Soil Testing & Plant Analysis

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Soil Testing Lab

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Soil Testing:

Virginia Cooperative Extension
A partnership of Virginia Tech and Virginia State University www.ext.vt.edu
VirginiaTech Invent the Future
VSU Virginia State

- **Used to estimate nutrient availability in the soil and to provide fertilizer and lime recommendations.**
- **Available through Virginia Cooperative Extension and private laboratories.**
- **Routine Soil Test Analysis --**
  - **Soil pH plus plant available levels of P, K, Ca, Mg & various micronutrients and estimated CEC.**

Soil Testing Lab, Virginia Tech

Today, Soil Testing is also Part of Monitoring and Managing Environmental Risk

RUTGERS
New Jersey Agricultural Experiment Station

Components of Soil Testing

- **Sample collection**
- **Analysis**
- **Interpretation**
- **Recommendations & Reporting**

Summary of Sampling Instructions

Back of Form→

↓On Sample Box↓

INSTRUCTIONS FOR SAMPLING SOIL

1. EQUIPMENT NEEDED: SAMPLING TUBE, SPADE, TROWEL, OR AUGER AND CLEAN PLASTIC PAIL.
2. SAMPLES SHOULD BE MADE UP OF AT LEAST 5 SUBSAMPLES OR CORES FROM EACH ACRE REPRESENTED BY THE SAMPLE. SAMPLE TO PLOW DEPTH IN CROP LAND AND THE TOP 2 TO 4 INCHES IN PASTURE OR SOD. MIX SAMPLE THOROUGHLY IN THE PAIL BEFORE THE SAMPLE CARTON IS FILLED WITH SOIL. SAMPLE SHOULD NOT REPRESENT MUCH OVER 10 ACRES.
3. IF THERE ARE VISIBLE DIFFERENCES IN SOILS OR CROP GROWTH IN A FIELD, A SEPARATE SAMPLE SHOULD BE TAKEN FROM EACH UNIFORM AREA. DO NOT TAKE SUBSAMPLES FROM ERODED SPOTS, BACK FURROWS OR SMALL DEPRESSIONS. LARGE AREAS IN A FIELD THAT HAVE BEEN MANURED, LIMED, FERTILIZED, OR OTHERWISE TREATED DIFFERENTLY SHOULD BE SAMPLED SEPARATELY.

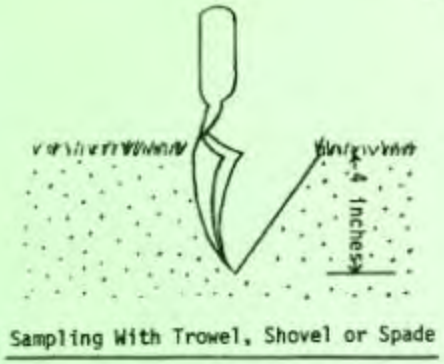
Important:
For test results to be meaningful, use extreme care when taking soil samples. Each sample represents many tons of soil in your lawn or garden. Test results cannot be any more accurate than the sample submitted to the laboratory. **Do not** take samples when the soil is extremely wet.

Sampling Instructions:
Divide your lawn or garden into sampling areas. Each area should be uniform in the kind of soil and in the past fertilizer and lime treatments it has received. An example would be separate samples (areas) for front and back lawns. For **shrubs and trees,** select an area from the trunk to the outer edges of the branches. Take a separate sample from each area as shown in the diagram below.

Use the following procedure for each sampling area:

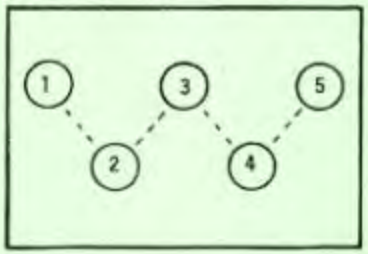
A – Take samples with a trowel, shovel, spade, or auger. Make a vertical cut 4" deep for lawns, or to plowing depth for gardens, and push the soil aside. Then cut a thin slice from the side of the opening that is of uniform thickness, approximately 2" in width, and extending from the top of the ground to the depth of the cut. Scrape away or discard any surface mat of grass or litter and place the slice of soil into a clean bucket or other container. Follow this sampling procedure in 10 or more different locations within each sampling area, each time placing the resulting soil in the same container, giving you a composite sample.

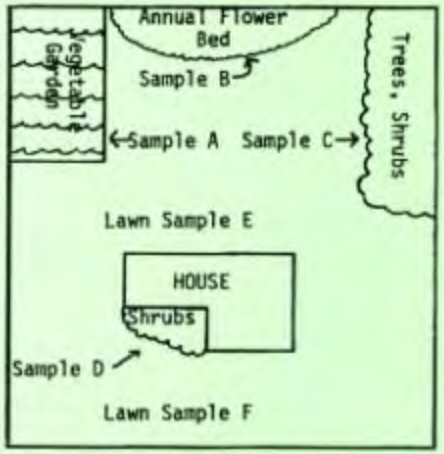
B – Thoroughly mix the soil from the composite sample and then fill the sample box to the top with the mixture. Fill in the information requested on the side of the sample box, including sample number, complete the other side of this sheet, and send sample, sheet, and payment directly to the Soil Testing Laboratory.



Sampling With Trowel, Shovel or Spade

How To Take Composite Samples of Each Bed or Section





Soil Testing Lab, Virginia Tech

www.pubs.ext.vt.edu/452/452-129/452-129.pdf

Virginia Cooperative Extension

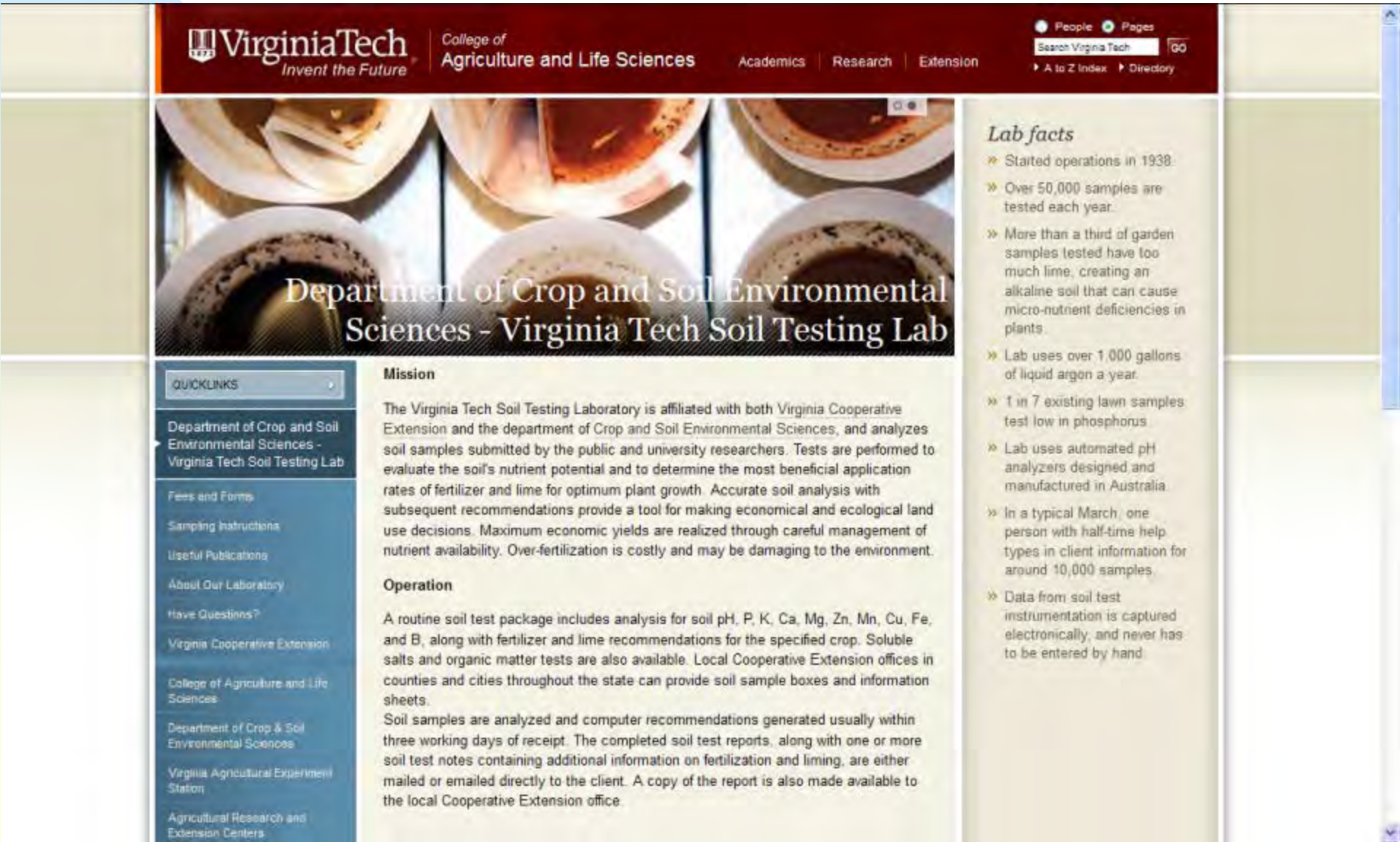
PUBLICATION 452-129

Soil Sampling For The Home Gardener

Joseph R. Hunnings, Extension Specialist, Virginia Tech
Stephen J. Donohue, Extension Specialist, Virginia Tech

A soil test can provide information on the proper amount of lime and fertilizer to apply to your lawn, garden and other areas of your landscape. When gardeners apply only as much lime and fertilizer as is necessary and at the appropriate time, nutrient runoff into surface or ground water is minimized, money is saved, and plant health is optimized.

