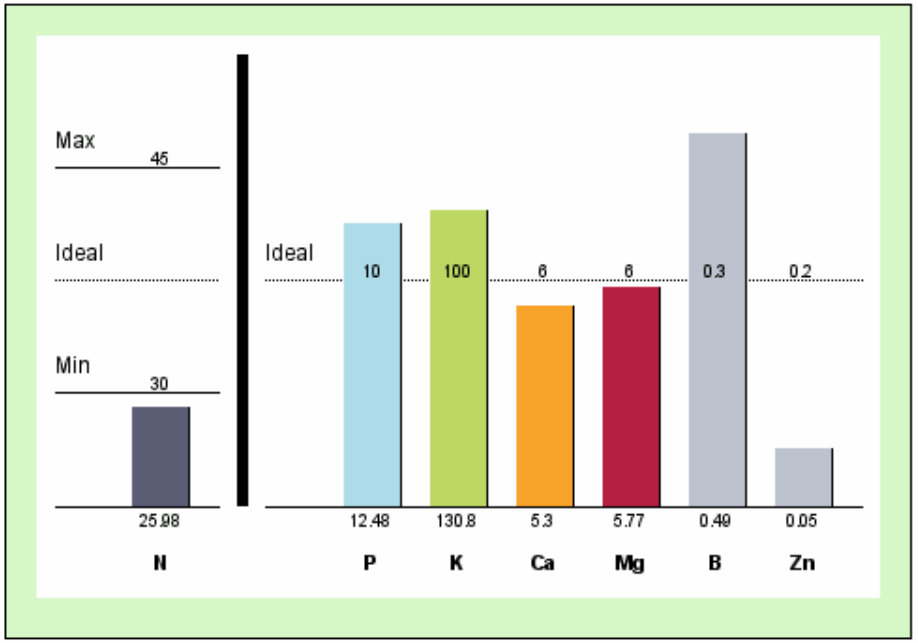
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client: SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By: Klicker, Kraig
Date of Analysis: January 13, 2006

NUTRIENT STATUS: 05 PLady@Hvst Av (Pink Lady)

	mg / 100g
Nitrogen	25.98
Phosphorus	12.48
Calcium	5.3
Magnesium	5.77
Potassium	130.8
Boron	0.49
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

