Interpreting Soil Test Results to Plan Your Tree Fertilization Program

Larry Kuhns

Kuhns Tree Farm

Professor emeritus, Penn State

KUHNS TREE FARM
About 45 Acres of Trees

KUHNS TREE FARM

**WHOLESALE**   **RETAIL**

Factors That Affect a Tree's Response to a Fertilizer Application

- Current pH and nutrient levels – **Soil Test**
- Nutrient balance – primarily Ca : Mg : K
- Soil type – Sandy vs Clay-based soils
- Incorporation of lime and fertilizer (esp. P)
- Timing of application – Cyclical Root Growth?
- Weather - Temperature / Rainfall

Soil Testing

- Soil probe, trowel
- Min. (10) ¾" dia. cores
- 6" deep
- Randomly taken
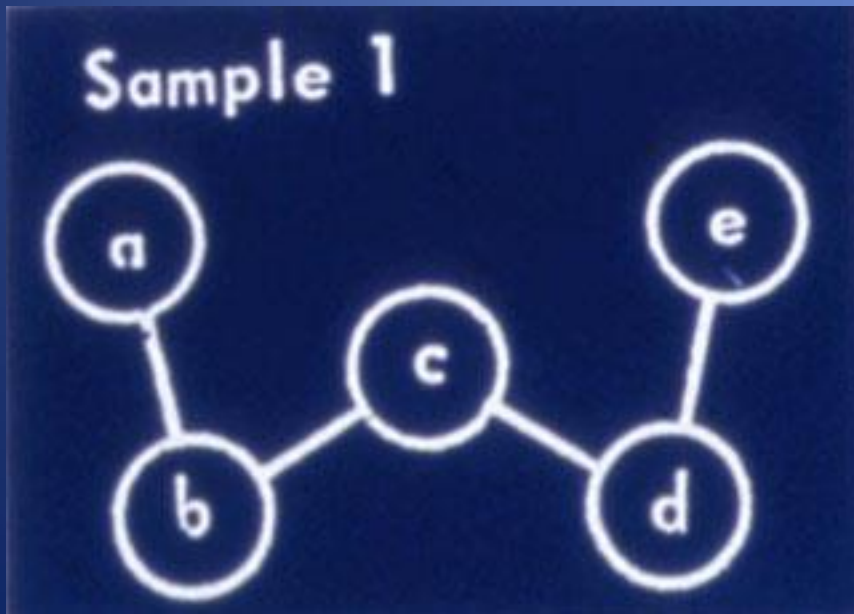
Sample 1

- Mix into bucket
- Air dry over night
- Take composite sample for testing
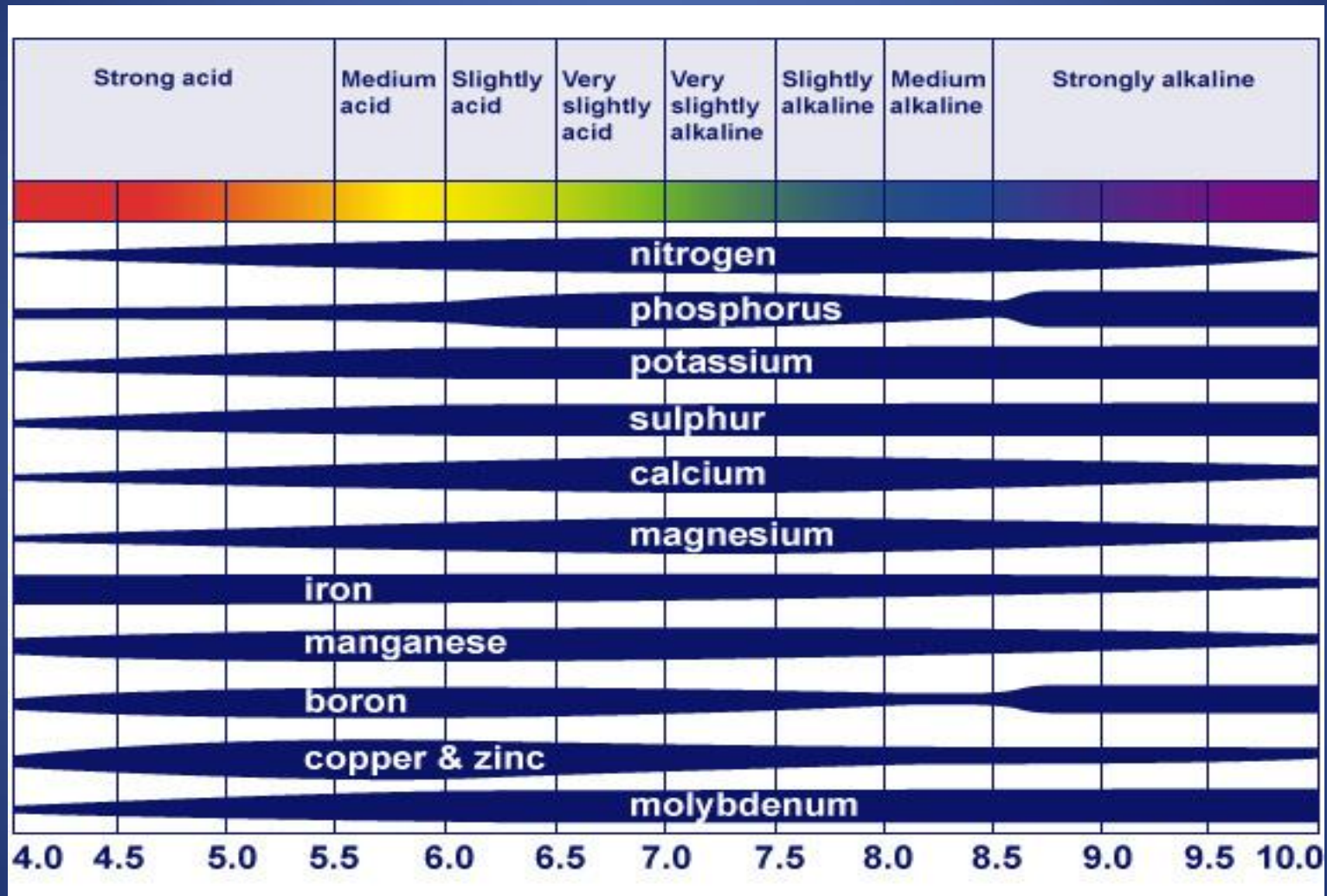
pH - Explanation

pH = Negative <u>log</u> of the Hydrogen Ion Concentration

What does that mean???

Decrease of 1 pH unit (pH 6 to 5) = 10X increase in H^+

pH 7 is neutral. Lower is acid, Higher is basic

The importance of pH is: It determines the availability of all of the plant nutrients (solubility/form)

Fraser, Balsam, Canaan, White Pine

Native to the east, where pH tends to be low (acid)

Douglas fir, White fir, Colo. spruce

Native to the west, where pH tends to be high

There are different opinions on what the optimum pH is for different Christmas tree species. It comes down to which expert do you want to believe.

Rutgers, NJ	acid loving:	5.2-5.8
	non-acid loving:	6.2-6.8
Oregon	Fr Fir & Can Fir	5.3-6.0
	Doug & Con Fir	5.5-6.5+
North Carolina Fraser Fir		5.0-5.5
Spectrum Analysis	Fras & Can	5.5-6.0
Canada		5.4-5.8
Larry, for all trees		5.5-6.5

I like to start all of my trees in the higher end of the range of 5.5 to 6.5

Christmas trees have around a 10 year production cycle. During this time, pH naturally decreases.

