Soil Sample Survey

Greene County

Samples analyzed by CNAL (2002-2006)

Greene County (photo credit: Mick Bessire, CCE of Greene County).

Summary compiled by

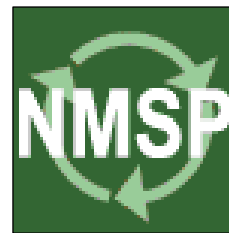### Renuka Rao, Mick Bessire, Quirine M. Ketterings, and Hettie Krol

Cornell Nutrient Analysis Laboratory
http://www.css.cornell.edu/soiltest/newindex.asp
&
Nutrient Management Spear Program
http://nmsp.css.cornell.edu/

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Greene County (photo credit: Mick Bessire, CCE of Greene County).

1. County Introduction

The birthplace of Irving's "Rip Van Winkle," is the county that's Greene - all year long. Greene County is located in the mid-eastern part of New York State: south of Albany County; south and east of Schoharie County; north of Ulster; and north and East of Delaware County. Columbia County borders Greene on the east, at the common boundary – the Hudson River. The northeast escarpment of the Great Northern Catskills rises abruptly from the fertile valley lowlands that lay down into the "Cohotate." (Iroquois name for "water that flows two ways" - the Hudson River). The elevation differential, ranging from near sea level at the river - to 4025 feet at the summit of Hunter Mountain, along with the consequential three Plant Hardiness Zones, (4, 5, & 6) make for Greene County's distinctive grandeur. This unique topography has inspired countless visitors, down through the ages, to come celebrate the views; travelers, painters, photographers, and writers. It has also inspired the placement of two renown ski areas (Hunter, Windham). All the while, the interspersed fertile soils have inspired diverse agricultural enterprise here.
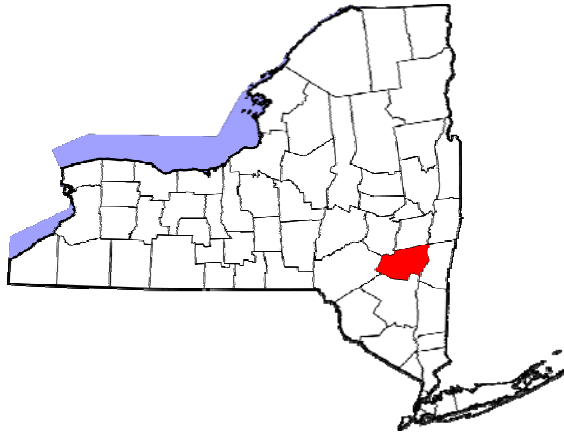
Of its 417,920 total acres, 48,770 are currently in farmland. The remainder that is not developed is clad in forest, (82%) and includes 70,000 acres in the premier state forest preserve, The Catskill Park. Of the farmland, 24,910 of its acres are considered prime farmland from a soils perspective, and even with the short end of the growing season, produce a wide variety of crops and livestock.

The 244 farms in Greene County generate estimated sales of over $15,000,000 annually. The average "economic multiplier effect" for all agricultural enterprises is 1.98, making the money "go around" in the county to the tune of $29,700,000 per year. The top commodities produced in the county are; 1) dairy products, 2) poultry and poultry products, 3) nursery and greenhouse crops, 4) cattle and calves, 5) vegetables, sweet corn, fruit, and melons, and 6) equine operations. Hay and haying enterprises comprise another major segment of agricultural production, supportive of the livestock production, with

internal and external marketing venues. Forestry, and agroforestry (maple, ginseng, etc) enterprise revenues, if an accurate accounting could be ascertained, would probably outstrip all the other commodity receipts, combined. It is estimated that there is over 250 million dollars worth of standing timber in the county. Notable enterprises in addition to traditional agriculture would include: a large SPF egg production facility that produces eggs for research and pharmaceutical manufacture, an elk farm, a huge pheasant operation, a working farm vacation setting, a recreational beef enterprise, (a rodeo ranch) the heritage trails system, and numerous other agri- and eco-tourism venues.