Lab's web site → www.soiltest.vt.edu




The greatest potential
for error in soil testing
is in taking the sample

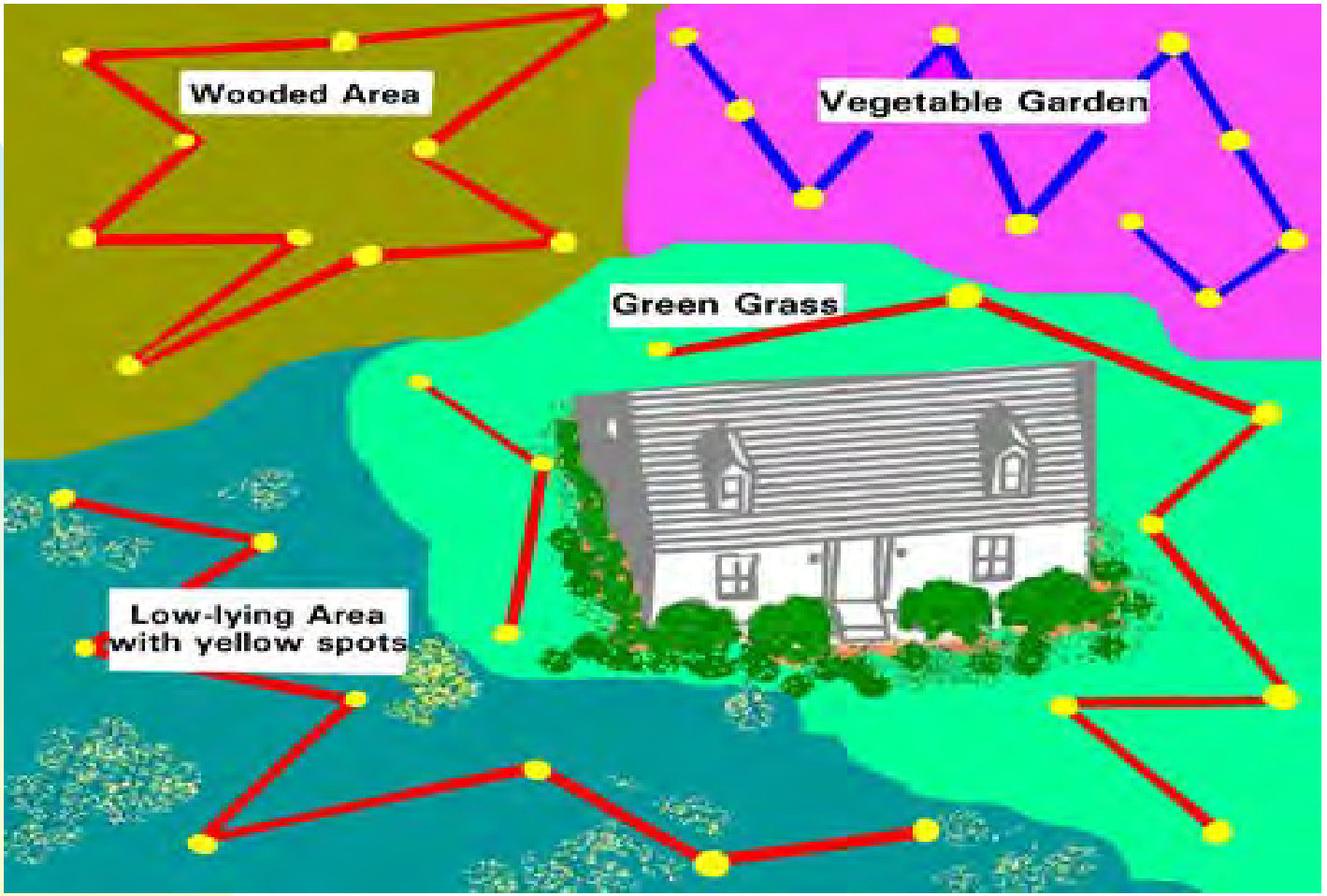
Why do we need to collect a good soil sample?

- **A half to one pound sample must represent, on the average, 2 million lbs of soil per acre being sampled**

MANMH: p. 157

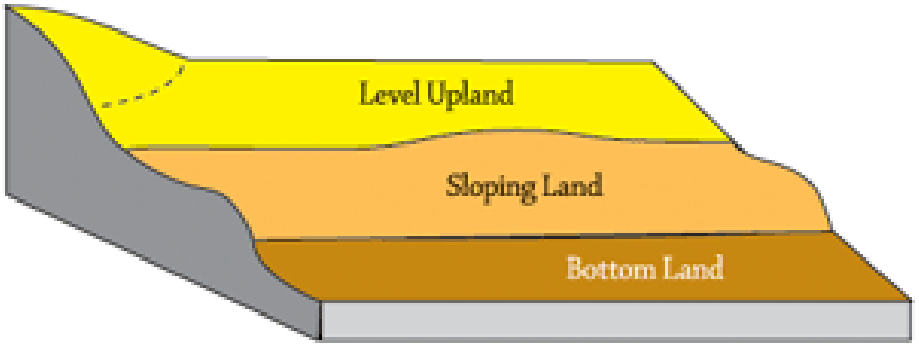
Samples *must* be representative of the area being sampled, thus:

- **One sample should represent just *one* management unit**
- **Separate landscape into *uniform* areas no larger that 10 acres**

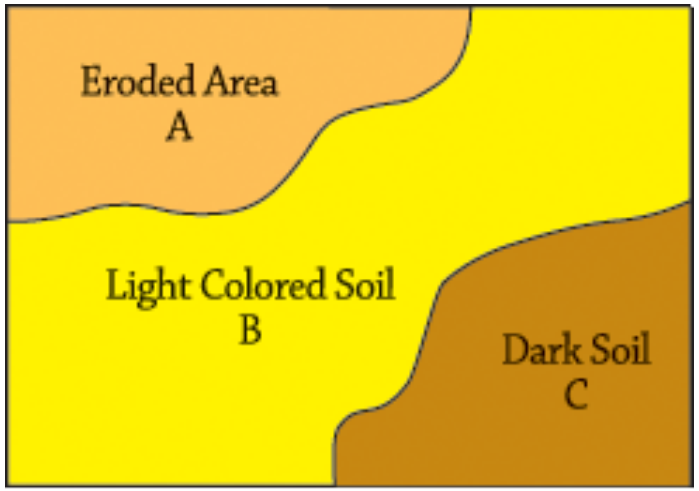


Soil Testing Lab, Virginia Tech

Landscape Position



Soil Color



Samples *must* be representative of the area being sampled, thus:

- **Take separate samples from areas that differ significantly *if* they can and will be managed as different management units**

- **Avoid areas that are *not* representative of the *entire* area, such as old fence rows and other odd spots, including areas influenced by pets, chemicals or other man-made activities**