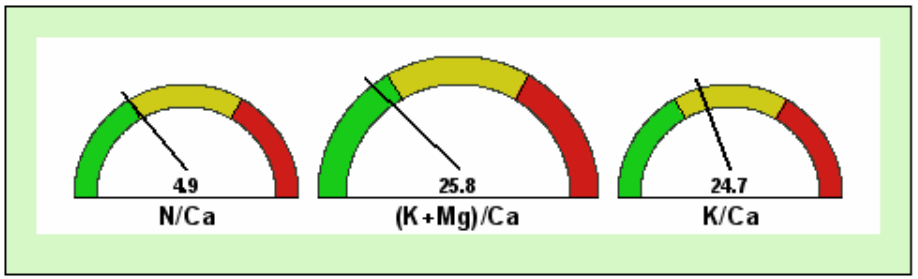


Weight & Moisture

Average Weight	211.74 g
Moisture	80.89 %

Nutrient Ratios

Mg + K / Ca	25.77
N / Ca	4.9



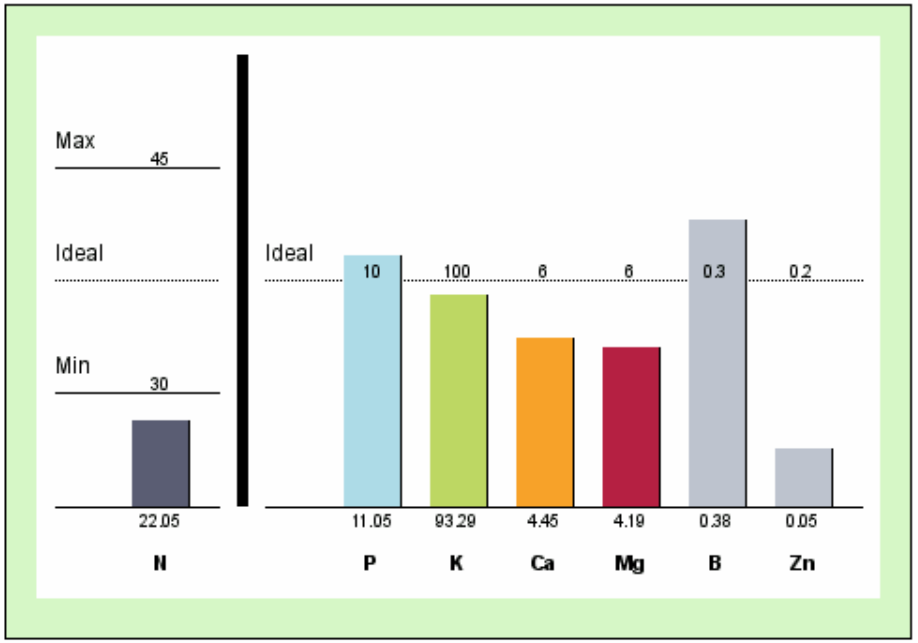
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client:	SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By:	Klicker, Kraig
Date of Analysis:	January 13, 2006

NUTRIENT STATUS: 05 RDel@Hvst Avg (Red Del)

	mg / 100g
Nitrogen	22.05
Phosphorus	11.05
Calcium	4.45
Magnesium	4.19
Potassium	93.29
Boron	0.38
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

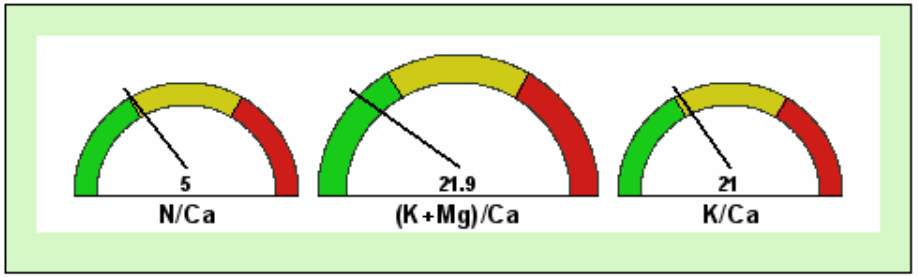


Weight & Moisture

Average Weight	239.56 g
Moisture	84.19 %

Nutrient Ratios

Mg + K / Ca	21.91
N / Ca	4.96



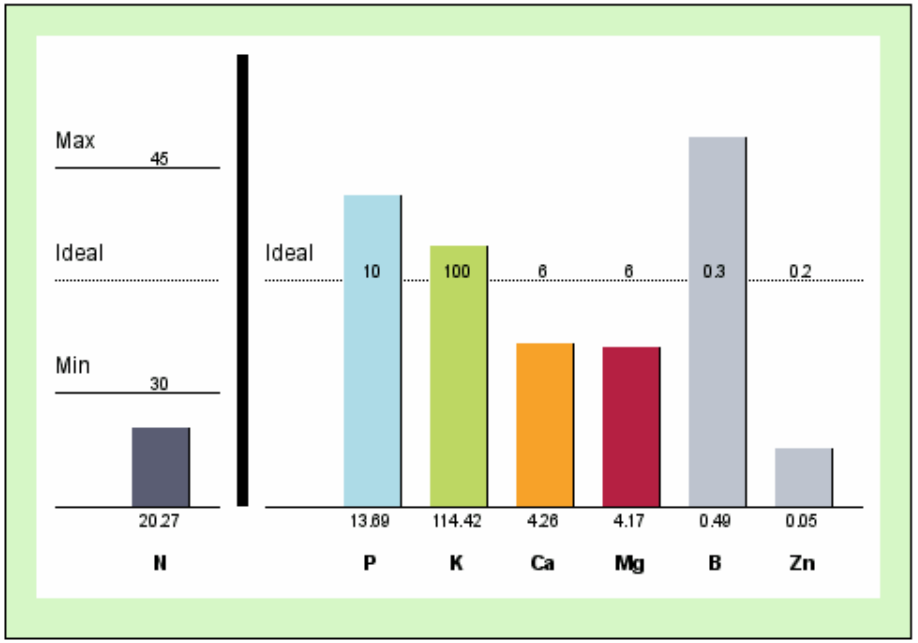
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client: SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By: Klicker, Kraig
Date of Analysis: January 13, 2006