Most of our farms are family-owned and operated, with about half of those deriving their principle source of income and stated primary occupations from farming operations. Farmers employ approximately 260 additional workers full-time, with 150-200 hired part-time during the crop production season. The average age of full-time farmers is 58 years. The average size of our farms is ~200 acres, representing an average investment of ~$400,000 for land, buildings, and equipment. This represents a total investment into the Greene County economy of ~$97,600,000. Agriculture is a big business in our county, even as small as it is in comparison with many of the other counties in NYS. We're proud of our agricultural roots and heritage here. We're proud of the beautiful lands we've been given to steward. And, most of all, we're proud of the good people here – on, and of the land.

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Greene County (photo credit: Mick Bessire, CCE of Greene County).

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as "commercial samples") and homeowner samples from Greene County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 511. Of these, 461 samples (90%) were submitted by commercial growers while 50 samples (10%) were submitted by homeowners.
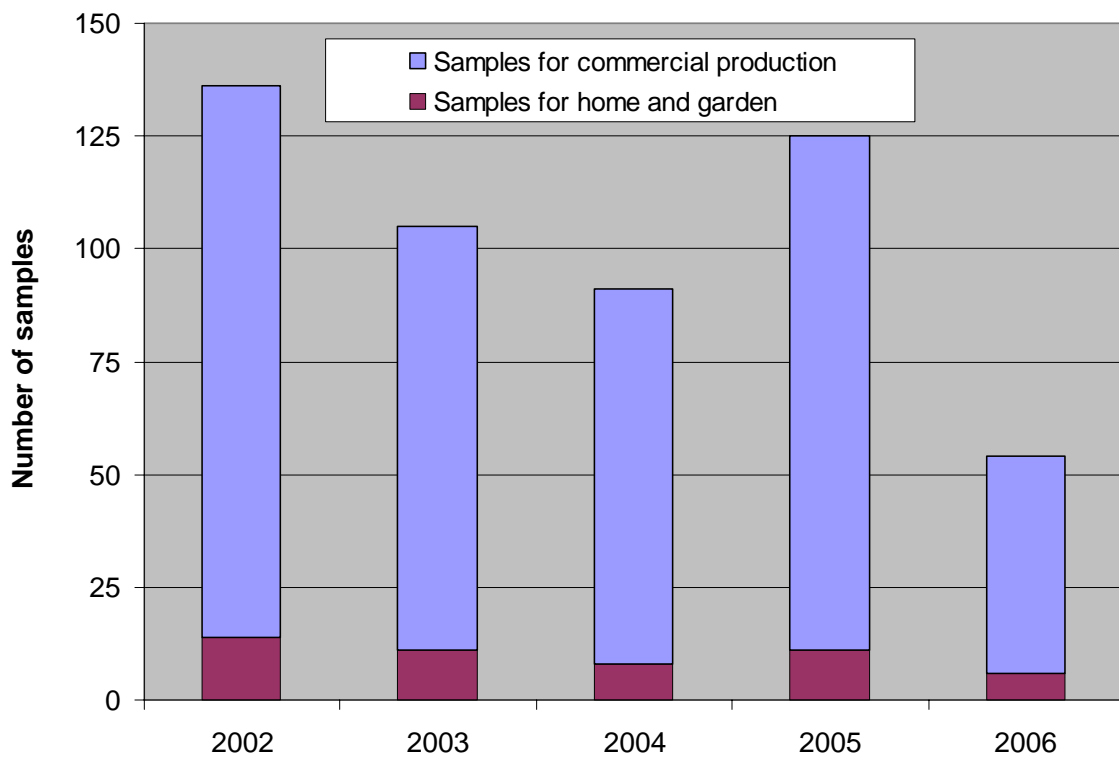
	Homeowners		Commercial		Total
2002	14	2002	122		136
2003	11	2003	94		105
2004	8	2004	83		91
2005	11	2005	114		125
2006	6	2006	48		54
Total	50	Total	461		511

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (32%), greens (12%), vegetables and perennials (10%). Commercial growers submitted samples primarily to grow grass for hay production (47%) and pasture (17%).