*Rainfall leaches nutrients from the field

*The trees absorb nutrients from the field

*Additions of nitrogen add H ions to the soil, which lowers pH

% N, lbs needed to provide 100 lbs of Nitrogen, and amount of lime needed to neutralize the N added

Nitrogen Source	% N	CaCO$_3$ Equivalent per ton of fert.
Urea	46 (200)	1680
Ammonium Nitrate	34 (300)	1180 pounds
Diammonium phosphate	18 (500)	1480
Ammonium Sulfate	21 (500)	2240

ANY QUESTIONS ON PH?

CEC – CATION EXCHANGE CAPACITY

CATIONS have a positive charge

ANIONS have a negative charge

Soil particles have negative charges on their surface. The negative charges will hold cations. The number of negative charges a soil has determines the number of cations that it can hold. This is the CEC of the soil. Clay soils have high CEC's (8-12) and sandy or shaly soils have lower CEC's (4-6).

CEC – CATION EXCHANGE CAPACITY

The CEC = the total of the Exchangeable Cations

The CEC of the soil is almost completely filled with H, K, Mg, and Ca

H and K have a single positive charge (+).

Ca and Mg have a double positive charge (++). They are held tighter onto the CEC than H or K

pH – General Rule

It is easy to raise pH

-The chemical reaction with lime is simple

- Ca^{++} and Mg^{++} replace H^+

It is difficult to lower pH

-The chemical reaction with sulfur involves bacteria and is complex

 - H^+ must replace Ca^{++} and Mg^{++}

How does soil texture impact fertilization practices?

- Sandy soils - Low CEC, leaches readily
  - Will require lighter and more frequent applications of fertilizer

- Clay soils - High CEC, limited leaching

BASE SATURATION

H is considered to be acid

K, Mg, and Ca are considered to be bases

Base saturation = the % of the CEC that is occupied by the bases (K, Mg, Ca)

BASE SATURATION

Plants need more Ca than Mg, and more Mg than K

The relative amounts of the Ca, Mg, and K in the soil are more important than the actual amounts, because they are absorbed in similar ways by plants.

Suggested: Calcium around 50% of the CEC

6 - 8 to 1 Ca : Mg

2 - 3 to 1 Mg : K

PHOSPHORUS

Penn State P recommendations are based on a target amount of 150 to 200 lbs/A for Christmas trees.

NC State is in the same range

Canada recommends 100 – 150 kg/ha

Spectrum Analytical – 80-120 lbs for Christmas trees

A & L Labs has a target amount of about 25 ppm, which equal about 50 lbs/A. Virginia is the same.

Factors Affecting the Absorption of Phosphorus

- Phosphorus Storehouse in the Soil

- Mycorrhizae

- Relatively high amounts of phosphorus in the soil don't seem to harm trees

AgroEnviroLab

CERTIFICAT D'ANALYSES

Sol

Accrédité par CEAEQ, ISO-CEI 17025

Accrédité pour pH, pH tmpon, Mat.Org, P, K, Ca, Mg, Cu, Zn, B(Mehlich) par CEAEQ.

Numéro du champ : 1	**Provenance**	**Échantillon**
Numéro du lab : 273730	CAE de l'Estrie	Plantations Réal Beloin
Date de réception : 21 juin 12	4260, boul. Bourque	74 de l'Église
Date du rapport : 27 juin 12	Sherbrooke	East Hereford
Méthode : Extraction Mehlich 3	J1N 2A5	J0B 1S0
Numéro d'accréditation : 459		Réal Beloin
Numéro du certificat : 273730	Échantillonné le : 14 juin 2012	Par : Caitlin Aubin et Marie-Christine...

Résultat d'analyse — Base sèche — Culture prévue :

Extraction Mehlich 3 — Dosage ICP

Méthode		Incinération											
Nom méthode	AEL-I-CHI-005	AEL-I-CHI-007	AEL-I-CHI-006				AEL-I-CHI-008			AEL-I-CHI-006			
Éléments	**pH**	**Matière**	**P**	**K**	**Ca**	**Mg**	**Al**	**P/Al**[1-2-3]	**Mn**	**Cu**	**Zn**	**B**	**S**
	eau / tampon	organique	Phosphore	Potassium	Calcium	Magnésium	Aluminium	ISP1	Manganèse	Cuivre	Zinc	Bore	Soufre
Unités		%			kg/ha		ppm	%			ppm		
1	4.7 5.5	12.5	72	177	1 611	231	1 268	2.5	67.5	0.87	6.95	0.14	

Très riche / Riche / Bon / Moyen bon / Moyen / Pauvre / Très pauvre

1- P/Al   Valeur environnementale critique = limite entre bon et riche. Valeurs agronomiques critiques = limite entre pauvre et moyen, et, entre riche et très riche.
2-Si la culture est la canneberge, le calcul est le P / (Al+Fe)   3- Sols Organiques, ISP 3 : P /(Al+(5*Fe))   TP très pauvre, P pauvre, M moyen, MB moyen bon, B Bon, R riche, TR très riche

Besoins en chaux IVA 100%

Besoins en chaux (t/ha)	14.2
Type de chaux	Calcique

Contrôle qualité
Valeurs attendues : 85 à 115 %

pH	100.1	Na	
M.O.	102.0	S	
P	100.4	B	102.8
K	103.3	Mn	96.0
Ca	104.7	Cu	85.7
Mg	104.7	Zn	94.7
Al	103.2	Fe	

CEC et saturations en bases

CEC (meq/100 g)	22.2	B
Saturation (%)	Marge moy.	
Potassium	0,3 - 2,0	0.9	M
Calcium	25 - 60	16.2	P
Magnésium	1 - 10	3.9	B
Total des bases	10 - 90	20.9	P
Rapports	Marge moy.	
K/Mg	0,1 - 0,5	0.24	B
K/Ca	,01 - ,06	0.06	B
Mg/Ca	,03- 0,25	0.24	B
Sodium	(ppm)	15
Ratio d'adsorption du sodium	< 5,0	0.45

Autres résultats

N total (%)		C / N	
N-NO3 (ppm)		N-NH4 (ppm)	
Conductivité électrique (mmhos/cm)		Fer (ppm)	261
Texture	Sable %	Limon %	Argile %
Classe texturale			
Type de sol			
Densité estimée g/cm3		Basse	0.72
Porosité estimée %		Élevée	70.4
Perméabilité estimée			
Coefficient de perméabilité estimée cm / h			
Coefficient réserve eau utile (CRU) g eau / 100 g sol sec			

Voir votre conseiller pour interprétation des résultats plus spécifique

Très faible, Faible, Bon, Élevé, Très élevé

Remarques

Résultat d'analyse

Base sèche **Culture prévue :**

Méthode			Incinération	Extraction Mehlich 3 Dosage ICP										
Nom méthode	AEL-I-CHI-005		AEL-I-CHI-007	AEL-I-CHI-006				AEL-I-CHI-008	AEL-I-CHI-008	AEL-I-CHI-006				
Éléments	pH		Matière organique	P	K	Ca	Mg	Al	P/Al [1-2-3]	Mn	Cu	Zn	B	S
	eau	tampon	organique	Phosphore	Potassium	Calcium	Magnésium	Aluminium	ISP1	Manganèse	Cuivre	Zinc	Bore	Soufre
Unités			%	kg/ha				ppm	%	ppm				
1	4.7	5.5	12.5	72	177	1 611	231	1 268	2.5	67.5	0.87	6.95	0.14	

