Fine Tuning Fertilizer Applications for Small Fruit

Mary Concklin
Extension Educator Emerita
Fruit Production & IPM

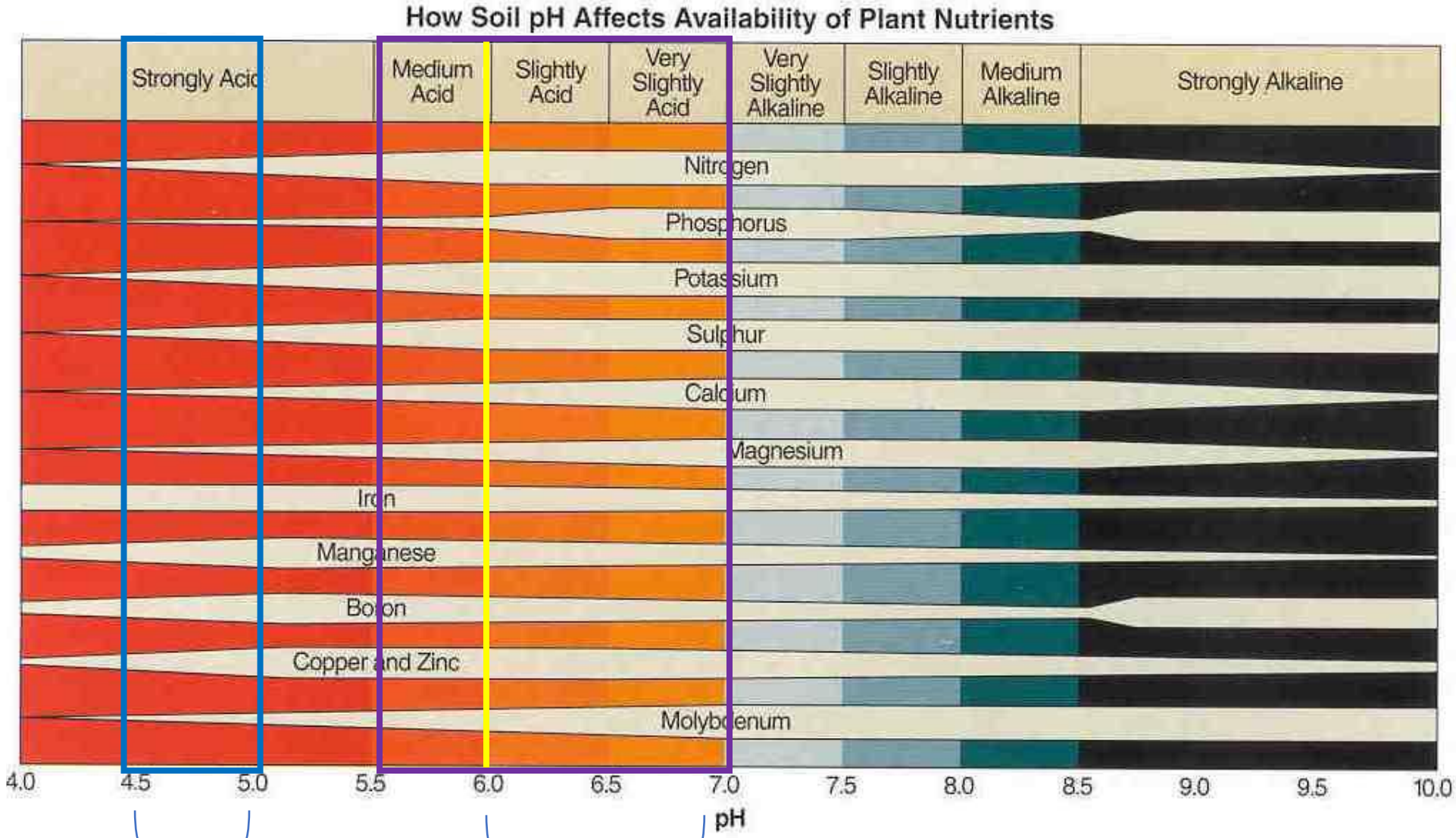
UCONN | COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Developing fertilizer programs takes into account:

- Soil pH & nutrient levels
- Tissue analysis
- Existing mineral nutrients in the soil
- Available water
- Ground management
- Climatic conditions

Photo: Mary Concklin



Blueberries

Brambles & Strawberries

Grapes

Using visual symptoms
Understanding nutrient mobility

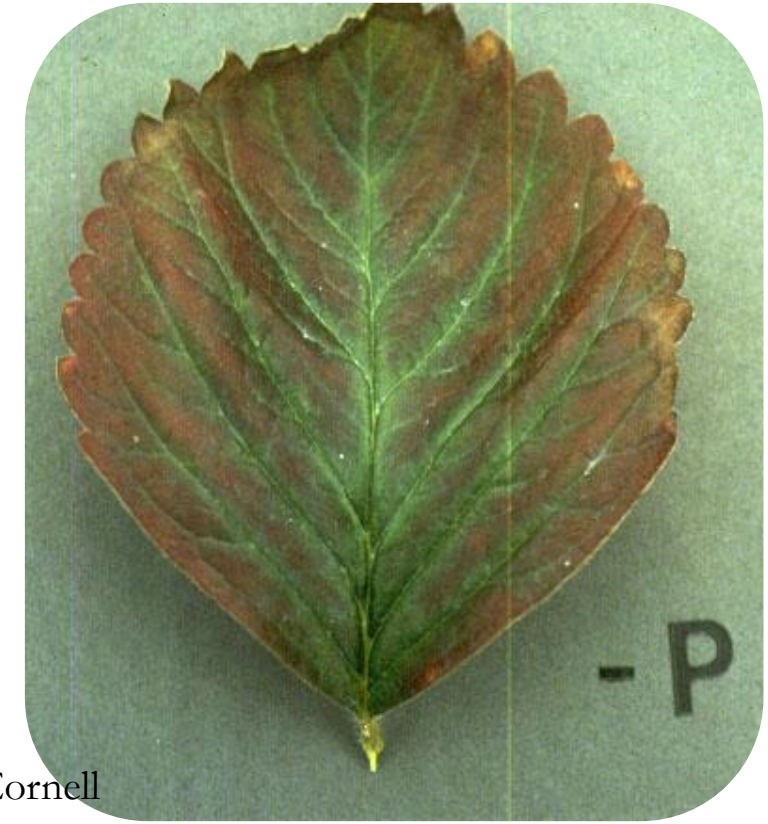


Photo: Marvin Pritts, Cornell

Photo: Mary Concklin

University of Connecticut
Department of Plant Science

Soil Nutrient Analysis Laboratory, 6 Sherman Place, Box U-102, Storrs, CT 06269-5102,
Phone : 860-486-4274, Fax : 860-486-4562.

GROWER'S ADDRESS
[redacted]

SAMPLE ID
BLUEBERRIES

LAB ID	RECEIVED	REPORTED
6455	09/02/09	09/09/09

SALES AGENT

NUTRIENTS EXTRACTED FROM YOUR SOIL (MODIFIED MORGAN EXTRACTABLE)

		BELOW OPTIMUM	OPTIMUM	ABOVE OPTIMUM
pH	6.4			
Calcium	3781 lbs/acre	**********	********	**********
Magnesium	>500 lbs/acre	**********	********	**********
Phosphorus	26 lbs/acre	**********	**********	***
Potassium	88 lbs/acre	**********		

Element	ppm	Soil Range
Boron (B)	0.20	0.1-2.0
Copper (Cu)	0.10	0.3-8.0
Iron (Fe)	3.60	1.0-40.0
Manganese (Mn)	1.40	3.0-20.0
Zinc (Zn)	0.90	0.1-70.0
Aluminum (Al)	32	10-300