Soils tested for home and garden in Greene County were classified as belonging to soil management group 2 (32%), group 3 (20%), group 4 (38%), or group 5 (10%). A description of the different management groups is given below.

Soil Management Groups for New York

1	Fine-textured soils developed from clayey lake sediments and medium- to fine-textured soils developed from lake sediments.
2	Medium- to fine-textured soils developed from calcareous glacial till and medium-textured to moderately fine-textured soils developed from slightly calcareous glacial till mixed with shale and medium-textured soils developed in recent alluvium.
3	Moderately coarse textured soil developed from glacial outwash and recent alluvium and medium-textured acid soil developed on glacial till.
4	Coarse- to medium-textured soils formed from glacial till or glacial outwash.
5	Coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas.
6	Organic or muck soils with more than 80% organic matter.

Of the samples submitted by commercial growers, 77% belonged to soil management group 3. There were no group 1 samples. Five percent belonged to group 2, 1% to group 4, one sample was a group 5 soil while the remainder was of unknown origin. Wellsboro was the most common soil series (19% of all samples), followed by Lewbeak (11%), Lackawanna (10%), and Tunkhannock and Barbour (9% each).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to 62% (most likely a muck soil). For homeowner samples, 43% had between 2 and 5% organic matter, 40% testing 5% organic or higher while 18* had less than 2% organic matter. Of the samples submitted by commercial growers, 57% contained more than 5% organic

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matter, 28% tested between 2 and 5% organic matter, while 3% had less than 2% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from less than 4.6 to 7.8 for home and garden samples. Twenty-two percent had a pH less than 6.0, 36% tested between pH 6.0 and 6.9, while 40% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 8.0 and 63% had a pH of 63%, 33% tested between pH 6.0 and 6.9, while the remainder had a pH between 7.0 and 7.9.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan method (Morgan, 1941). This solution contains sodium acetate buffered at pH of 4.8.

Soil test P levels of <1 lb P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and anything higher is classified as very high. For homeowners, 26% of the soils tested low for P, 16% tested medium, 20% tested high and 38% tested very high. This meant that 58% tested high or very high in P. For commercial growers, 9% tested very high. In total 33% was low or very low in P, 27% tested medium for P while 31% of the submitted samples were classified as high in soil test P. This means that 40% tested high or very high in P.

Classifications for K depend on soil management group. The fine textured soils (soil management group 1) have a greater K supplying capacity than the coarse textured sandy soils (soil management group 5). Classification for each of the management groups in the above table represent very low, low, medium, high and very high. So for example for soil management group 5 and 6, <60 lbs K/acre means the soil is very low in K, between 60 and 114 lbs K/acre is medium, 115-164 lbs K/acre is medium, 165-269 lbs K/acre is high and >269 lbs K/acre is classified as very high (see Table on page 6).

Potassium classifications for Greene County soils varied from very low (5% of the commercial growers' soils) to very high (46% of the homeowner soils and 26% of the commercial growers' soils). For homeowner soils, 10% tested low in K, 12% tested medium, and 32% tested high for potassium. For commercial growers' soils, 9% tested

low, 17% tested medium and 27% tested high in K while 17% were of unknown soil type and could therefore not be classified as low, medium high or very high in K.

Soil Management Group	Potassium Soil Test Value (Morgan extraction in lbs K/acre)				
	Very low	Low	Medium	High	Very High
1	<35	35-64	65-94	95-149	>149
2	<40	40-69	70-99	100-164	>164
3	<45	45-79	80-119	120-199	>199
4	<55	55-99	100-149	150-239	>239
5 and 6	<60	60-114	115-164	165-269	>269

Soils test very low for Mg if Morgan extractable Mg is less than 20 lbs Mg/acre. Low testing soils have 20-65 lbs Morgan Mg per acre. Soils with 66-100 lbs Mg/acre test medium for Mg. High testing soils have 101-199 lbs Mg/acre while soils with more than 200 lbs Mg/acre in the Morgan extraction are classified as very high in Mg. Magnesium levels ranged from 35 to almost 8000 lbs Mg/acre. There were only two commercial grower soils that tested very low for Mg. Most soils tested high or very high for Mg (90% of the homeowner soils and 83% of the soils of the commercial growers).