NUTRIENT STATUS: **05 Fuji@Hvst Avg (Fuji)**

	mg / 100g
Nitrogen	20.27
Phosphorus	13.69
Calcium	4.26
Magnesium	4.17
Potassium	114.42
Boron	0.49
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

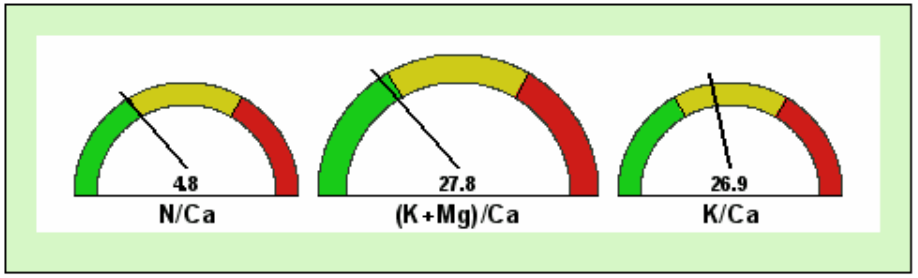


Weight & Moisture

Average Weight	262.77 g
Moisture	82.75 %

Nutrient Ratios

Mg + K / Ca	27.84
N / Ca	4.76



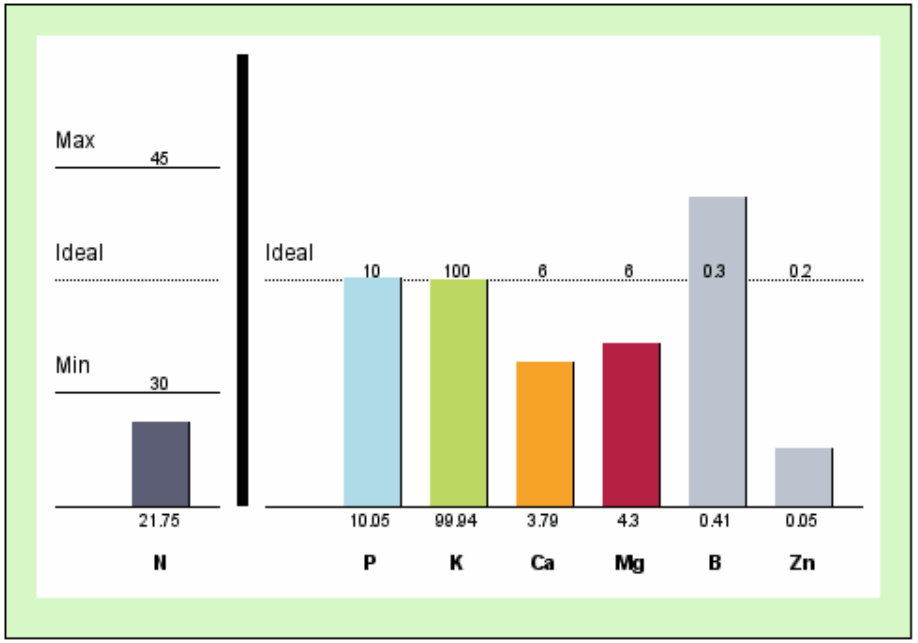
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client: SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By: Klicker, Kraig
Date of Analysis: January 13, 2006