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K/Mg	0,1 - 0,5	0.24	B
K/Ca	,01 - ,06	0.06	B
Mg/Ca	,03- 0,25	0.24	B
Sodium	(ppm)	15	
Ratio d'adsorption du sodium	< 5,0	0.45	

Autres résultats

N total (%)		C / N	
N-NO3 (ppm)		N-NH4 (ppm)	
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Perméabilité estimée			
Coefficient de perméabilité estimée cm / h			
Coefficient réserve eau utile (CRU) g eau / 100 g sol sec			

Très faible, Faible, Bon, Élevé, Très élevé

Voir votre conseiller pour interprétation des résultats plus spécifique

Remarques

CEC / Base Saturation / pH / Ca : Mg : K
Add N and P and Mg / No lime or K

540-967-3422

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W
N
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R

CARROLL JOHN
207 FAIRWAY DR

LOUISA, VA 23093

C F
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SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
BUF A	131415 RLT	Corn (Grain), No Till (1)		---	0	CCB2 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	45	204	1195	77	2.4	8.3	0.6	16.0	0.2	
Rating	H–	H–	M	M–	SUFF	SUFF	SUFF	SUFF	SUFF	

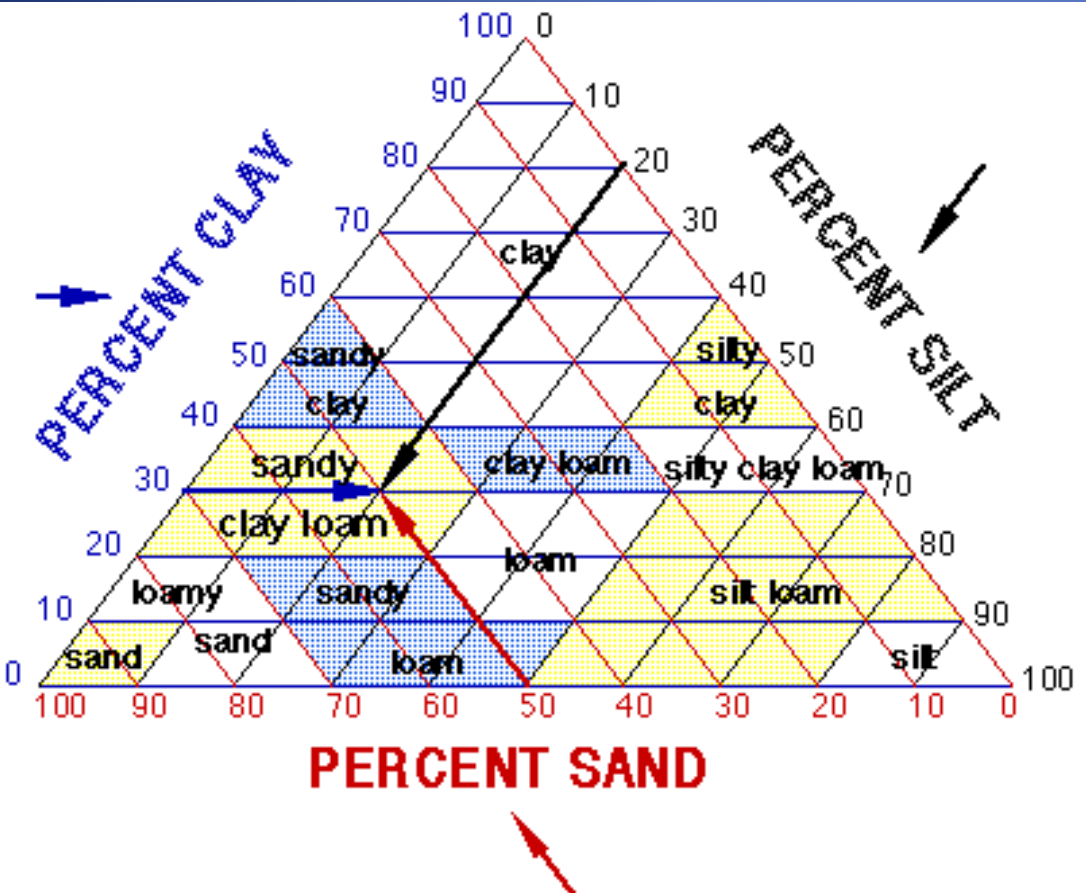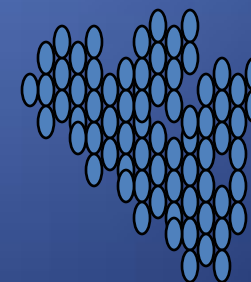| Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.3	6.22	4.6	23.1	76.9	64.4	6.9	5.6	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Christmas Trees-Fraser Fir, etc. (113)

Lime, TONS/AC		Fertilizer, lb/A		
Amount	Type	N	P205	K20
0		50	60	60

Soil Texture
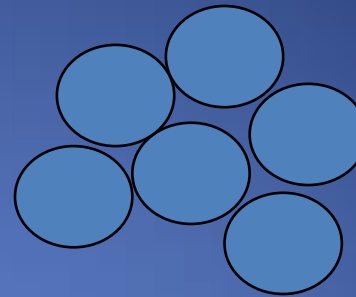
How does soil texture impact fertilization practices?

- Sandy soils -   Low CEC, leaches readily
  - Will require lighter and more frequent applications of fertilizer

- Clay soils   -   High CEC, limited leaching

Nutrient Holding Capacity

Negative soil particles hold positive mineral ions.

Hydrogen ions replace mineral ions.