Soils with more than 50 lbs Morgan extractable Fe per acre test excessive for Fe. Anything lower than 50 lbs Fe/acre is considered normal. Iron levels ranged from 82-96% in the normal range with 4% of the homeowner soils and 18% of the commercial grower soils testing excessive for Fe. Similarly, most soils (84-94%) tested normal for manganese. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. Anything less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lb Zn per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lb of Morgan extractable Zn per acre. If more than 1 lb of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the homeowner soils, 84% tested high for Zn while 16% tested medium. Of the commercial growers' samples, 3% tested low, 13% tested medium while 84% were high in Zn.

In the following sections, the summary tables for each of the soil fertility indicators described above are given. The appendix contains the crop codes used in section 3.

3. Cropping Systems

3.1 Homeowner Samples

Crops for which recommendations were requested by homeowners:

	2002-2006	%
ATF	1	2
BLU	2	4
FAR	3	6
GEN	6	12
GRA	1	2
HRB	1	2
LAW	16	32
MVG	5	10
OTH	5	10
PER	5	10
PRK	1	2
SAG	4	8
Total	50	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations were requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE	0	0	0	0	1	1	0
AGE/AGT	0	7	0	12	0	19	4
ALE/ALT	1	0	2	0	3	6	1
APP	0	0	3	0	1	4	1
BCT	1	0	0	0	0	1	0
BGT	1	0	0	0	0	1	0
BUK	0	0	1	0	0	1	0
CGT	5	0	3	0	0	8	2
CHC	0	0	0	0	1	1	0
CLE	2	0	0	0	0	2	0
COS	3	6	1	15	3	28	6
GIT	6	0	0	0	0	6	1
GPF	0	0	0	1	0	1	0
GRE/GRT	41	60	47	56	12	216	47
HRB	0	3	0	0	0	3	1
IDL	0	0	0	0	1	1	0
MIX	2	0	4	0	0	6	1
OAT	1	1	0	0	1	3	1
OTH	6	6	7	11	18	48	10
PGE/PGT	7	0	0	0	2	9	2
PIT	3	0	0	2	0	5	1
PLT	0	0	0	5	2	7	2
PNT	22	4	15	11	3	55	12
SOF	0	1	0	0	0	1	0
Unknown	21	6	0	1	0	28	6
Total	122	94	83	114	48	461	100

Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002-2006	%
SMG 1 (clayey)	0	0
SMG 2 (silty)	16	32
SMG 3 (silt loam)	10	20
SMG 4 (sandy loam)	19	38
SMG 5 (sandy)	5	10
SMG 6 (mucky)	0	0
Total	50	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Appleton	2	1	0	0	0	0	1	0
Arnot	3	0	0	1	0	0	1	0
Barbour	3	13	24	3	0	3	43	9
Burdett	2	0	0	0	2	1	3	1
Busti	3	0	0	0	0	3	3	1
Elnora	5	0	0	0	0	1	1	0
Halcott	2	3	1	0	0	0	4	1
Hudson	2	0	1	0	0	1	2	0
Lackawanna	3	1	1	15	24	4	45	10
Lewbeach	3	28	14	6	1	0	49	11
Lordstown	3	0	0	1	0	0	1	0
Maplecrest	2	3	0	1	0	0	4	1
Mardin	3	3	7	2	4	5	21	5
Middelbury	3	6	1	2	0	0	9	2
Morris	3	0	0	0	0	4	4	1
Nassau	4	0	0	0	2	3	5	1
Nunda	2	2	0	0	0	0	2	0
Onteora	3	3	2	1	3	0	9	2
Oquaga	3	0	5	0	1	0	6	1
Rhinebeck	2	5	0	0	0	2	7	2
Riverhead	4	0	1	0	0	0	1	0
Tunkhannock	3	5	16	3	14	2	40	9
Venango	3	0	1	0	0	0	1	0
Vly	3	5	1	0	0	0	6	1
Volusia	3	0	0	2	3	0	5	1
Wellsboro	3	13	3	26	40	5	87	19
Willowemoc	3	6	0	3	14	0	23	5
Unknown	-	25	16	17	6	14	78	17
Total	-	122	94	83	114	48	461	100