NUTRIENT STATUS: 05Gldn@Hvst Avg. (Golden)

	mg / 100g
Nitrogen	21.75
Phosphorus	10.05
Calcium	3.79
Magnesium	4.3
Potassium	99.94
Boron	0.41
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

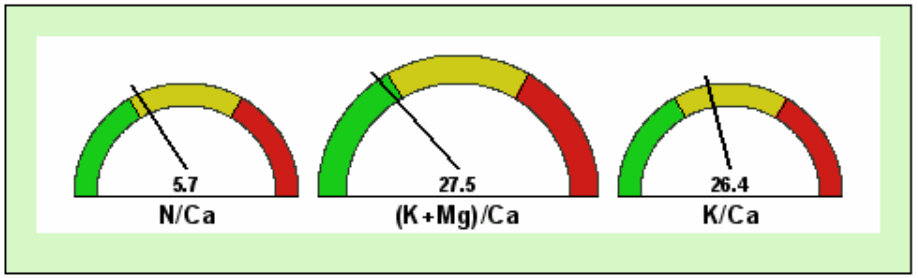


Weight & Moisture

Average Weight	226.08 g
Moisture	82.89 %

Nutrient Ratios

Mg + K / Ca	27.5
N / Ca	5.74



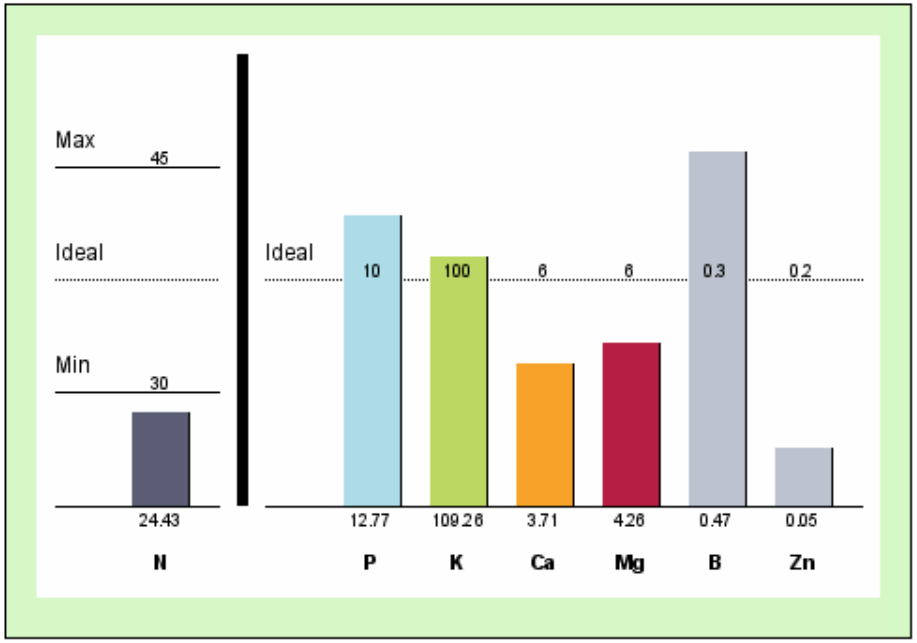
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client:	SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By:	Klicker, Kraig
Date of Analysis:	January 13, 2006

NUTRIENT STATUS: 05Brbrn@Hvst Avg (Braeburn)

	mg / 100g
Nitrogen	24.43
Phosphorus	12.77
Calcium	3.71
Magnesium	4.26
Potassium	109.26
Boron	0.47
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