Mineral ions can be leached away
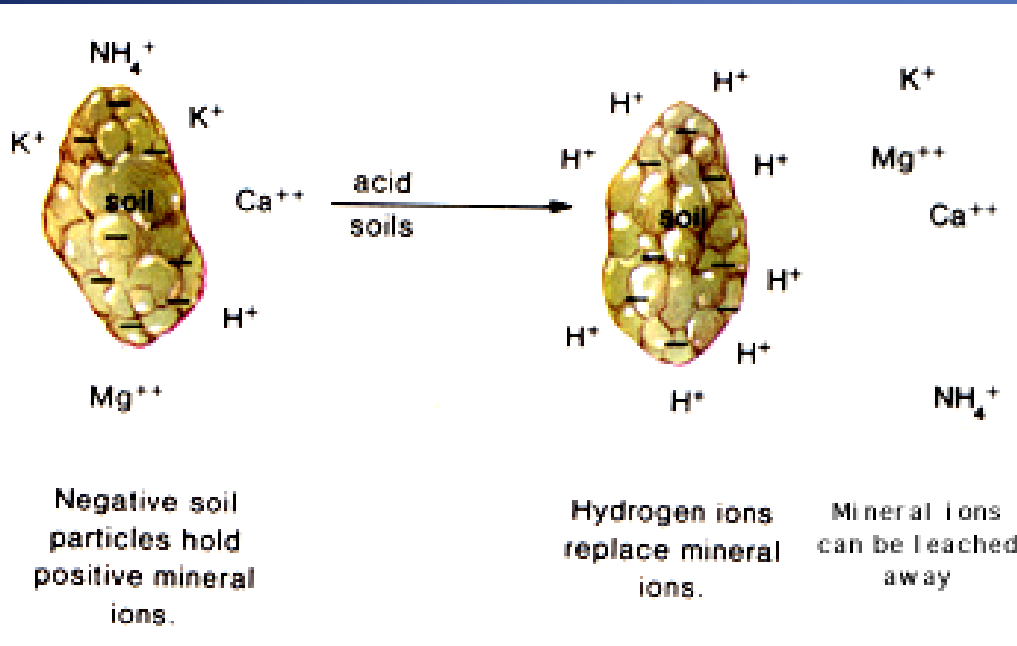
$\Uparrow$Surface area = $\Uparrow$ Capacity
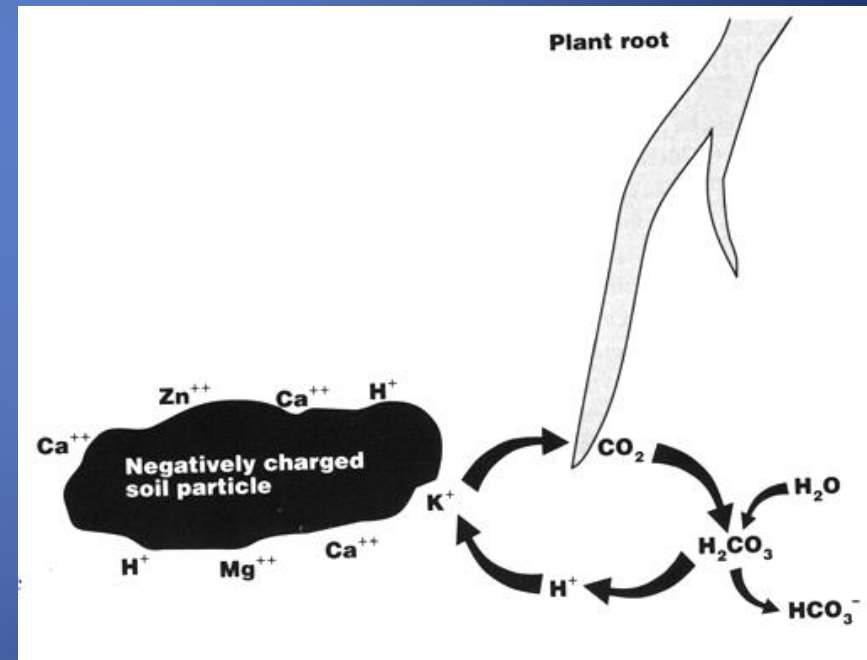
Cation Exchange Capicity (CEC):
The transfer of cations to and from the soil surface

Nutrient Uptake

Timing

- Plant growth cycles
  - Plants with one flush of growth (determinant)
    - Colorado spruce
  - Plants with multiple growth flush (indeterminant)
    - Offers an opportunity in the nursery for increased rates and applications throughout the year
- Fall application vs. Spring application
  - Fall NH_{4+} preferred over NO_{3-}
  - Cations are held tighter to the soil and through winter
  - Anions are not held and flush readily with soil temperature and moisture in the soil

Timing of application in the landscape

- If needed, an annual app of N is sufficient in most soils

- Response to fertilization is greatest when moisture levels are high

- Utilization may not occur until growth begins in late winter/early spring

- Research shows that: early shoot growth depends almost entirely on the level of dormant stored nutrients, before significant uptake occurs from the soil

- A slow release nitrogen fertilizer in the late summer/fall will allow nitrogen to be available for spring growth.

Current pH and nutrient levels

- Fertilization should be based on knowledge
  - Soil testing and foliar analysis
  - Understanding that nutrient balance will impact the growth and health of plants

- Know the plants on the site and the pH that they prefer

Soil Test

- Requirements:
  - Name your crop
- Results
  - Soil pH
  - Phosphorus
  - Potassium
  - Magnesium
  - Calcium
  - CEC
- Recommendations
  - Liming or sulfur recs
  - General fertilizer recs

Nutrient Balance

Common Antagonisms and Interactions

- N $\longrightarrow$ K $\longrightarrow$
- P $\longrightarrow$ Zn $\longrightarrow$
- K $\longrightarrow$ N,Ca,Mg
- Na $\longrightarrow$ K,Ca,Mg
- Ca $\longrightarrow$ Mg,B
- Mg $\longrightarrow$ Ca $\longrightarrow$
- Fe $\longrightarrow$ Mn $\longrightarrow$
- Mn $\longrightarrow$ Fe $\longrightarrow$

How does soil texture impact fertilization practices?

- Sandy soils -   Low CEC, leaches readily
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Placement (continued)

- Foliar
  - For testing for deficiencies and as a temporary application of a minor element
- Trunk injection (Implants/microinjection)
  - When absolutely necessary
  - Restricted root zone situations
  - Soil-induced problems (Fe, Mn)
  - Tree injury an issue
- Drip line application?

General Rates

- At planting-
  - In the nursery
    - 10 lbs. of 5-10-5/cubic yard
- Established plants-
  - Soil test and amend as directed
    - Keep in mind pH and nutrient balance
  - 1 – 6 lbs. of Nitrogen/1000 ft^2
  - 40 – 250 lbs. of N/Acre
- Adjust the rate to fit the site
  - Open lawn vs. 4' square planting

Soil Testing I – Interpreting the Soil Test Report

Larry J. Kuhns
Dept. of Horticulture
Penn State University

SEVEN SITES

- Carbon County – 2

- Centre County – 2

- Indiana County – 2

- Huntington County - 1

THREE LABS

- Penn State

- North Carolina State

- A & L – Fort Wayne, IN

Penn State Lab Results
What is Included?

- pH
- P (lb/A)
- Exchangeable Cations

  -Acidity

  -K (Potassium)

  -Mg (Magnesium)

  -Ca (Calcium)

- CEC – Cation Exchange Capacity
- % Saturation of the CEC

  -K

  -Mg

  -Ca

pH - Explanations

pH = Negative <u>log</u> of the Hydrogen Ion Concentration

Decrease of 1 pH unit (pH 6 to 5) = 10X increase in H

Huh???

Low pH is acid, High pH is basic

What is the importance of pH?

It determines the availability of all of the plant nutrients (solubility/form)

pH - Explanations

There are different opinions on what the optimum pH is for different plant species.

Most Christmas tree species will grow OK in the range of 5.0 to 6.5

General rule:

It is easy to raise pH; it is difficult to lower it

CEC – CATION EXCHANGE CAPACITY

CATIONS have a positive charge

ANIONS have a negative charge

Soil particles have negative charges on their surface. The negative charges will hold cations. The number of negative charges a soil has determines the number of cations that it can hold. This is the CEC of the soil. Clay soils have high CEC's and sandy or shaly soils have lower CEC's.

CEC – CATION EXCHANGE CAPACITY

The CEC of the soil is almost completely filled with H, K, Mg, and Ca

The CEC = the total of the Exchangeable Cations

H and K have a single positive charge.