Estimated Total Lead: Low, typical background levels

Amount of Sulfur in Pounds per Acre Required to Lower Soil pH

Present pH of soil	Desired pH Value of 4.5		
	Sand	**Loam**	**Clay**
4.5	0.0	0.0	0.0
5.0	174	522	609
5.5	284	1054	1132
6.0	522	1524	1612
6.5	653	2003	2090
7.0	827	2526	2613
7.5	1001	3005	3093

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GROWER'S ADDRESS

SAMPLE ID		
RASP 1		
LAB ID	RECEIVED	REPORTED
3936	04/23/12	05/01/12
SALES AGENT		

NUTRIENTS EXTRACTED FROM YOUR SOIL (MODIFIED MORGAN EXTRACTABLE)

		BELOW OPTIMUM	OPTIMUM	ABOVE OPTIMUM
pH	6.9			
Calcium	>4000 lbs/acre	**********	********	**********
Magnesium	472 lbs/acre	**********	********	**********
Phosphorus	73 lbs/acre	**********	********	**********
Potassium	>600 lbs/acre	**********	********	**********

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GROWER'S ADDRESS

SAMPLE ID		
FLD3: 19 STRAWBERRY		
LAB ID	RECEIVED	REPORTED
1380	04/04/13	04/08/13
SALES AGENT		
DAVE POSTEMSKI		

NUTRIENTS EXTRACTED FROM YOUR SOIL (MODIFIED MORGAN EXTRACTABLE)

		BELOW OPTIMUM	OPTIMUM	ABOVE OPTIMUM
pH	5.8			
Calcium	1570 lbs/acre	**********		
Magnesium	201 lbs/acre	**********	**	
Phosphorus	1 lbs/acre	***		
Potassium	178 lbs/acre	**********		

LIMESTONE: The target pH for strawberries is 6.3. Apply **1175** lbs. of ground limestone per acre. Thoroughly incorporate the recommended amount of limestone into the upper 6 to 8 inches of soil.

Nutrient in excess	Induced deficiency
Nitrogen	Potassium

Nutrient in excess	Induced deficiency
Nitrogen	Potassium
Potassium	Nitrogen, Calcium, Magnesium

Nutrient in excess	Induced deficiency
Nitrogen	Potassium
Potassium	Nitrogen, Calcium, Magnesium
Phosphorus	Potassium, Copper
Sodium	Potassium, Calcium, Magnesium
Calcium	Magnesium, Boron
Magnesium	Calcium, Potassium
Iron	Manganese
Manganese	Iron
Copper	Iron