Soil Testing: Sampling Tools

- **A sampling tube or auger (trowel or spade can be used)**

- **A clean *plastic* container**
- **Laboratory's soil sample containers**

Sampling with a spade or garden trowel

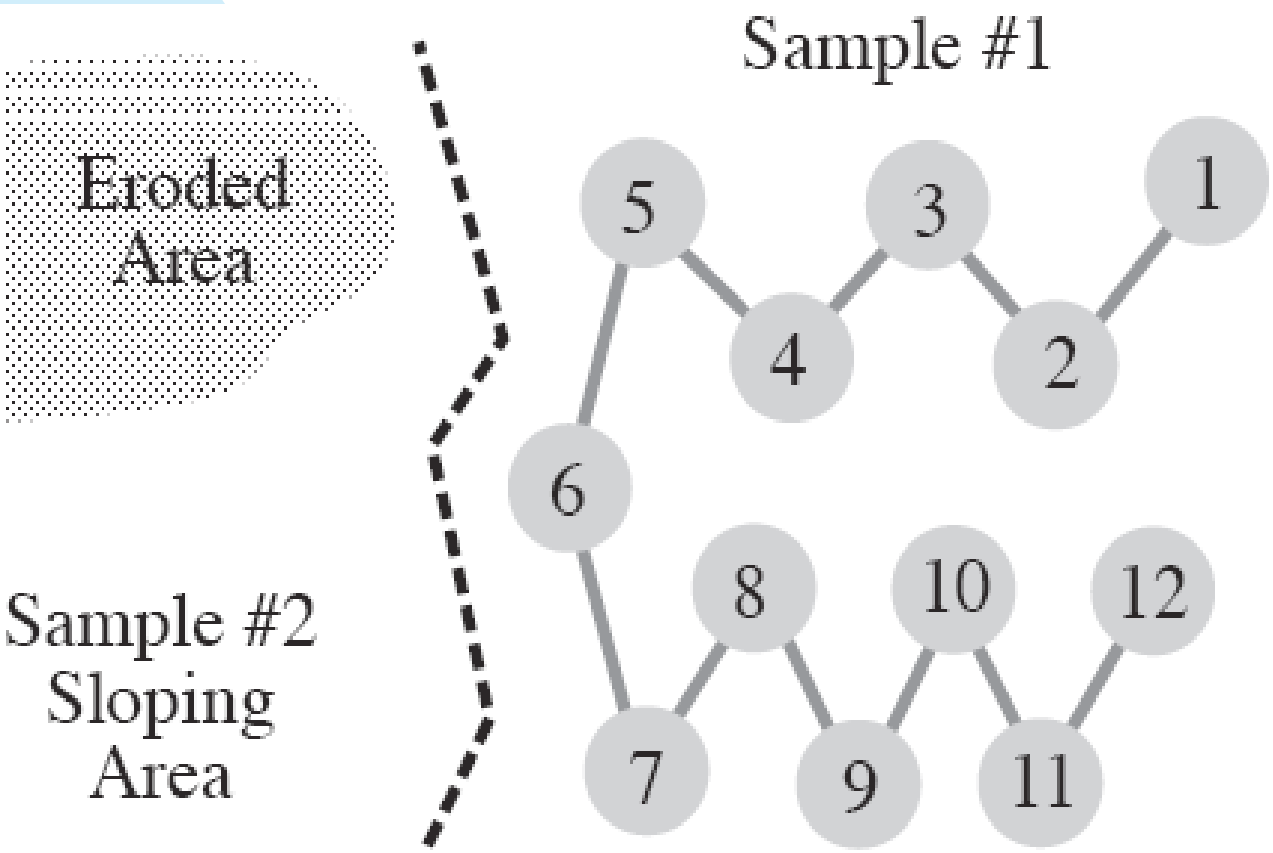
Soil Testing Lab, Virginia Tech

Samples *must* be representative of the area being sampled, thus:

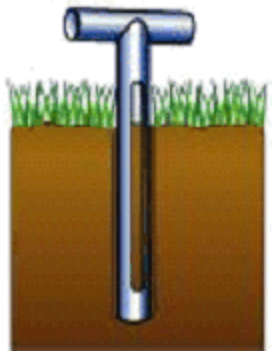
- **Take 10 or more subsamples per sample area**
- **For large acreage, a minimum of 5 cores (subsamples) *per acre* should be collected within a uniform area**

Soil Testing Lab, Virginia Tech

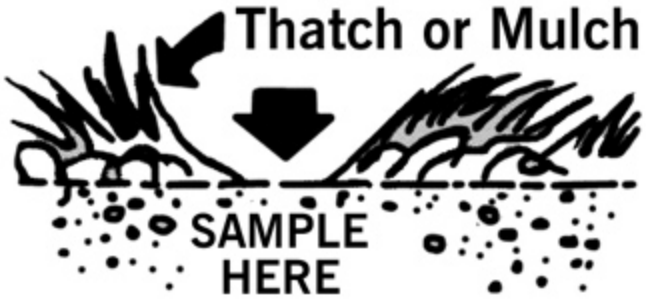
Zig-Zag “Pseudo-Random” Pattern



Sampling Point



Sampling Depth



- **Turf – 2 to 4”, excluded any thatch**
- **Gardens – 6 to 8” or tillage depth**
- **Trees and shrubs – 6” remove any mulch or surface debris**

Soil Testing Lab, Virginia Tech

Additional Guidelines: Soil Sampling

- **Sample before plant establishment!**
- **Areas should be tested at least once every three years**
- **Do not wait until the last minute. Fall is a good time to sample**
- **Recommendations are only as good as the sample collected and information supplied.**

Garbage In ► Garbage Out

Virginia Cooperative Extension — Virginia Tech Soil Testing Laboratory

PUBLICATION 452-125

Soil Sample Information Sheet for Home Lawns, Gardens, Fruits, and Ornamentals

Please Print

INSTRUCTIONS: See other side for sampling instructions. For a recommendation, be sure to fill in the **plant code number.** Place check marks (√) where appropriate. Use another form for commercial crop production. Send samples, forms, and payment to Virginia Tech Soil Testing Lab, 145 Smyth Hall (0465), Blacksburg, VA 24061, in a sturdy shipping carton. Processing will be delayed if soil is not received in an official sample box. See *www.soiltest.vt.edu* for more information.

Your Name: _____

E-mail: _____ Phone: _____

Mailing Address: _____

_____

City: _____ ZIP Code (required): _____

County Where Soil is Located (required): _____

Copy Report To (Consultant, etc.): _____

Their E-mail: _____

Date sampled: _____ MM/DD/YY

Office Use only
Extension Unit Code:

SAMPLE IDENTIFICATION
Your Sample Box Number or Name (Up to 5 digits)

PLANT TO BE GROWN
Insert Plant Code # from list at right

SOIL INFORMATION
Last Lime Application

Months Previous	Pounds per 1,000 sq. ft.
○ –	○ 0
○ 0 – 6	○ 10 – 50
○ 7 – 12	○ 51 – 100
○ 13 – 18	○ 101 – 150
○ 19+	○ 151+

PLANT CODE LIST

Lawn: Kentucky Bluegrass, Fescue, or Ryegrass
201 Establishing New Lawn
202 Maintaining Lawn, Repair of Bare Spots

Lawn: Bermudagrass, Zoysiagrass, or St. Agustine
203 Establishing New Lawn
204 Maintaining Lawn, Repair of Bare Spots

Garden
210 Vegetable Garden
211 Flower Garden
212 Roses

Acid-Loving Shrubs
240 Azaleas
241 Andromedas
242 Camellias
243 Laurel
244 Rhododendron

Non-Acid-Loving Shrubs and Trees
245 Shrubs - Lilac, Forsythia, Boxwood, etc.
246 Trees - Pine, Maple, Oak, etc.

Fruits
220 Apples
221 Blackberries
222 Blueberries
223 Currants
224 Gooseberries
225 Grapes
226 Nectarines
227 Peaches
228 Pears
229 Plums
230 Quince
231 Raspberries
232 Sour Cherry
233 Strawberries
234 Sweet Cherries

House Plants
250 Potted House Plants

SOIL TESTS DESIRED AND FEES	COST PER SAMPLE IN-STATE	COST PER SAMPLE OUT-OF-STATE
☐ Routine (soil pH, P, K, Ca, Mg, Zn, Mn, Cu, Fe, B, and estimated CEC)	$10.00	$16.00
☐ Organic Matter – Determines percentage in soil – no recommendation given	$4.00	$6.00
☐ Soluble Salts – Determines if fertilizer salts are too high	$2.00	$3.00
☐ Fax Results: FAX # (w/ area code): _____	$1.00	$2.00

Send in payment along with soil sample and form; make check or money order payable to *"Treasurer, Virginia Tech."*

Please fill out the following form.

"Writeable" Forms Available Online at www.soiltest.vt.edu

under "Fees and forms"

Soil Testing Lab, Virginia Tech

Soil Testing Office

Soil Testing Lab, Virginia Tech

Virginia Cooperative Extension

Virginia Tech
Soil Testing Laboratory

PUBLICATION 452-125

Soil Sample Information Sheet for Home Lawns, Gardens, Fruits, and Ornamentals

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Your Name: _____

E-mail: _____ Phone: _____

Mailing Address: _____

_____

City: _____ ZIP Code (required): _____

County Where Soil is Located (required): _____

Copy Report To (Consultant, etc.): _____

Their E-mail: _____

Date sampled: _____ MM/DD/YY

Office Use only
Extension Unit Code:

Soil Testing Lab, Virginia Tech

FILL TO HERE!
WITH LOOSE SOIL

DO NOT OVERFILL

YOUR NAME _____

YOUR SAMPLE ID | | | | | |

(NO MORE THAN 5 DIGITS OR LETTERS)

Name & Sample ID on box = what's on form

SAMPLE IDENTIFICATION

Your Sample Box Number or Name
(Up to 5 digits)

PLANT TO BE GROWN

Insert Plant Code # from list at right

SOIL INFORMATION

Last Lime Application	
Months Previous	Pounds per 1,000 sq ft.
☐ —	☐ 0
☐ 0 – 6	☐ 10 – 50
☐ 7 – 12	☐ 51 – 100
☐ 13 – 18	☐ 101 – 150
☐ 19+	☐ 151+

PLANT CODE LIST

Lawn: Kentucky Bluegrass, Fescue, or Ryegrass

201 Establishing New Lawn
202 Maintaining Lawn, Repair of Bare Spots

Lawn: Bermudagrass, Zoysiagrass, or St. Agustine

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Garden

210 Vegetable Garden
211 Flower Garden
212 Roses

Acid-Loving Shrubs

240 Azaleas
241 Andromedas
242 Camellias
243 Laurel
244 Rhododendron

Non-Acid-Loving Shrubs and Trees

245 Shrubs - Lilac, Forsythia, Boxwood, etc.
246 Trees - Pine, Maple, Oak, etc.

Fruits

220 Apples
221 Blackberries
222 Blueberries
223 Currants
224 Gooseberries
225 Grapes
226 Nectarines
227 Peaches
228 Pears
229 Plums
230 Quince
231 Raspberries
232 Sour Cherry
233 Strawberries
234 Sweet Cherries

House Plants

250 Potted House Plants

Virginia Cooperative Extension

Virginia Tech
Soil Testing Laboratory

PUBLICATION 452-128

Soil Sample Information Sheet for Golf Courses and Industrial Lawns

Please Print

INSTRUCTIONS: For a recommendation, be sure to fill in the turf code number. Place check marks (√) where appropriate. Use another form for commercial sod production. Send samples, forms, and payment to Virginia Tech Soil Testing Lab, 145 Smyth Hall (0465), Blacksburg, VA 24061, in a sturdy shipping carton. Processing will be delayed if soil is not received in an official sample box. See *www.soiltest.vt.edu* for more information.