Ca and Mg have a double positive charge. They are held tighter onto the CEC than H or K

BASE SATURATION

H is considered to be acid

K, Mg, and Ca are considered to be bases

Base saturation = the % of the CEC that is occupied by the bases (K, Mg, Ca)

BASE SATURATION

Plants need more Ca than Mg, and more Mg than K

The relative amounts of the Ca, Mg, and K in the soil are more important than the actual amounts

Suggested: Calcium around 50% of the CEC

6-8 to 1 Ca:Mg

2-3 to 1 Mg:K

PHOSPHORUS

Penn State P recommendations are base on a target amount of 150 to 200 lbs/A

NC State is in the same range

For agronomic crops (corn, soybeans) Penn State has a target of around 50 lbs/A

A & L Labs has a target amount of about 25 ppm, which equal about 50 lbs/A

A&L Labs

Report K, Mg, Ca, and P in parts per million (ppm) instead of meq/100g   (So what?)

For P, ppm X 2 = lbs/A

K, Mg, and Ca are also reported in % base saturation of the CEC

North Carolina State

Reports Mg and Ca as % base saturation of the CEC

Reports K and P as indexes:

    0-10   = Very Low

    11-25   = Low

    26-50   = Medium

    51-100   = High

    100+   = Very High

North Carolina State

Other characteristics measured:

% Humic Acid (a measure of organic matter)

Weight:Volume (W/V)

Exchangeable acidity (Ac) in meq/100g

Mn, Zn, Cu, S, NH4 indexes

Virginia Cooperative Extension
Soil Test Report

Questions? Contact:
Louisa County Office
Virginia Cooperative Extension - Louisa County
P. O. Box 399
Louisa, VA 23093-0399
540-967-3422

Virginia Tech Soil Testing Laboratory
145 Smyth Hall (0465)
Blacksburg, VA 24061
www.soiltest.vt.edu

SEE NOTES:
1 4

| O W N E R | | CARROLL JOHN
207 FAIRWAY DR

LOUISA, VA 23093 | | C O P Y | F O R | MATT CARROLL |

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP Name	Yield	LAST LIME APPLICATION Months Prev.	LAST LIME APPLICATION Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
HT 1	CLBRK HT	Tall Grass - Hay (44)		18+	0.1-1.0	ANB2 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	5	71	949	112	0.9	12.6	0.4	10.3	0.1	
Rating	L	L+	M-	M	SUFF	SUFF	SUFF	SUFF		

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.0	6.28	3.6	19.6	80.4	65.2	12.7	2.5	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Tomatoes - Processing, Mult Harvest (72)

Lime, TONS/AC		Fertilizer, lb/A		
Amount	Type	N	P205	K20
1	AG	115	250	300

990. We are trying to improve our service. PLEASE take a moment to complete our brief, anonymous customer survey at tinyurl.com/soiltestsurvey

991. Numbered notes are viewable at http://www.soiltest.vt.edu/Files/publications.html

652. Boron is needed. For rate of application, see Note 4.

Nutrient Balance

- Mg : K - 2-3 : 1

- Ca : Mg – 6-8 : 1

CEC / Base Saturation / pH / Ca : Mg : K
Add N / dolomitic lime / P (P2O5)

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
PSTRB				18+	1.1–2.0	ENC3 42	END3 30	ASC 28		

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	26	183	474	94	1.0	3.2	0.7	20.3	0.1	
Rating	M	H−	L	M−	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	5.4	5.88	4.9	63.1	36.9	24.2	7.9	4.8	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Christmas Trees-Nursery (116)

Lime, TONS/AC	
Amount	Type
0	

Fertilizer, lbs/1000 sq.ft.		
N	P205	K20
See Comment	5	1

733. Apply two and a half pounds of nitrogen per 1,000 sq. ft.

CEC / Base Saturation / pH / Ca : Mg : K
Add N / No lime / P and K

SAMPLE HISTORY

| Sample ID | Field ID | LAST CROP | | LAST LIME APPLICATION | | SOIL INFORMATION | | | | |
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
CEMF				18+	1.1–2.0	ELB 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	10	35	1255	191	0.5	4.7	0.1	7.7	0.2	
Rating	L+	L	M+	H	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.7	6.29	4.6	14.2	85.9	67.8	17.0	1.0	

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Fertilizer, lbs/1000 sq.ft.		
N	P205	K20
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CEC / Base Saturation / pH / Ca : Mg : K
Add N / No lime or P / K ???

12 Acre?

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP Name	Yield	LAST LIME APPLICATION Months Prev.	Tons/Acre	SOIL INFORMATION SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
12ACR					0	ELB2 40	HAC 40	ELC2 20		

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	159	135	1415	163	5.3	6.8	0.7	54.2	0.2	
Rating	VH	M	M+	H-	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.1	6.26	5.2	16.0	84.0	67.8	12.9	3.3	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Christmas Trees-Fraser Fir, etc. (113)

Lime, TONS/AC Amount	Type	Fertilizer, lb/A N	P2O5	K2O
0		110	0	105

732. The above recommendation is for broadcast application at establishment.

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540-967-3422

OWNER

CARROLL JOHN
207 FAIRWAY DR

LOUISA, VA 23093

COPY FOR

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
BUF A	131415 RLT	Corn (Grain), No Till (1)		---	0	CCB2 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	45	204	1195	77	2.4	8.3	0.6	16.0	0.2	
Rating	H-	H-	M	M-	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.3	6.22	4.6	23.1	76.9	64.4	6.9	5.6	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Christmas Trees-Fraser Fir, etc. (113)

Lime, TONS/AC		Fertilizer, lb/A		
Amount	Type	N	P205	K20
0		50	60	60

CARROLL JOHN
207 FAIRWAY DR

LOUISA, VA 23093

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP			LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
HVY A	131415 PLT	Corn (Grain), No Till (1)		7-12		CCB2 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	181	149	8337	116	7.4	17.2	0.7	9.3	0.4	
Rating	VH	M	VH	M	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	8.1	N/A	21.5	N/A	100.0	96.9	2.2	0.9	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Christmas Trees-Fraser Fir, etc. (113)

Lime, TONS/AC		Fertilizer, lb/A		
Amount	Type	N	P205	K20
0		50	0	105

732. The above recommendation is for broadcast application at establishment. To convert to a maintenance recommendation in ounces per tree, refer to the "Explanation of Fertilizer Rates" section in Soil Test Note 23.

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991. Numbered notes are viewable at http://www.soiltest.vt.edu/Files/publications.html

RUTGERS

New Jersey Agricultural Experiment Station

Soil Testing Laboratory
Rutgers, The State University
ASB II
57 US Highway 1 South
New Brunswick, NJ 08901-8554

Soil Test Report
Lab #:   2015-39825

Woodsedge Tree Farm
Tim Dunne
118 Beechwood Road
Belvidere, NJ 07823

woodsedgetreefarm@gmail.com
(908)763-9920

Sample ID: Field AB

Date Received: 2015-01-05
Date Reported: 2015-01-09
Serial #: AR-2374
Referred To: Rutgers Cooperative Ext. of Warren County
(908)475-6505

Crop or Plant
Farm: Christmas tree, acid-loving (primary)
Farm: Christmas tree, non-acid-loving (secondary)

Results and Interpretations

Silt Loam

pH: 6.57   Slightly acidic

Primary Crop

Secondary Crop
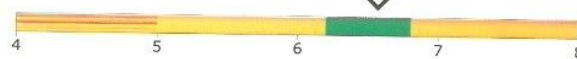
Lime Requirement Index: 7.28

The Lime Requirement Index (LRI) is a measure of the buffering capacity of the soil, its resistance to pH change, and is used to determine the appropriate amount of limestone, when necessary. LRI value near 8.0 indicates low buffering capacity of soil and a lower rate of limestone amendment compared to soil with high buffering capacity (LRI near 7.0).