- Available water

Photo: Mary Concklin

- Ground management
  - Compaction

Photo: Mary Concklin

- Ground management
  - Allow vegetation to grow

Photos: Mary Concklin

- Ground management
  - Mulch

Photos: Mary Concklin

- Ground management
  - Clean strip

Photos: Mary Concklin

- Ground management
  - Plastic/ landscape fabric

Photos: Mary Concklin

- Climatic conditions
  - Moisture
  - Heat

Soil microbial activity

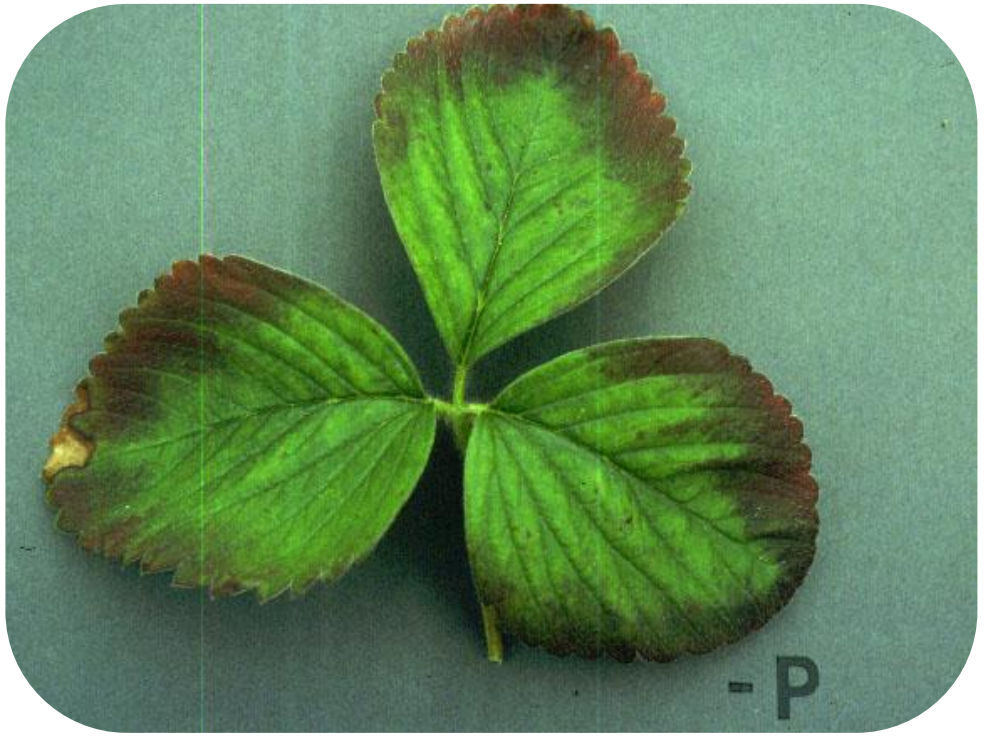
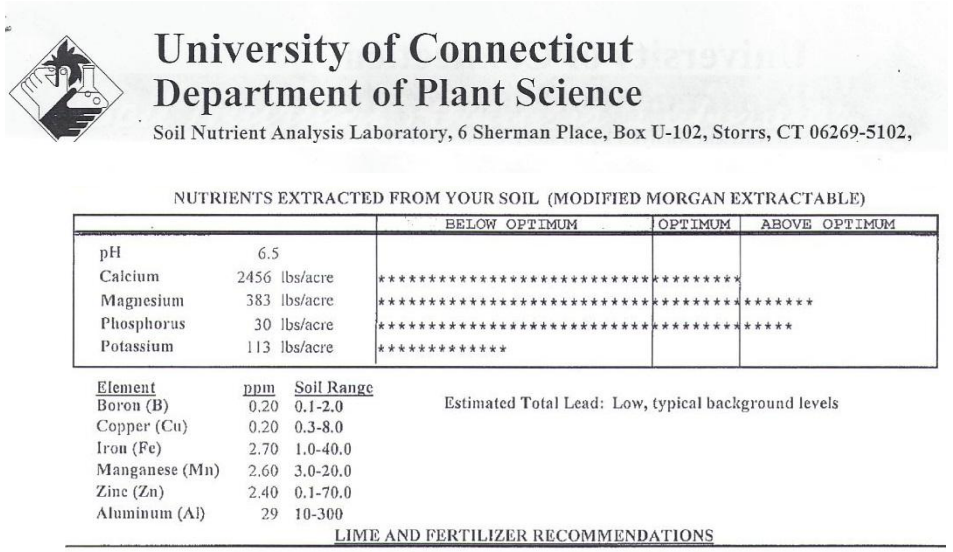


Photo: Marvin Pritts, Cornell

Soil Testing

- Use same lab
- Will vary based on:
  - Topography
  - Cultivation practices
  - Time of year sampling
  - Prior applications of fertilizers, compost
  - Pesticides influence?
- Pre-plant and throughout planting lifespan
- Compost testing



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NUTRIENTS EXTRACTED FROM YOUR SOIL (MODIFIED MORGAN EXTRACTABLE)