Your Name: _____

E-mail: _____ Phone: _____

Mailing Address: _____

_____

City: _____ ZIP Code (required): _____

County Where Soil is Located (required): _____

Copy Report To (Consultant, etc.): _____

Their E-mail: _____

Date sampled: _____ MM/DD/YY

Office Use only
Extension Unit Code:

SAMPLE IDENTIFICATION

Your Sample Box Number or Name
(Up to 5 digits)

PLANT TO BE GROWN

Insert Plant Code # from list at right

SOIL INFORMATION
Last Lime Application

Months Previous	Rate Tons/Acre
◯ –	◯ 0
◯ 0 – 6	◯ 0.1 – 1.0
◯ 7 – 12	◯ 1.1 – 2.0
◯ 13 – 18	◯ 2.1 – 3.0
◯ 19+	◯ 3.1+

TURF CODE LIST

80 Putting Greens, Bentgrass
81 Putting Greens, Bermudagrass
82 Tees, Bentgrass
83 Tees, Bermudagrass
84 Fairways - Kentucky Bluegrass, Fescue
85 Fairways - Bermudagrass
86 Athletic Fields - Kentucky Bluegrass, Fescue
87 Athletic Fields - Bermudagrass
88 Industrial Lawns - Kentucky Bluegrass, Fescue
89 Industrial Lawns - Bermudagrass

SOIL TEST DESIRED AND FEES	COST PER SAMPLE IN-STATE	COST PER SAMPLE OUT-OF-STATE
☐ Routine (soil pH, P, K, Ca, Mg, Zn, Mn, Cu, Fe, B, and estimated CEC)	$10.00	$16.00
☐ Organic Matter	$4.00	$6.00
☐ Soluble Salts	$2.00	$3.00
☐ Fax Results: FAX # (w/area code) _____	$1.00	$2.00

Method of Payment: ☐ Check Enclosed *or* ☐ Bill my Business FIN or SS# required for billing _____

Send in payment along with soil sample and form; make check or money order payable to *"Treasurer, Virginia Tech."*

Drying Samples

- If a soil sample is wet, then
  - Allow it to air-dry

  - Do **not** oven-dry

Certified Crops Advisors Sample Exam Question

The most precise component in a soil testing program is normally:

- A. sampling
- B. laboratory analysis
- C. extrapolation
- D. interpretation and recommendations

Soil Testing – Analysis Prep

Soil Testing – Nutrient Extraction

Soil Testing: Analysis of Samples

- **Extractants will vary from one lab to another!!!**
- **Using different extracts will results in different numbers being reported for the same nutrient!**

Selected Common Soil Test Extractants

Extractant	Composition	Nutrient	Source
Mehlich I	0.05 M HCl + 0.0125 M H_2SO_4	P	Fe/Al & Ca bound
Mehlich III	0.015 M NH_4F + 0.2 M CH_3COOH + 0.25 M NH_4NO_3 + 0.001 M EDTA+ 0.013 M HNO_3	P	Fe/Al & Ca bound
Bray P_1 *or* Weak Bray	0.03 M NH_4F + 0.025 M HCl	P	Fe/Al bound
Bray P_2	0.03 M NH_4F + 0.1 M HCl	P	
Olson	0.5 M $NaHCO_3$	P	Ca bound
Ammonium Acetate	NH_4OAc	K	Exchangeable

First Soil Fertility Test

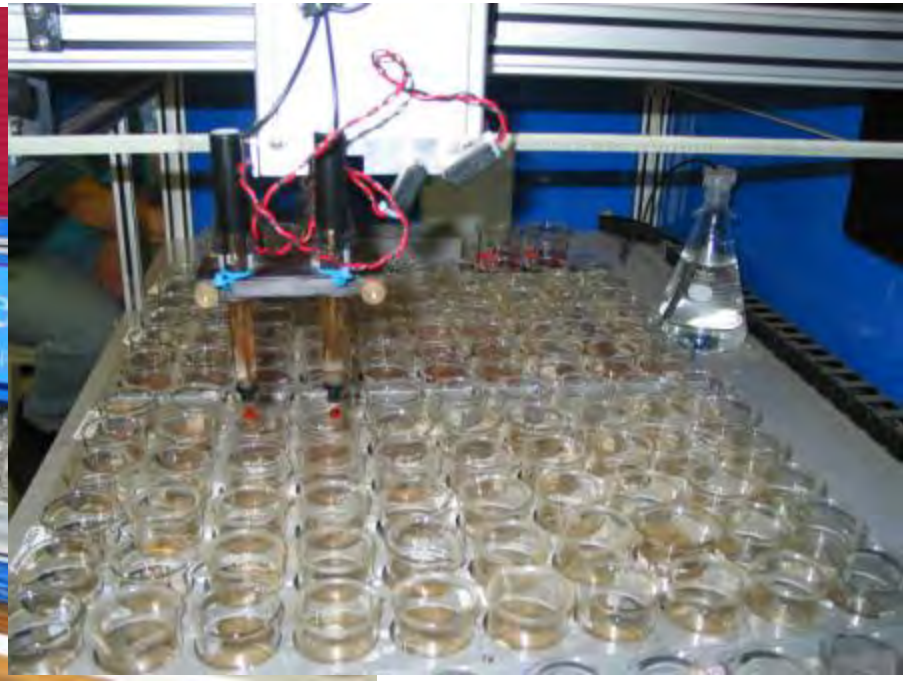
50 B.C.

Columella recommended the **Taste Test** to measure acidity and salinity of soils.