Macronutrients (pounds per acre)

Nutrient	Value	Interpretation
Phosphorus:	290	(Above Optimum)
Potassium:	150	(Optimum)
Magnesium:	233	(Optimum)
Calcium:	1737	(Below Optimum)
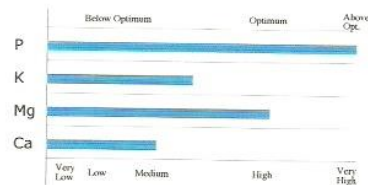
by Mehlich 3 extraction

Micronutrients (parts per million)

Zinc(Zn)	Copper(Cu)	Manganese(Mn)	Boron(B)	Iron(Fe)

13.13 (Adequate)   2.77 (Adequate)   53.79 (High)   0.28 (Low)   91.33 (Adequate)

Estimated Cation Exchange Capacity and Basic Cation Saturation

CEC	Base Saturation	Calcium	Magnesium	Potassium
11.3 meq/100g		4.3 meq/100g	1 meq/100g	0.2 meq/100g
(100%)	49%	39%	9%	2%

Suggested Range of Cation Saturation: 65-76%   10-15%   4-7%

Special Tests Results
No special test data available

pH, Calcium, and Magnesium Recommendations
Primary Crop

The soil pH is higher than the optimum range of 5.20 to 5.80 for the growth of most Christmas tree, acid-loving. Do not apply any limestone, compost or wood ashes to the area.

Prior to new seeding/planting, soil pH should be adjusted by application and thorough mixing of powdered elemental sulfur into the root zone (8-10 inches deep). Apply the elemental sulfur at a rate of 900 pounds per acre

Till or otherwise mix to distribute the sulfur as uniformly as possible. Follow amendment by watering and keep soil moist over the subsequent several weeks to promote the acidification process. Measure pH again 4 months after amendment to determine additional acidification need.

Secondary Crop

The soil pH is in the optimum range of 6.20 to 6.80 for the growth of most Christmas tree, non-acid-loving. Do not apply any limestone.

However, the soil calcium level is low. To increase the calcium level without changing the pH apply 450 pounds/acre of agricultural gypsum (calcium sulfate).

Fertilizer Recommendations

The agricultural agent of Rutgers Cooperative Extension will fill in a copy of this table to provide recommendations.
Primary Crop

Plant nutrients recommended (pounds per acre)				When to apply	How to apply[1]	Notes
N	P_2O_5	K_2O	Mg^2			

[1] Br=broadcast; PD=plowdown; DI=disk in; BP=band place; SD=sidedress; TD=topdress; Dr=drill

[2] When magnesium soil test value is low or very low and no limestone is needed to correct soil acidity, apply magnesium in fertilizer form to meet crop needs as shown.

Secondary Crop

Plant nutrients recommended (pounds per acre)				When to apply	How to apply[1]	Notes
N	P_2O_5	K_2O	Mg^2			

[1] Br=broadcast; PD=plowdown; DI=disk in; BP=band place; SD=sidedress; TD=topdress; Dr=drill
[2] When magnesium soil test value is low or very low and no limestone is needed to correct soil acidity, apply magnesium in fertilizer form to meet crop needs as shown.

Micronutrient Statements

Zinc does not appear to be a limiting factor. For information about zinc in soil for plant nutrition, see FS721.

Copper does not appear to be a limiting factor. As with most other micronutrients, copper availability is related to soil pH. Do not over-lime. For more information about soil copper, see FS720.

Manganese may be toxic to sensitive crops when grown on low pH soil. Adding lime to the soil raises the pH and decreases manganese toxicity. Liming is generally not recommended for acid-loving plants, which are more tolerant of high levels of manganese. In excessive amounts, soil manganese can cause plant damage. This occurs primarily in low pH soil. Lime soil as recommended to decrease availability of manganese to plants. Avoid fertilizers that contain manganese. See FS973 for more information.

Plant types differ in their susceptibility to boron deficiency; certain fruit, vegetable, and field crops are most susceptible. Symptoms include improper development or dieback of growing tips, poor flowering or fruit set, twisting and yellowing of young leaves from base to tip, and black heart of roots. Lime only as necessary, since pH above 7.0 limits boron availability. Building up organic matter content of soil will increase boron availability. Use of boron fertilizer must be done only with extreme care because of the toxicity that might occur if over-applied and the difficulty of applying the low rates necessary. See FS873 for more information and follow recommendations above.

Iron should be sufficient as long as soil pH is in the optimum range for the plant being grown. The availability of iron to plants decreases as soil pH increases. Maintain soil pH in the recommended range to assure availability of iron to plant roots. See FS971 for more information.

Comments: *5 Acres to be planted to Canaan Fir (2015). Previous crop: Douglas fir (2004-2014) with good yield. Fertilizer applied September 2014, Urea (46-0-0) at 60 lbs/A and March 2014, Urea at 60 lbs/A. No irrigation, good drainage, level topography. Note: Natural stands of Canaan fir are found in moderately to strongly acidic soil.*

O
W
N
E
R

CARROLL JOEN
207 FAIRWAY DR

LOUISA, VA 23093

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
REG 1	PLT 131415	Corn (Grain), No Till (1)		7-12		CCB2 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	60	138	2451	75	2.7	16.2	1.0	40.8	0.3	
Rating	H	M	VH	M-	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	7.7	N/A	6.6	N/A	100.0	92.7	4.7	2.7	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Christmas Trees-Fraser Fir, etc. (113)

Lime, TONS/AC		Fertilizer, lb/A		
Amount	Type	N	P205	K20
0		50	45	105

732. The above recommendation is for broadcast application at establishment. To convert to a maintenance recommendation in ounces per tree, refer to the "Explanation of Fertilizer Rates" section in Soil Test Note 23.
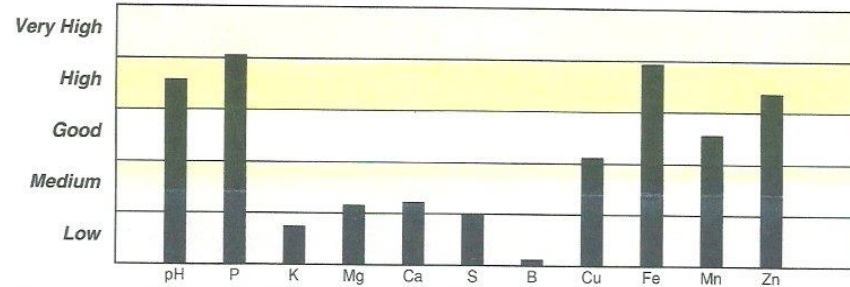
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991. Numbered notes are viewable at http://www.soiltest.vt.edu/Files/publications.html

Soil Analysis Report

Spectrum Analytic
1087 Jamison Road NW
Washington Court House, OH 43160-8748
www.spectrumanalytic.com