			BELOW OPTIMUM	OPTIMUM	ABOVE OPTIMUM
pH	6.5				
Calcium	2456	lbs/acre	**********	*********	
Magnesium	383	lbs/acre	**********	*********	*******
Phosphorus	30	lbs/acre	**********	*********	*****
Potassium	113	lbs/acre	**********		

Element	ppm	Soil Range
Boron (B)	0.20	0.1-2.0
Copper (Cu)	0.20	0.3-8.0
Iron (Fe)	2.70	1.0-40.0
Manganese (Mn)	2.60	3.0-20.0
Zinc (Zn)	2.40	0.1-70.0
Aluminum (Al)	29	10-300

Estimated Total Lead: Low, typical background levels

LIME AND FERTILIZER RECOMMENDATIONS

UConn Soil Nutrient Analysis Laboratory

6 Sherman Place, Union Cottage, Unit 5102
Storrs, CT 06269-5102
860-486-4274
soiltesting.cahnr.uconn.edu

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EXTENSION & PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Counties in several states have invasive pest QUARANTINES! If you live in these areas, there is an additional disposal fee of $20 per sample. The USDA APHIS website has information regarding which US counties are quarantined.

How would you like to receive results?

Mail

Email

Form For: Standard Commercial Vegetable, Fruit and Field Grown Nursery Crops

See soil sampling instructions. Fill out this sheet and place in mailing envelop or small box along with your sample and a check made payable to UConn for the appropriate amount. Send to the above address.

Name:		**Copy To:**	
Business:		**Business:**	
Street Address:		**Street Address:**	
Town, State & Zip:		**Town, State & Zip:**	
Phone:		**Phone:**	
Email:		**Email:**	

	Sample ID/Name *(choose a name you will remember)*	**Crop code** *Can Choose Multiple, Limit 3 per sample. Scroll for list.*	**Standard Nutrient Analysis** *Includes pH (Enter $15)*	**Fee for extra tests** *(Enter total cost if requested)*	**Total Cost per sample**	*For Lab Use Only* **LAB #**	**pH**	**Buffer pH**
1.					$ 0.00			
2.					$ 0.00			
3.					$ 0.00			
4.					$ 0.00			
5.					$ 0.00			
				Total Enclosed (check payable to UConn):	$ 0.00			

If you have specific problems that you want addresses by the horticulturists at the UConn Home & Garden Education Center, describe them here or on a separate sheet:
If submitting more than 5 samples, fill out and print **ADDITIONAL SOIL SAMPLES FORM.**
If requesting additional tests, like organic matter or soluble salts, fill out **ADDITIONAL TEST FORM.**
View our discount Policy if submitting more than 10 samples for Standard Nutrient Analysis

Office use only

$ Received

check #

Add $7 for organic matter

Soil Nutrient Analysis Laboratory
Soil Nutrient Analysis Laboratory,6 Sherman Place, Unit 5102, Storrs, CT 06269-5102 - Phone: 860-486-4274, Fax: 860-486-4562
Location: Union Cottage, Depot Campus, Mansfield

PLANT ANALYSIS RESULTS

Client: Mary Concklin
PSLA
WB Young
Storrs, CT 06269
mary.concklin@uconn.edu

Copy to:

Date Received: 7-27-2018
Date Processed: 8-20-2018

Crop: Blueberries Sample ID: T18-129 Lab ID: 18023 blueberry

Plant Nutrient	Sample Results	Sufficiency Range
Nitrogen (N) % Dry Weight	1.94	1.7 - 2.1
Phosphorus (P) % Dry Weight	0.13	0.10-0.40
Potassium (K) % Dry Weight	0.52	0.40-0.65
Calcium (Ca) % Dry Weight	0.56	0.30-0.80
Magnesium (Mg) % Dry Weight	0.18	0.15-0.30
Boron (B) PPM Dry Weight	78.00	30-70
Copper (Cu) PPM Dry Weight	2.20	5-20
Iron (Fe) PPM Dry Weight	90.30	60-200
Manganese (Mn) PPM Dry Weight	211.60	50-350
Molybdenum (Mo) PPM Dry Weight	0.0	No data
Zinc (Zn) PPM Dry Weight	11.20	8-30
Non-Essential Elements		
Sodium (Na) % Dry Weight	0.01	No data
Aluminum (Al) PPM Dry Weight	95.60	120-160
Lead (Pb) PPM Dry Weight	0	No data , Ideal value would be 0