Soil Testing – Nutrient Analysis

Soil Testing Lab, Virginia Tech

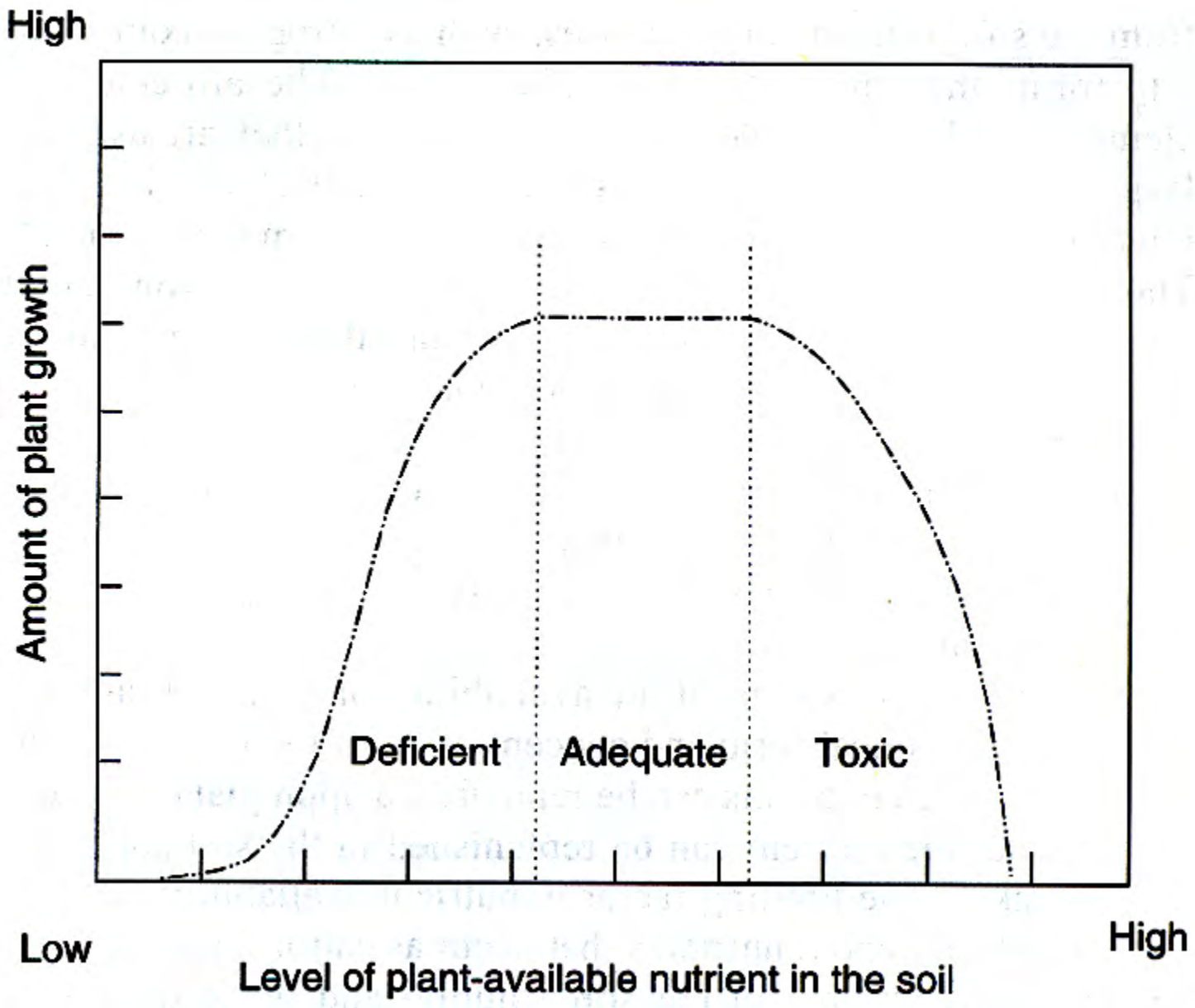
Soil Testing – pH Measurement



Soil Testing Lab, Virginia Tech

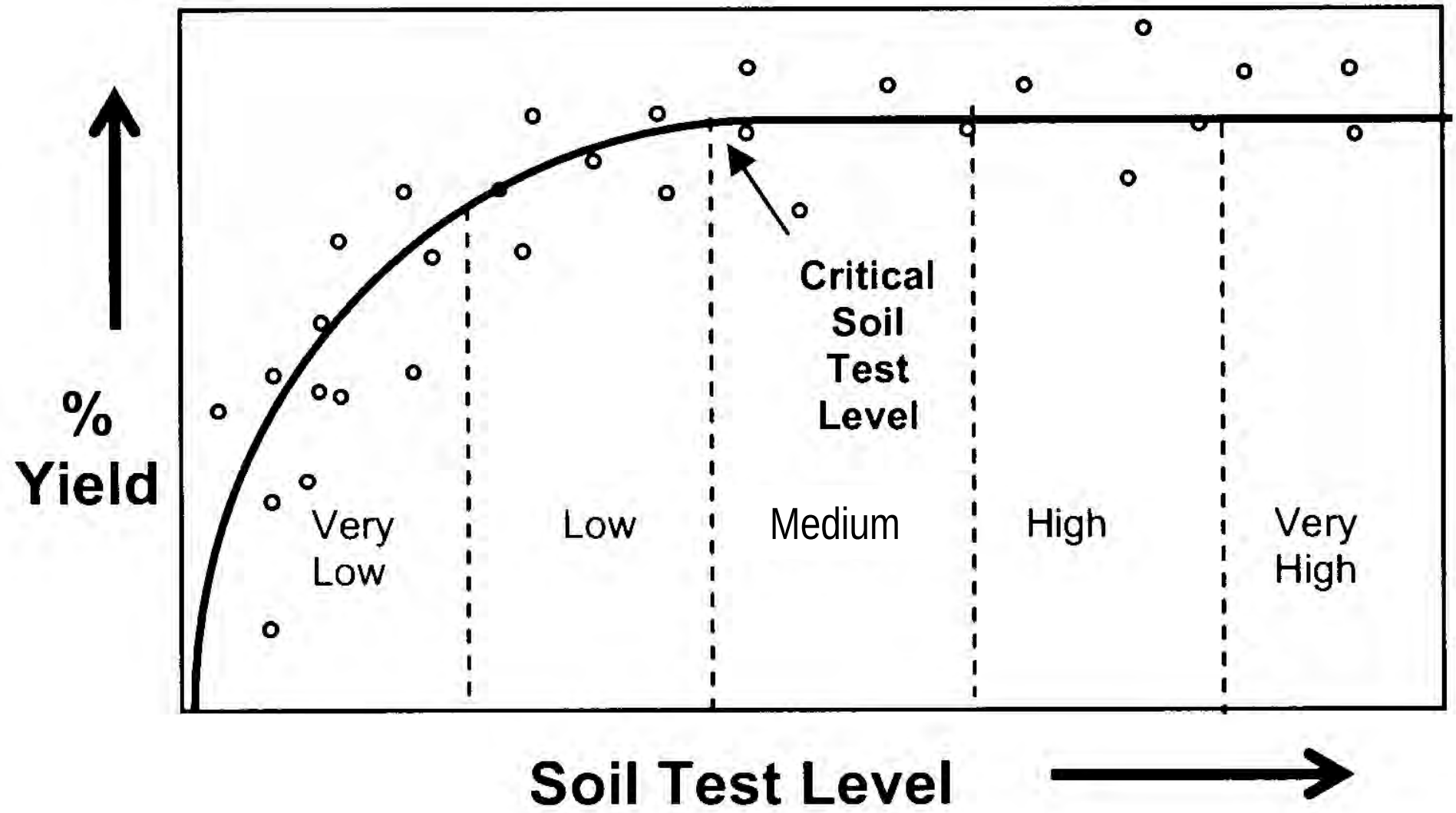
Components of Soil Testing

- **Sample collection**
- **Analysis**
- **Interpretation – Sufficient, Low, etc.**
- **Recommendations – Fertilizer and Lime Needs**



Soil Testing Lab, Virginia Tech

Calibration Curve



Soil Testing Lab, Virginia Tech

pubs.ext.vt.edu/

Virginia Cooperative Extension

PUBLICATION 424-035

Fertilizer Types and Calculating Application Rates

Rory Maguire, Assistant Professor, Crop and Soil Environmental Sciences, Virginia Tech
Mark Alley, W. G. Wysor Professor, Crop and Soil Environmental Sciences, Virginia Tech
Webb Flowers, Extension Agent, Agriculture and Natural Resources/Animal Science, Carroll County

Introduction

Crop production has increased dramatically over the last few decades, much of which has been due to the widespread introduction of chemical fertilizers starting in the mid-1900s. Matching fertilizer application rates to crop needs is an essential component of optimizing crop production. However, different crops in separate fields will require varying rates of the major nutrients – nitrogen (N), phosphate (P_2O_5), and potassium (potash, K_2O) – due to variations in soil types, soil test phosphorus and potassium levels, and nutrient ranges of

Calculating Nutrient Requirements

The first step in applying the correct rate of fertilizer is calculating crop nutrient requirements. A soil test is the only way to measure how much P_2O_5 and K_2O are available in soils, and soil tests are available through several private and public laboratories. An explanation of how to perform soil tests and interpret results is available at *www.soiltest.vt.edu*.

Applications of P_2O_5 and K_2O may not be required annually, depending on how much is available in par-

P & K Recommendations: VT STL

- **Phosphorus:**
  - **L+, L, L- (<12 lb/a) – Critical Level**
- **Potassium:**
  - **L, L- (<56 lb/a) – critical value**
  - **Loamy sands and sandy loams, K will tend to leach and accumulate in the subsoil. If plant roots can reach this K, then K may not be a problem despite a low test level in the top several inches**