SPECTRUM ANALYTIC INC
1087 JAMISON RD NW
WASHINGTON CH, OH 43160-8748

Prepared For

TIM DUNNE/WOODSEDGE TREE FM
118 BEECHWOOD RD
BELVIDERE, NJ 07823

Sample Information

Sample	FIELD AB	Sampled	12-24-2014
Lab Number	A41855	Tested	12-30-2014
Acres	5		

Analysis		Result	Optimal	Analysis		Result	Optimal
Soil pH		6.3	5.5-6.0	Sulfur	m3-ppm	10	20-40
Buffer pH		6.5		Boron	m3-ppm	0.1	1.7-2.6
Organic Matter	%	2.5		Copper	m3-ppm	1.2	Varies
CEC		9.6		Iron	m3-ppm	97	9-40
K Saturation	%	1.2	2.0-4.0	Manganese	m3-ppm	64	Varies
Mg Saturation	%	6.8	10-20	Zinc	m3-ppm	13.4	3.9-10.9
Ca Saturation	%	29.2	50-70				
K/Mg Ratio		0.6					
Ca/Mg Ratio		8.4					
Phosphorus	m3-ppm	170	80-120				
Potassium	m3-ppm	53	140-240				
Magnesium	m3-ppm	89	150-300				
Calcium	m3-ppm	745	1200-1800				

Bar chart showing levels (Very High, High, Good, Medium, Low) for pH, P, K, Mg, Ca, S, B, Cu, Fe, Mn, Zn.

Recommendations — Nutrients expressed in broadcast lbs/A, except Fe (foliar) and Mn (row)

Yr	Crop	CaCO3	N	P2O5	K2O	Mg	S	B	Cu	Fe	Mn	Zn
15	Fir, Canaan	0	40	0	110	39	150	0.50	0	0	0	0

Lime expressed in 100% pure CaCO3. Adjust accordingly. D=Dolomitic. C=Calcitic.

Sulfur: The S recommendation is the total amount needed to reach the desired soil pH. Do not exceed 218 lb S/acre/application or 436 lb S/acre/year on established turf. Do not exceed 300 lb S/acre/year on sandy soils. Sample soils annually to monitor pH change.

Fir, Canaan: For commercial Christmas trees, apply additional 44 lb. N/acre in May of harvest yr. For landscape trees or grass undergrowth, triple the N rate after year 1. Apply any additional Ca as gypsum. Adj. fertilizer rates per annual tissue analysis.

Fir, Canaan: Apply 210 lbs/A Calcium from gypsum and/or fertilizer sources.

Analyzed by Spectrum Analytic Inc.
www.spectrumanalytic.com

HID:0701-0248-9411-0011

AgroEnviroLab

CERTIFICAT D'ANALYSES

Sol

Accrédité par CEAEQ, ISO-CEI 17025 | Accrédité pour pH, pH tmpon, Mat.Org, P, K, Ca, Mg, Cu, Zn, B(Mehlich) par CEAEQ.

Numéro du champ:	1B,1C,1D
Numéro du lab:	273727
Date de réception:	21 juin 12
Date du rapport:	27 juin 12
Méthode:	Extraction Mehlich 3
Numéro d'accréditation:	459
Numéro du certificat:	273727

Provenance
CAE de l'Estrie
4260, boul. Bourque
Sherbrooke
J1N 2A5

Échantillonné le: 14 juin 2012

Échantillon
Plantations Réal Beloin
74 de l'Église
East Hereford
J0B 1S0
Réal Beloin
Par : Caitlin Aubin et Marie-Christine...

Résultat d'analyse — Base sèche — Culture prévue :

Méthode			Incinération					Extraction Mehlich 3 Dosage ICP						
Nom méthode	AEL-I-CHI-005		AEL-ACHI-007	AEL-I-CHI-008				AEL-I-CHI-008	AEL-I-CHI-008			AEL-I-CHI-006		
Éléments	pH eau	tampon	Matière organique	P Phosphore	K Potassium	Ca Calcium	Mg Magnésium	Al Aluminium	P/Al[1-2-3] ISP1	Mn Manganèse	Cu Cuivre	Zn Zinc	B Bore	S Soufre
Unités			%	kg/ha				ppm	%	ppm				
1B,1C,1D	5.3	6.0	9.4	222	192	2 323	182	1 505	6.6	48.4	1.93	6.08	0.26	

Barres de classement : Très riche, Riche, Bon, Moyen bon, Moyen, Pauvre, Très pauvre

1- P/Al Valeur environnementale critique = limite entre bon et riche. Valeurs agronomiques critiques = limite entre pauvre et moyen, et, entre riche et très riche.
2-Si la culture est la canneberge, le calcul est le P / (Al+Fe)   3- Sols Organiques, ISP3: P / (Al+(5*Fe))   TP très pauvre, P pauvre, M moyen, MB moyen bon, B Bon, R riche, TR très riche

Besoins en chaux IVA 100%

Besoins en chaux (t/ha)	9.2
Type de chaux	Calcique

Contrôle qualité
Valeurs attendues: 85 à 115 %

pH	100.1	Na	
M.O.	102.0	S	
P	100.4	B	102.8
K	103.3	Mn	96.0
Ca	104.7	Cu	85.7
Mg	104.7	Zn	94.7
Al	103.2	Fe	

CEC et saturations en bases

CEC (meq/100 g)		19.6	MB
Saturation (%)	Marge moy.		
Potassium	0,3 - 2,0	1.1	B
Calcium	25 - 60	26.5	M
Magnésium	1 - 10	3.5	B
Total des bases	10 - 90	31.0	M
Rapports	Marge moy.		
K/Mg	0,1 - 0,5	0.33	B
K/Ca	,01 - ,06	0.04	B
Mg/Ca	,03- 0,25	0.13	B
Sodium	(ppm)	10	
Ratio d'adsorption du sodium	< 5,0	0.25	

Autres résultats

N total (%)		C / N	
N-NO3 (ppm)		N-NH4 (ppm)	
Conductivité électrique (mmhos/cm)		Fer (ppm)	195
Texture	Sable %	Limon %	Argile %
Classe texturale			
Type de sol			
Densité estimée g/cm3		Moyenne	0.82
Porosité estimée %		Moyenne	67.0
Perméabilité estimée			
Coefficient de perméabilité estimée cm / h			
Coefficient réserve eau utile (CRU) g eau / 100 g sol sec			

Très faible, Faible, Bon, Élevé, Très élevé

Voir votre conseiller pour interprétation des résultats plus spécifique
Résultats applicables aux échantillons soumis à l'analyse seulement. Ce document est à l'usage exclusif du client et est confidentiel, si vous n'êtes pas le destinataire visé, soyez avisé que tout usage, reproduction, ou distribution de ce document est strictement interdit. Ce certificat ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite du laboratoire.

Remarques

1642, de la Ferme, La Pocatière (Québec) G0R 1Z0
Tél. : 418 856.1079   Téléc. : 418 856.6718
Sans frais : 1 866-288-1079
Courriel : agro-enviro-lab@bellnet.ca
www.agro-enviro-lab.com

Michel Champagne, agronome

Karin Arsenault, chimiste

Karin Arsenault 2004-036

Résultat d'analyse — Base sèche — Culture prévue :

Méthode			Incinération	Extraction Mehlich 3 Dosage ICP											
Nom méthode	AEL-I-CHI-005		AEL-I-CHI-007	AEL-I-CHI-006				AEL-I-CHI-008	AEL-I-CHI-008		AEL-I-CHI-006				
Éléments	pH		Matière	P	K	Ca	Mg	Al	P/Al¹⁻²⁻³	Mn	Cu	Zn	B	S
	eau	tampon	organique	Phosphore	Potassium	Calcium	Magnésium	Aluminium	ISP1	Manganèse	Cuivre	Zinc	Bore	Soufre
Unités			%		kg/ha			ppm	%			ppm		
1B,1C,1D	5.3	6.0	9.4	222	192	2 323	182	1 505	6.6	48.4	1.93	6.08	0.26	

1- P/Al   Valeur environnementale critique = limite entre bon et riche. Valeurs agronomiques critiques = limite entre pauvre et moyen, et, entre riche et très riche.