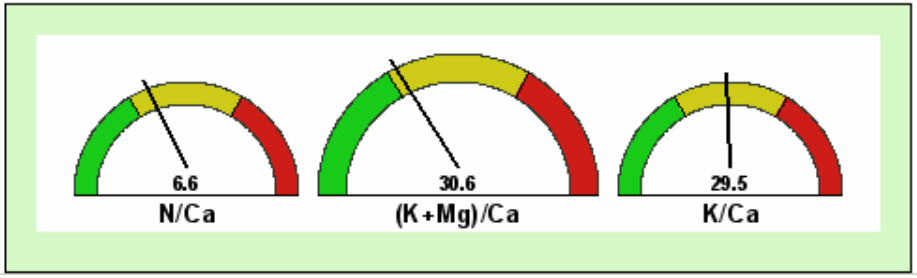


Weight & Moisture

Average Weight	229.44 g
Moisture	84.13 %

Nutrient Ratios

Mg + K / Ca	30.6
N / Ca	6.58



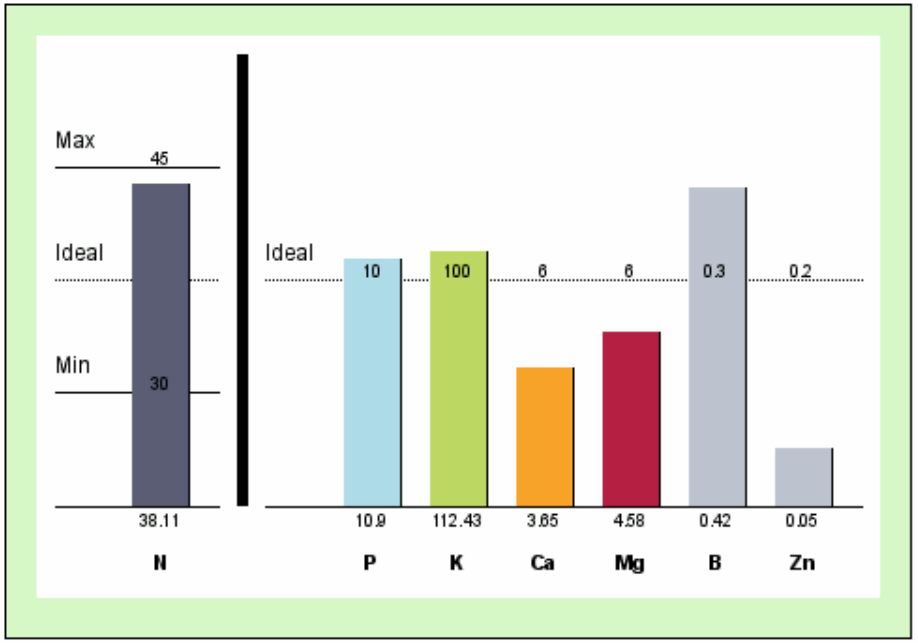
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client: SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By: Klicker, Kraig
Date of Analysis: January 13, 2006

NUTRIENT STATUS: 05 GS@Hvst Avg. (Granny Smith)

	mg / 100g
Nitrogen	38.11
Phosphorus	10.9
Calcium	3.65
Magnesium	4.58
Potassium	112.43
Boron	0.42
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