Values based on sample consisting of 75 mature leaves from new growth collected during summer.
From: Berry Soil and Nutrient Management Guide, M. Pritts, C. Heidenreich, L. McDermott & J. Millers (editors) Cornell University, NY www.sare.org. and
Mills, H. A. and J. B. Jones, Jr. 1996. Plant Analysis Handbook II. MicroMacro Publishing. Athens, Georgia.

Cost $30

Foliar – Petiole Analysis

- Timing: when nutrient levels are most stable

Crop	Timing
Strawberry – June bearers	Renovation
Bramble	Late July-Early August
Blueberry	Late July-Early August
Currents/Gooseberries	Late July-Early August
Grapes	Bloom or Veraison

Nutrient concentration as affected by time throughout the growing season

Decreases **Higher concentrations early**	**Most Elements are Stable**	**Increases** **Higher concentrations later**
Nitrogen	Magnesium	Calcium
Phosphorus (slight)	Iron	Manganese
Potassium	Copper	
Boron		

From Orchard Nutrition Management – W. Stile & S. Reid; www.smallfruits.org/BunchGrapes/production/TissueAnalysisforGrapevines.pdf

Foliar and Petiole Analysis

- Results will vary with plant stresses
  - Water
  - Crop load
  - Pest injury
- Will vary with pesticide use
  - Ziram, Copper, Sulfur
- Will vary from cultural practices
- Troubleshooting visual or perceived problems
  - 2 samples

Nutrient	Foliar Results	Sufficiency Range
N %	2.17	1.7 – 2.1
P %	0.09	0.1 – 0.4
K %	0.28	0.4 – 0.65
Ca %	0.58	0.3 – 0.8
Mg %	0.15	0.15 – 0.3
B ppm	20.3	30 - 70
Cu ppm	6.6	5 - 20
Fe ppm	39.4	60 - 200
Mn ppm	111.2	50 - 350
Zn ppm	14.5	8 - 30

Mature Blueberry

Photo: Mary Concklin

Nutrient	Foliar Results	Sufficiency Range
N %	2.17	1.7 – 2.1
P %	0.09	0.1 – 0.4
K %	0.28	0.4 – 0.65
Ca %	0.58	0.3 – 0.8
Mg %	0.15	0.15 – 0.3
B ppm	20.3	30 - 70
Cu ppm	6.6	5 - 20
Fe ppm	39.4	60 - 200
Mn ppm	111.2	50 - 350
Zn ppm	14.5	8 - 30

Mature Blueberry

Photo: Mary Concklin

	Soil Results	Sufficiency Range
pH	4.6	4.5 – 5.0
Ca lbs	187	1000 - 1800
K lbs	257	150 – 200 (grape), 240-360 (straw, rasp)
Al ppm	364.5	< 300
B ppm	0.0	0.35 – 0.75

Problems with guessing:

- Multiple deficiencies may exist
- Symptoms similar for deficiency & excesses
- Guessing may result in
  - Inadequate or excessive plant vigor
  - Over or under nutrient applications
  - Poor fruit set
  - Reduced fruit quality
  - Misdiagnosis
- Costs you $$$
- Visual symptoms = damage already done

Photo: Mary Concklin

Long Term Management Decisions

- Supplemental water during dry periods
- Foliar analysis annually
- Soil analysis every 2-4 years - same lab
- Combine both for fine-tuned fertilizer programs
  - Crop load
  - Cultural practices
- Past experience
- Comparing results from year to year will show a reliable trend

Thank you ☺

mary.concklin@uconn.edu