2- Si la culture est la canneberge, le calcul est le P / (Al+Fe)   3- Sols Organiques, ISP 3 : P / (Al+(5*Fe))   TP très pauvre, P pauvre, M moyen, MB moyen bon, B Bon, R riche, TR très riche

Besoins en chaux IVA 100%

Besoins en chaux (t/ha)	9.2
Type de chaux	Calcique

Contrôle qualité
Valeurs attendues: 85 à 115 %

pH	100.1	Na	
M.O.	102.0	S	
P	100.4	B	102.8
K	103.3	Mn	96.0
Ca	104.7	Cu	85.7
Mg	104.7	Zn	94.7
Al	103.2	Fe	

CEC et saturations en bases

CEC (meq/100 g)		19.6	MB
Saturation (%)	Marge moy.		
Potassium	0,3 - 2,0	1.1	B
Calcium	25 - 60	26.5	M
Magnésium	1 - 10	3.5	B
Total des bases	10 - 90	31.0	M
Rapports	Marge moy.		
K/Mg	0,1 - 0,5	0.33	B
K/Ca	,01 - ,06	0.04	B
Mg/Ca	,03- 0,25	0.13	B
Sodium	(ppm)	10	
Ratio d'adsorption du sodium	< 5,0	0.25	

Autres résultats

N total (%)		C / N	
N-NO3 (ppm)		N-NH4 (ppm)	
Conductivité électrique (mmhos/cm)		Fer (ppm)	195
Texture	Sable %	Limon %	Argile %
Classe texturale			
Type de sol			
Densité estimée g/cm3		Moyenne	0.82
Porosité estimée %		Moyenne	67.0
Perméabilité estimée			
Coefficient de perméabilité estimée cm / h			
Coefficient réserve eau utile (CRU) g eau / 100 g sol sec			

Très faible, Faible, Bon, Élevé, Très élevé

Voir votre conseiller pour interprétation des résultats plus spécifique

Remarques

aux IVA 100%		
a)	9.2	
Calcique		

qualité
: 85 à 115 %

Na	
S	
B	102.8
Mn	96.0
Cu	85.7
Zn	94.7
Fe	

CEC et saturations en bases

CEC (meq/100 g)		19.6	MB
Saturation (%)	Marge moy.		
Potassium	0,3 - 2,0	*1.1*	*B*
Calcium	25 - 60	*26.5*	*M*
Magnésium	1 - 10	*3.5*	*B*
Total des bases	10 - 90	*31.0*	*M*
Rapports	Marge moy.		
K/Mg	0,1 - 0,5	0.33	B
K/Ca	,01 - ,06	0.04	B
Mg/Ca	,03- 0,25	0.13	B
Sodium	(ppm)	10	
Ratio d'adsorption du sodium	< 5,0	0.25	

Autre

N total (%)	
N-NO3 (ppm)	
Conductivité électrique (mmhos/cm)	
Texture	S:
Classe texturale	
Type de sol	
Densité estimée	g/
Porosité estimée	
Perméabilité estimé	
Coefficient de perméab estimée	cm
Coefficient réserve eau (CRU) g eau / 100 g so	

Très faible, Faible, Bon,

Analysis Results

Laboratory					
Field Identification		SM-6-Ouest			
Intended crop					
AEL-I-SOL-006	**pH**	4.9 ᴸ			
AEL-I-SOL-007	**Buffer pH**	5.3 ⱽᴸ			
AEL-I-SOL-005	**Org. Mat. %**	4.3 ᴴ			
kg/ha	**P**	23 ⱽᴸ			
kg/ha	**K**	83 ᴸ			
kg/ha	**Ca**	195 ⱽᴸ			
kg/ha	**Mg**	231 ᴴ			
ppm	**Al**	1 674 ⱽᴴ			
ISP	**P/Al***	0.6 ¹			
ppm	**Mn**	13.1 ᴴ			
ppm	**Cu**	0.39 ᴬᴳ			
ppm	**Zn**	2.01 ᴬ			
ppm	**B**	0.22 ⱽᴸ			
ppm	**S**				
ppm	**Fe**	420			
%	**Total N**				
	C / N				
ppm	**N-NH₄**				
ppm	**N-NO₃**				

(Left vertical label: AEL-I-SOL-003+AEL-I-EQP-028)

VL= Very low, L=Low, A=Average, AG=Avg. good, G=Good, H =High, VH=Very High

Soil physical properties

CEC and base saturation

Field No		SM-6-Ouest			
CEC (meq/100g)		21.0 G			
Base	Avg. Margin	**Base saturation**			
K	0,3 - 2,0	0.5 A			
Ca	25 - 60	2.1 L			
Mg	1 - 10	4.1 G			
Total	10 - 90	6.6 L			
Ratio	Avg. Margin	**Ratio between elements**			
K/Mg	0,1 - 0,5	0.11 A			
K/Ca	,01 - ,06	0.22 VH			
Mg/Ca	,03- 0,25	1.97 H			
Other results					
Na / RAS	ppm	<5	3	0.2	
Electric Conductivity	mmhos/cm				

* P/AI   Valeur environnementale critique = limite entre bon et riche. Valeurs agronomiques critiques =   limite entre pauvre et moyen, et, entre riche et très riche.

Estimate	SM-6-Ouest			

om

y High

Liming Needs IVA 100%

Laboratory No				
Field No	SM-6-Ouest			
Intended crop				
Quantity t/ha	17.0			
Type of lime	Calcique			

MULT A

CEC and base saturation

Field No		SM-6-Ouest		
CEC (meq/100g)		21.0 ᴳ		
Base	Avg. Margin	Base saturation		
K	0,3 - 2,0	0.5 ᴬ		
Ca	25 - 60	2.1 ᴸ		
Mg	1 - 10	4.1 ᴳ		
Total	10 - 90	6.6 ᴸ		

OM

Ratio	Avg. Margin	Ratio between elements		

IVA 100%				
14.2				
lcique				

CEC et saturations en bases

CEC (meq/100 g)		22.2	B
Saturation (%)	Marge moy.		
Potassium	0,3 - 2,0	*0.9*	M
Calcium	25 - 60	*16.2*	P
Magnésium	1 - 10	*3.9*	B
Total des bases	10 - 90	*20.9*	P
Rapports	Marge moy.		
K/Mg	0,1 - 0,5	0.24	B
K/Ca	,01 - ,06	0.06	B
Mg/Ca	,03- 0,25	0.24	B
Sodium	(ppm)		15
Ratio d'adsorption du sodium	< 5,0		0.45

15 %	
102.8	
96.0	
85.7	
94.7	

A
N total (%)
N-NO3 (ppm)
Conductivité électrique (mmhos/cm
Texture
Classe tex
Type de
Densité estimé
Porosité estim
Perméabilit
Coefficient de p estimée
Coefficient rése (CRU) g eau /

terprétation des résultats plus spécifique

Très faible, Faib

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