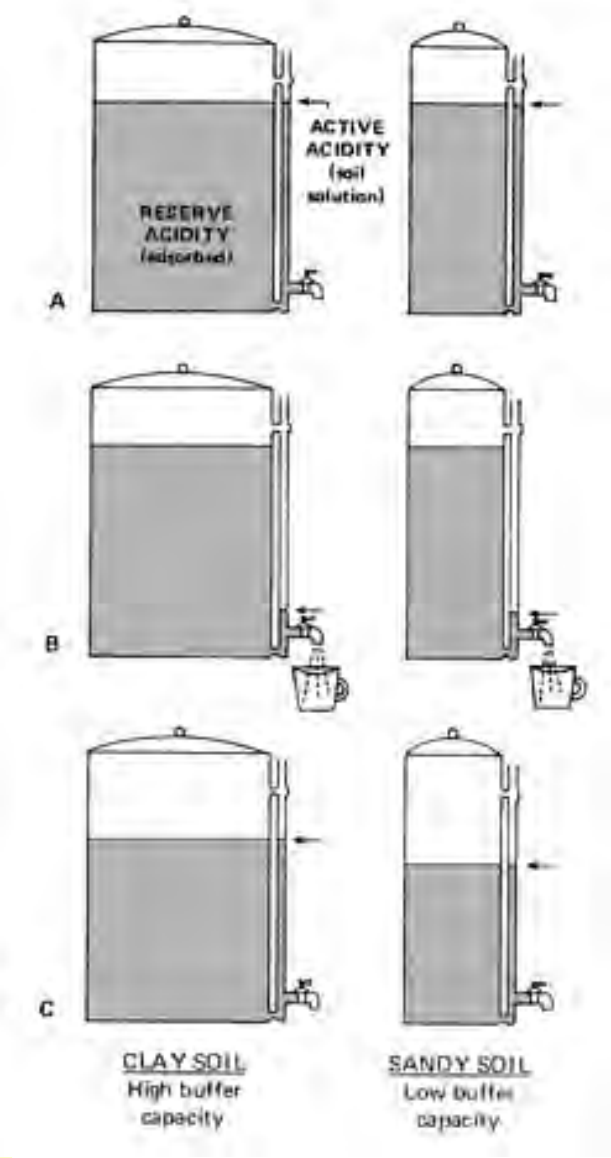
Ca & Mg Recommendations: VT STL

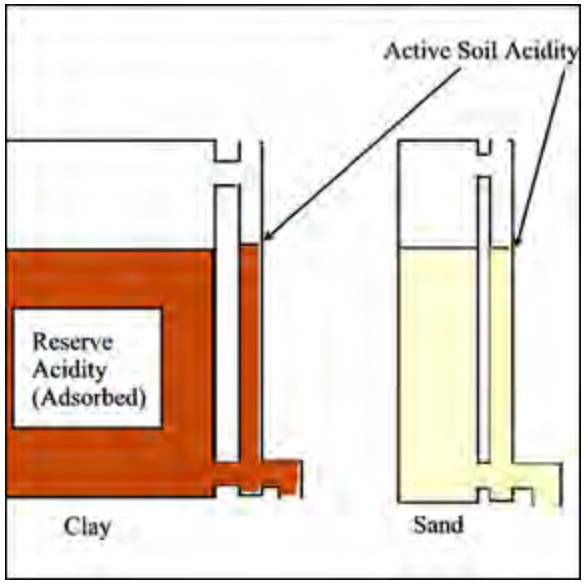
- **Calcium:**
  - **L^- - deficient for peanuts**
  - **L^- - may not be deficient for other plants, but pH is normally too low for optimum growth**
- **Magnesium:**
  - **L^- - critical level for coastal plain soils**
  - **L^-, L – critical level for Piedmont & Appalachian soils**
  - **Apply dolomitic limestone if pH is low**
  - **If pH is optimum, apply 30 lbs Mg/A**

What's Needed to Make a Lime Recommendation

- **Crop Code sets Target pH - where you want to be.**
- **Soil (water) pH tells where you are.**
- **Amount of Exchangeable/Residual Acidity (Buffering Capacity of Soil) tells how much lime is needed to get from WpH to TpH**

More Clay = ↑ CEC = ↑ Exch. Acidity


ACTIVE ACIDITY (soil solution)
RESERVE ACIDITY (adsorbed)
A
B
C
CLAY SOIL
High buffer capacity
SANDY SOIL
Low buffer capacity


Active Soil Acidity
Reserve Acidity (Adsorbed)
Clay
Sand

VNMS&C:
p. 44

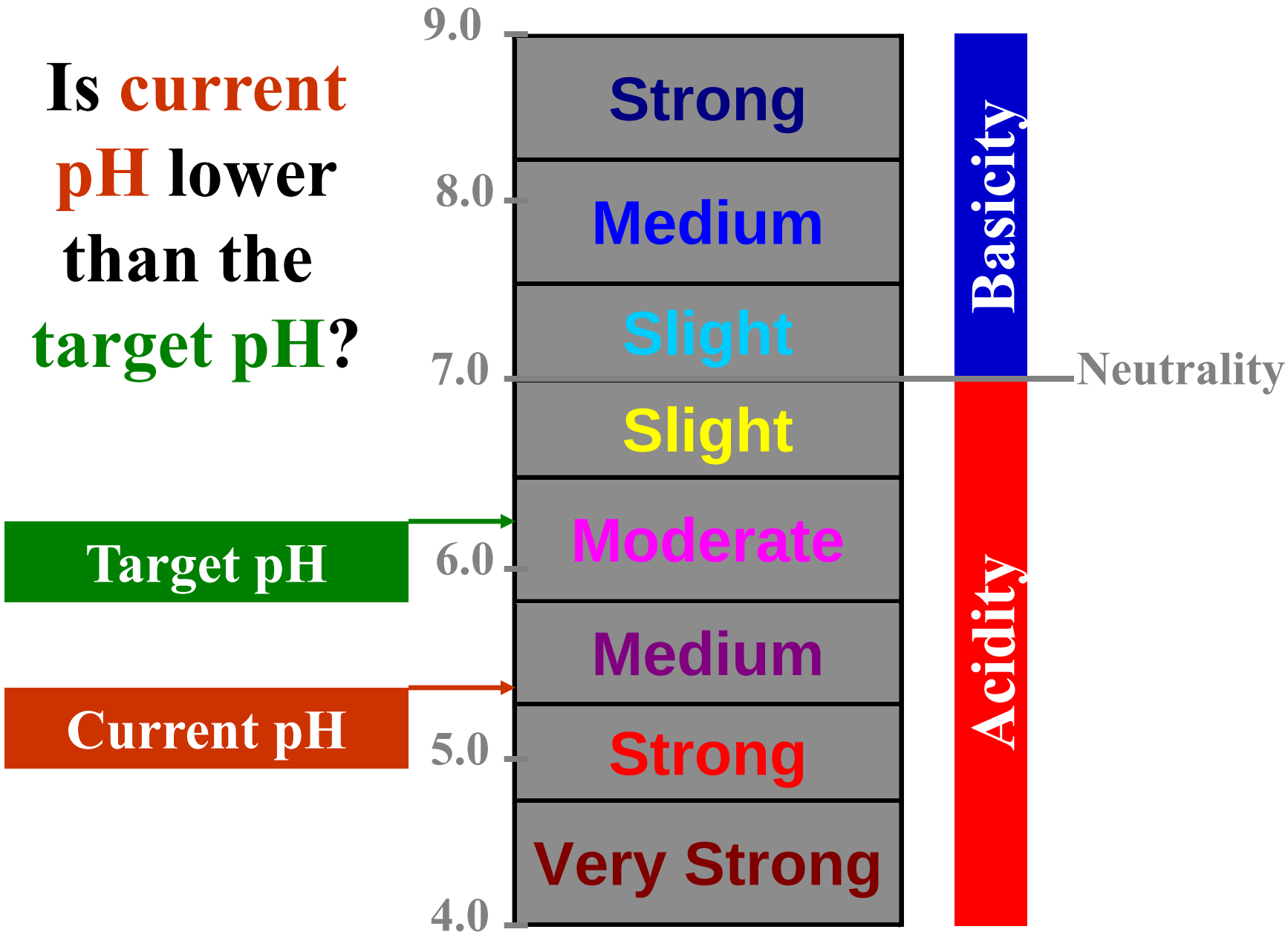
Lime Recommendations

BpH of Unlimed Soil	Target pH 5.2	6.2	6.8
	------ lime, T/A -----		
6.60	0.00	0.00	0.00
6.30	0.00	0.50	1.00
6.00	1.00	2.00	2.75
5.70	2.25	3.75	4.50
5.40	3.75	5.25	6.25

VT Lime Recommendations are Based on the Following Factors:

- 1. Crop to be Grown (sets target pH)
- 2. Soil [water] pH (plays a small role)
- 3. Soil Buffer [pH] Index (measures total acidity / buffering capacity of soil)
- 4. Credit For Previous Lime Application

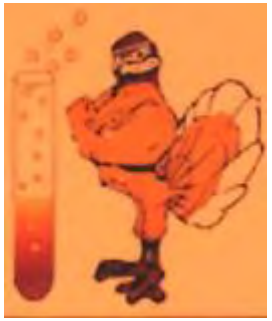
Is current pH lower than the target pH?



MANMH: p. 47

Important to Know the Method!

- Different buffer solutions (Initial pH):
  - Mehlich (6.6 pH)
  - Woodruff (7.0 pH)
  - SMP (7.5 pH)
  - Sikora (7.7 pH)
  - Adams-Evans (8.0 pH)



Note that a lot of other buffer readings will be higher than Mehlich BpH's starting pH. So if a BpH is > 6.6, then it is probably not a Mehlich buffer value.

Virginia Cooperative Extension

Soil Test Report

Augusta County Office
County Government Center
POB 590
Verona, VA 24482-0590
540-245-5750

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

SEE ENCLOSED NOTES:
1 3

OWNER
PHARMER JOE
123 RURAL RD

PENDROSS, VA 23648

DEPOT
MY FERTILIZER DEALER
P O BOX 111
ROCKFORD, VA 23648

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
OCF11	4463	Orchardgrass/Fescue-Clover Pasture (40)		18+		40B2 100				III

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	9	95	1408	209	1.2	10.3	0.3	4.4	0.5	
Rating	L+	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	5.7	6.21	5.6	20.1	79.9	62.5	15.3	2.2	3.6

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: Orchardgrass/Fescue-Clover Pasture (40)

Lime, TONS/AC		Fertilizer, lb/A		
Amount	Type	N	P2O5	K2O
1	AG	50	40	50

825. If stand contains less than 25 per cent clover, apply 40-60 lbs N/A.

131. If additional production is needed later on, apply 40 to 60 lbs/A of N during the grazing season. If you are planning to overseed a legume into the stand, omit the N recommendation.