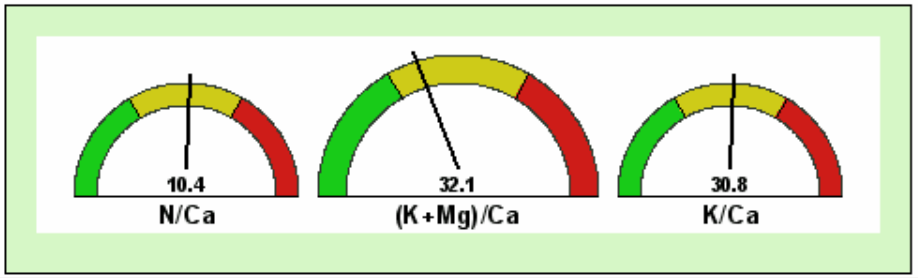


Weight & Moisture

Average Weight	217.71 g
Moisture	84.53 %

Nutrient Ratios

Mg + K / Ca	32.06
N / Ca	10.44



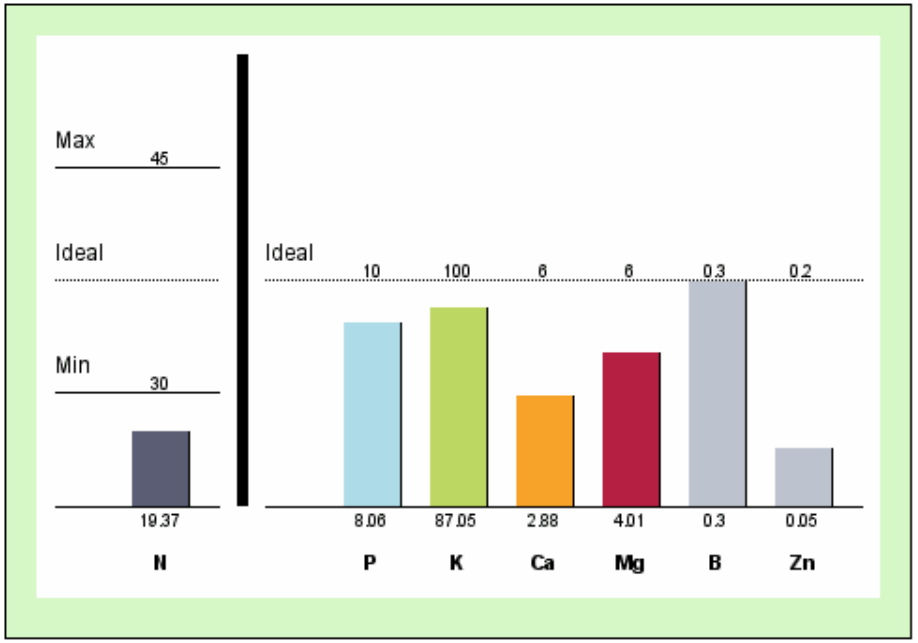
SoilTech
NORTHWEST, INC.

FRUIT ANALYSIS REPORT

Client: SoilTech Northwest, Inc. (Klicker, Kraig)
Request Submitted By: Klicker, Kraig
Date of Analysis: January 13, 2006

NUTRIENT STATUS: 05 HC@Hvst Avg. (Honeycrisp)

	mg / 100g
Nitrogen	19.37
Phosphorus	8.06
Calcium	2.88
Magnesium	4.01
Potassium	87.05
Boron	0.3
Manganese	0
Copper	0
Zinc	0.05
Iron	0
Molybdenum	0

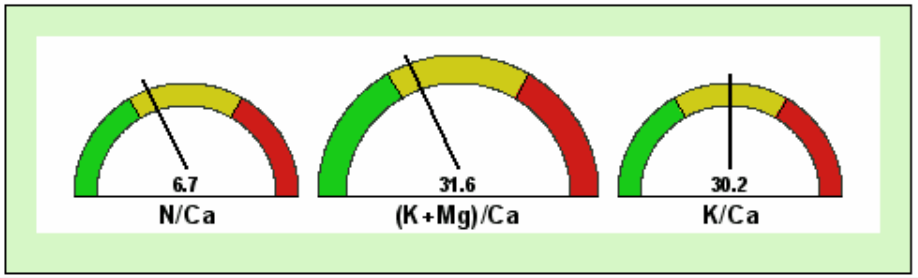


Weight & Moisture

Average Weight	261.05 g
Moisture	84.2 %

Nutrient Ratios

Mg + K / Ca	31.62
N / Ca	6.72



Identify the trends

(and be ready to react to the information)

Don’t get too hung up on the numbers

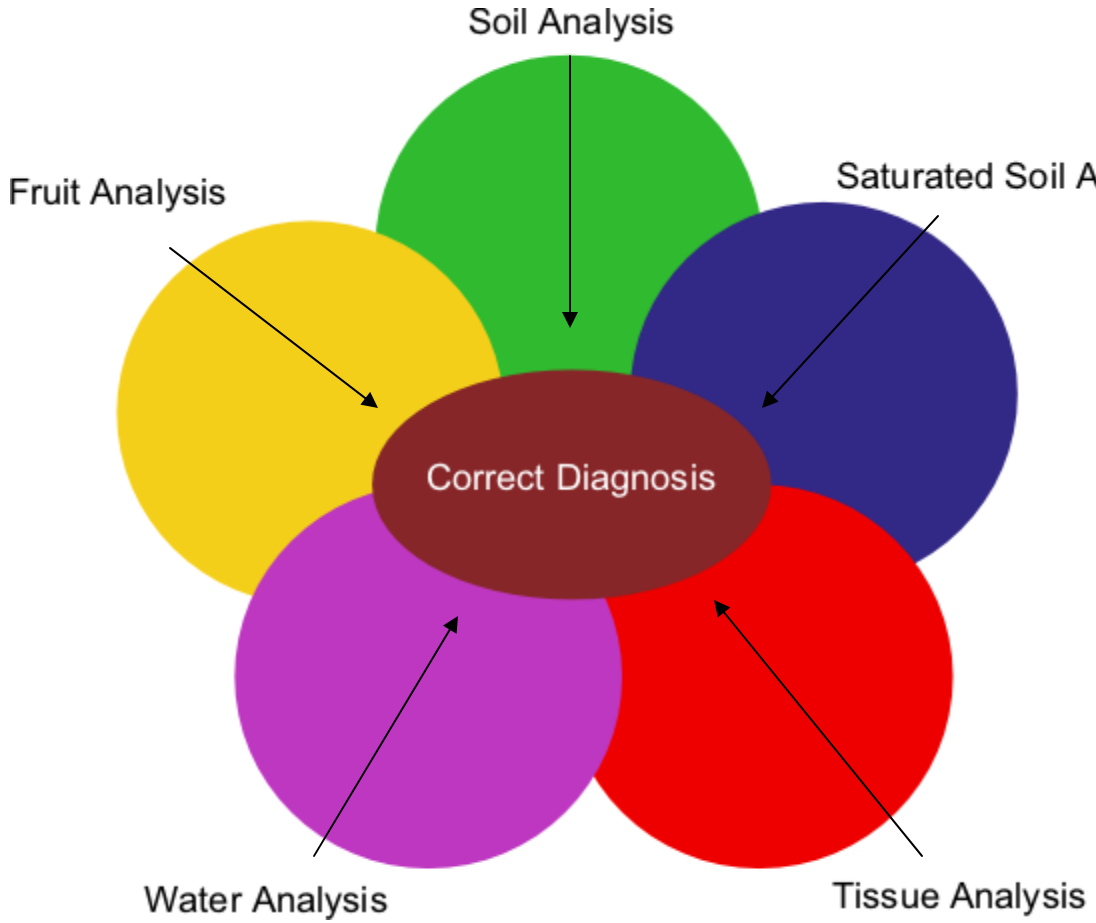
Watch Ratios - the lower the better

Mg + K / Ca

N/Ca

K/Ca

Five Tests for Accurate Soil / Crop Nutrient Decision Making



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Soil												
Saturated Soil												
Water												
Tissue												
Fruit	Fruit @ Harvest					ESFRU			Fruit @ Harvest			

SoilTech
NORTHWEST, INC.

www.soiltechnw.com

Soil Nutrition & Water Quality Specialists

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Public Information Exchange

File	Description
ESFRU 05 Compare.pdf (PDF, 123 KB)	Early Season Fruit Analysis Comments for 2005

102 Strawberry Lane, Walla Walla, WA 99362
(509) 529-1860 / (509) 522-2888 (fax)
soiltech@soiltechnw.com

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IN THE BLEACHERS By Steve Moore