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		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
325AW	NEWSAWMILL	Wheat (6)		18+	0.1-1.0	16B 75	4B 25			II

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	7	156	982	119	1.4	13.7	0.3	42.1	0.2	384
Rating	L	M+	M	M	SUFF	SUFF		SUFF	SUFF	L

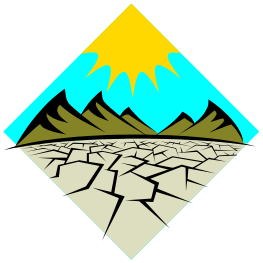
Analysis	Soil pH	Buffer pH	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	5.2	5.99	5.6	43.7	56.4	44.0	8.8	3.6	3.8

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Virginia Tech

Soil Testing Lab, Virginia Tech

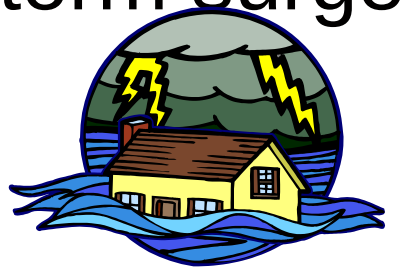
Soluble Salts Test $2 Not Normally Needed



- Container Grown
- Band fertilizer too close to the seed
- Drought
- Salts from external source

(over-fertilize, groundwater, VDOT, cleaning chemicals)

- Ocean salt from storm surges and brackish waters



Soil Organic Matter Test

$4

- Not normally needed
- Farmers use to adjust herbicide rates
- To know more precisely the amount – to verify contract specifications
- To compare levels at different times
- Requested most on garden samples

Other Reported Values

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
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Crop: Orchardgrass/Fescue-Clover Pasture (40)

Lime, TONS/AC	
Amount	Type
1	AG

Fertilizer, lb/A		
N	P205	K20
50	40	50

Virginia Tech

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QUICKLINKS

Department of Crop and Soil Environmental Sciences - Virginia Tech Soil Testing Lab

- Fees and Forms
- Sampling Instructions
- Useful Publications
- About Our Laboratory
- Have Questions?
- Virginia Cooperative Extension

- College of Agriculture and Life Sciences
- Department of Crop & Soil Environmental Sciences
- Virginia Agricultural Experiment Station
- Agricultural Research and Extension Centers
- Virginia Cooperative Extension
- Extension Local Offices

Useful Publications

Extension Handbooks

Homeowner | Commercial

Explanation of soil tests *note1*
Lawn fertilization for cool season grasses *note 17*
Lawn fertilization for warm season grasses *note 18*
Vegetable & flower gardens *note 19*
Home shrubs & trees note 20
Home fruit trees (PDF | 46KB) *note 21*
Small fruits for home use (PDF | 52KB) *note 22*
Turf & garden tips

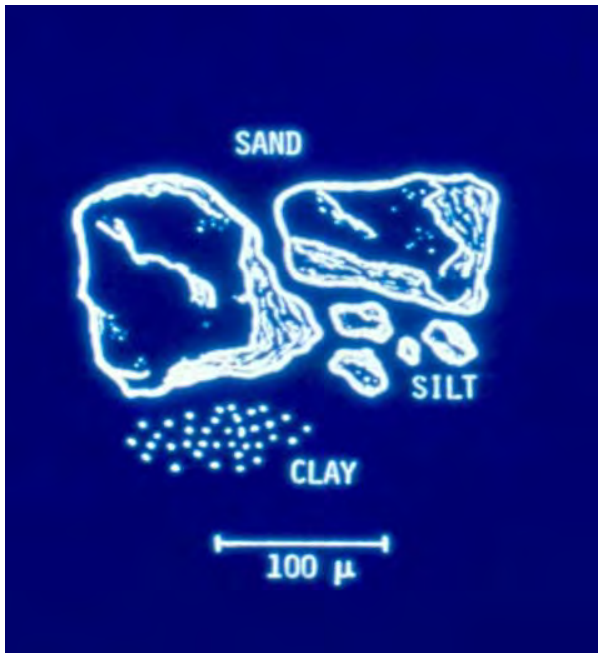
Other Publications

Most of the soil test notes listed in the upper right corner of soil test reports can be located by searching the VCE Publications & Resources site.For example, enter *soil test note 17* in the search box.

www.soiltest.vt.edu

Soil Components

- Sand
  - No Electrical Charge (Neutral)
- Silt
  - No Electrical Charge (Neutral)
- Clay
  - ***Negative*** Electrical Charge

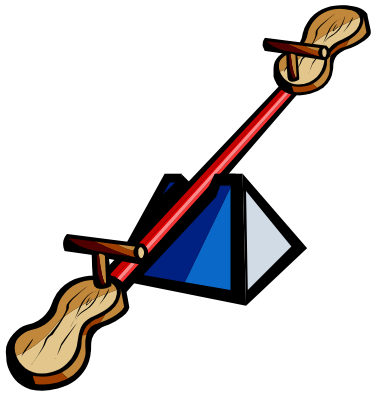


Est.-CEC suggests ballpark clay content of soil.

“Balancing the Soil”

As in the Basic Cation Saturation concept , is the approach a soil should contain a certain percentage of each of the basic cations, to be “balanced”.

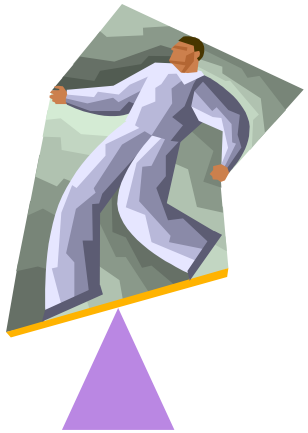
(e.g., 65-75% Ca, 10-12% Mg, 2-5% K)



~~"Balancing the Soil"~~

- **VT subscribes to the "sufficiency level" concept and not the "basic cation saturation" idea.**

- **The "Balancing" approach has not stood up well under scrutiny.**



Virginia Cooperative Extension
Soil Test Report

Augusta County Office
County Government Center
POB 590
Verona, VA 24482-0590
540-245-5750

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

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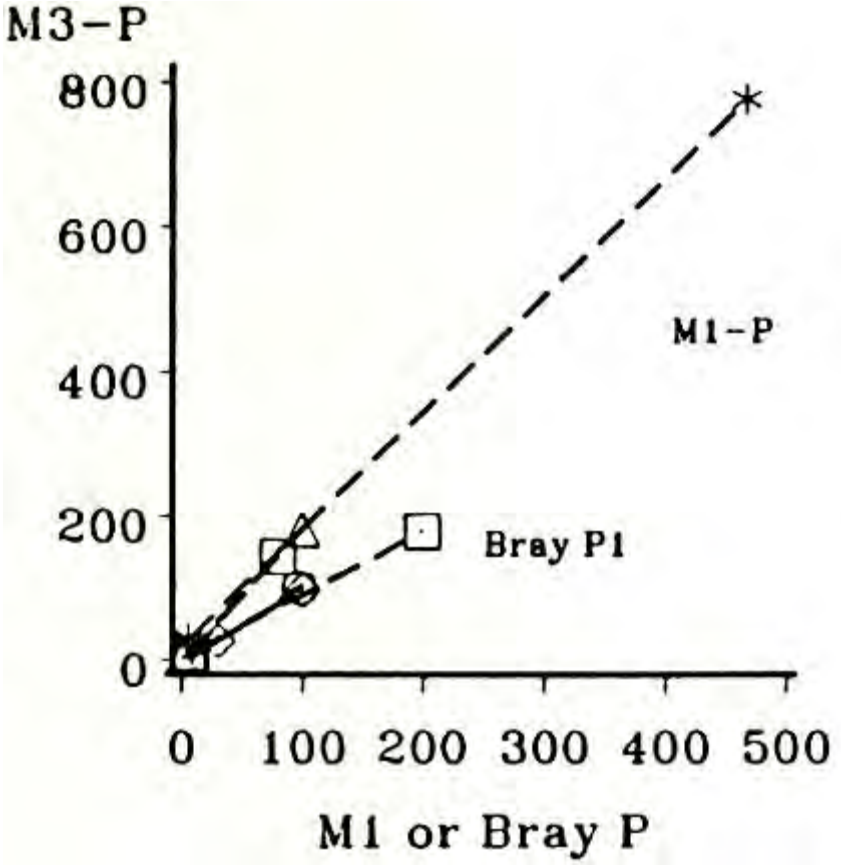
Common Conversions

$P \times 2.3 = P_2O_5$	$P_2O_5 \quad 2.3 = P$
$K \times 1.2 = K_2O$	$K_2O \quad 1.2 = K$
$NO_3^- \quad 4.4 = NO_3^-\text{-}N$	$NO_3^-\text{-}N \times 4.4 = NO_3^-$
ppm x 2 = lb/A	lb/A 2 = ppm

Labs report values in different forms and units!

Using Results from other Soil Testing Laboratories

- **Results from other labs must be converted to Virginia Tech values so that recommendations can be made based on VALUES recommendations.**



J. T. Sims (1989)

Report Number:
R06030-0140

Account Number:
88888

A&L Eastern Laboratories, Inc.

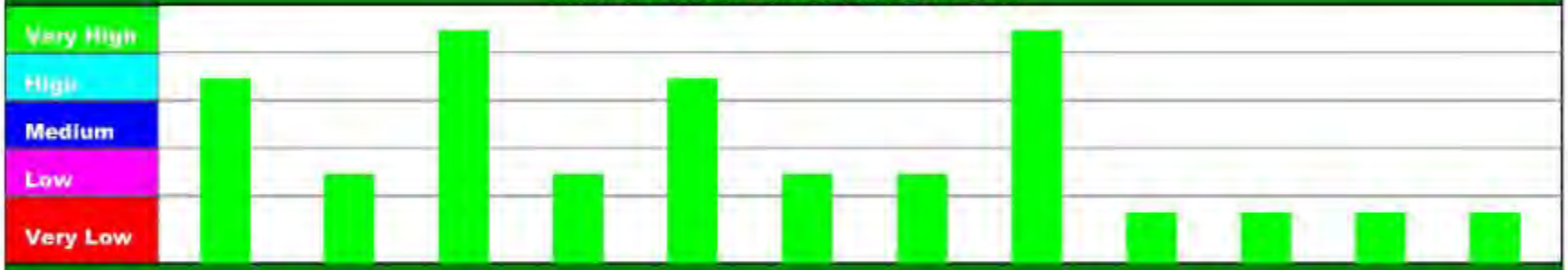
7621 Whitepine Road Richmond, Virginia 23237 (804) 743-9401
Fax No. (804) 271-6446 Email: office@al-labs-eastern.com

Send To: Isle of Wight Business
11111 Round Cir
Suite Z
Isle of Wight, VA 23397

Grower: JOE PHARMER

Sample Number: FAIR L1 **Lab Number:** 3786 **Date Received:** 1/27/2006 **Date Reported:** 1/31/2006

GRAPHIC SOIL ANALYSIS REPORT



TEST RESULTS	P	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B	Na	Soluble Salts
	Phosphorus	Potassium	Magnesium	Calcium	Sulfur	Zinc	Manganese	Iron	Copper	Boron	Sodium	
ppm	56	62	270	478	29	1.4	5	544	0.3	0.1	23	0.2

pH	ACIDITY	C.E.C.	PERCENT BASE SATURATION					ORGANIC MATTER	NITRATE	CHLORIDE			
Soil pH	H meq/100g	meq/100g	K %	Mg %	Ca %	Na %	H %	%	NO3-N ppm	Cl ppm			
5.6	1.5	6.4	2.5	35.2	37.4	1.6	23.3	4.2					

CROP	YIELD GOAL	SOIL FERTILITY RECOMMENDATIONS - POUNDS PER 1,000 SQUARE FEET											
		Lime	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper	B Boron	
Centipede & Carpet		15	1.0	0.5	2	0.00	0.00	0.00	0.00	0.00	0.02	0.00	

Soil Testing → Plant Analysis

MANMH: p. 180-185

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Tissue Testing

- **Most commonly used to diagnose nutritional problems related to poor growth or color, or to monitor the effectiveness of fertilizer practices on growing plants.**
- **Not a substitute for soil testing.**
- **Most effective when used in conjunction with a regular soil testing program.**

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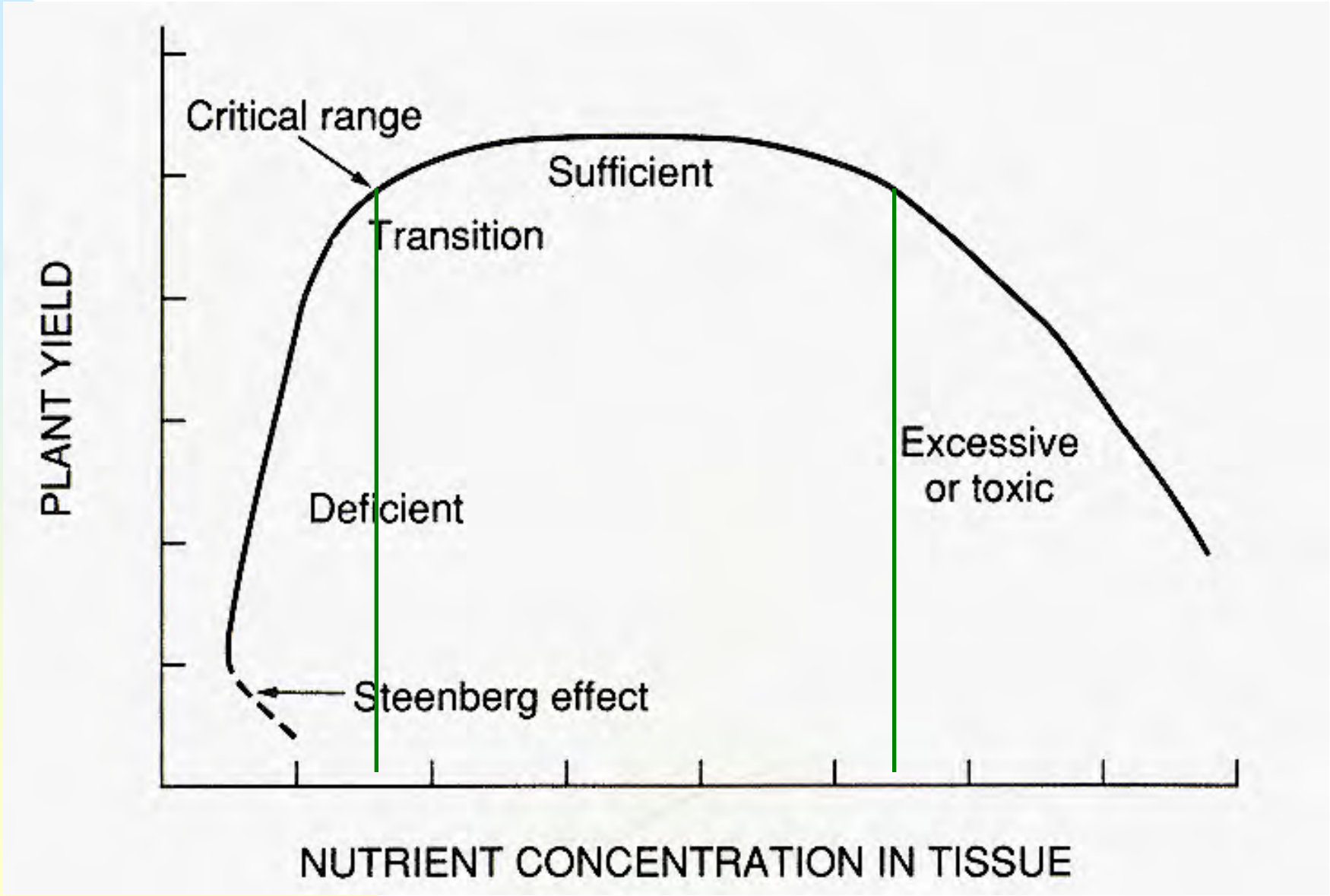

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Tissue Testing – Sample Collection

- **Proper sampling requires that a specific plant part be taken (particular leaf, group of leaves or portion of the plant)**

Tissue Testing – Sample Collection

- **If no instructions are available – general rule of thumb is to sample the upper, most recently mature, fully developed leaf**

Ornamentals and Flowers			
Crop	**When to Sample**	**Where to Sample**	**Quantity**
Carnations	Newly planted Established	4th-5th leaf pair from base 5th-6th leaf pair from base	20-30 20-30
Chrysanthemums	Before/at bloom	Top leaves on flowering stem	20-30
Ornamental trees and Shrubs	Current year's growth	Recently mature leaf	30-70
Pionsettias	Before/at bloom	Recently mature leaf	15-20
Roses	At bloom	Recently mature compound	15-20
Turf	Active growth	Leaf blades. Avoid soil contamination	2 cups

Tissue Testing – Sample Collection

- **DO NOT COLLECT:**
  - **Diseased or dead plant material**
  - **Materials damaged by insects or mechanical injury**
  - **Plant that have been under nutrient stress for an extended period of time.**

- **If a nutrient deficiency is expected:**
  - **Collect samples from affected area and from normal plants in the immediate or adjacent areas**

Tissue Testing

- **If leaves are dusty:**
  - **brush or wipe with a damp cloth to remove contaminates**

  or

  - **Wash in a mild detergent and rinse in running water.**

- **Air-Dry tissue samples before shipment to the laboratory**

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VCE's web site → www.ext.vt.edu or pubs.ext.vt.edu/

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