5. Organic Matter

5.1 Homeowner Samples

Organic matter (loss-on-ignition method) in homeowner samples (number):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
Number	1	8	9	7	5	5	1	14	50
Percentage	2	16	18	14	10	10	2	28	100

	2002-2006
Lowest:	0.8
Highest:	25.2
Mean:	8.6
Median:	4.1

5.2 Commercial Samples

Organic matter (loss-on-ignition method) in commercial samples (number):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	0	2	12	15	25	30	14	24	122
2003	0	8	24	9	11	17	13	12	94
2004	0	2	6	8	9	21	23	14	83
2005	0	0	3	15	27	28	25	16	114
2006	0	4	8	6	5	3	3	19	48
Total	0	16	53	53	77	99	78	85	461

	2002	2003	2004	2005	2006
Lowest:	1.8	1.1	1.4	2.0	1.6
Highest:	16.0	29.2	26.8	62.3	44.0
Mean:	5.5	5.1	6.0	6.6	8.6
Median:	5.3	4.4	5.9	5.4	5.2

Organic matter in commercial samples (% of total number of samples):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	0	2	10	12	20	25	11	20	100
2003	0	9	26	10	12	18	14	13	100
2004	0	2	7	10	11	25	28	17	100
2005	0	0	3	13	24	25	22	14	100
2006	0	8	17	13	10	6	6	40	100
Total	0	3	11	11	17	21	17	18	100

6. pH

6.1 Homeowner Samples

pH of homeowner samples (numbers):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	?	Total
Number	0	1	3	7	6	12	13	7	0	0	1	50
Percentage	0	2	6	14	12	24	26	14	0	0	2	100

	2002-2006
Lowest:	4.6
Highest:	7.8
Mean:	-
Median:	6.8

6.2 Commercial Samples

pH of commercial samples (number):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	16	10	10	42	26	9	7	1	1	0	122
2003	1	2	20	33	19	16	2	1	0	0	94
2004	2	3	20	27	17	11	2	1	0	0	83
2005	3	3	28	35	31	12	2	0	0	0	114
2006	8	6	5	15	5	8	1	0	0	0	48
Total	30	24	83	152	98	56	14	3	1	0	461

	2002	2003	2004	2005	2006
Lowest:	4.2	4.1	4.1	4.2	3.7
Highest:	8.0	7.7	7.6	7.2	7.0
Mean:	-	-	-	-	-
Median:	5.8	5.7	5.8	5.8	5.7

pH of commercial samples (% of total number of samples):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	13	8	8	34	21	7	6	1	1	0	100
2003	1	2	21	35	20	17	2	1	0	0	100
2004	2	4	24	33	20	13	2	1	0	0	100
2005	3	3	25	31	27	11	2	0	0	0	100
2006	17	13	10	31	10	17	2	0	0	0	100
Total	7	5	18	33	21	12	3	1	0	0	100

7. Phosphorus

7.1 Homeowner Samples

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
Number	0	13	8	10	8	1	2	2	0	6	50
Percentage	0	26	16	20	16	2	4	4	0	12	100

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002-2006
Lowest:	1
Highest:	502
Mean:	60
Median:	17

7.2 Commercial Samples

Phosphorus (lbs P/acre Morgan extraction) for commercial samples (number):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	65	18	35	4	0	0	0	0	0	122
2003	0	27	28	33	5	1	0	0	0	0	94
2004	0	19	35	17	5	1	1	2	1	2	83
2005	0	31	24	45	9	2	1	0	0	2	114
2006	0	12	17	15	2	1	1	0	0	0	48
Total	0	154	122	145	25	5	3	2	1	4	461

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	59	74	300	575	84
Mean:	8	12	23	24	13
Median:	3	7	6	9	7

Phosphorus in commercial samples (% of total number of samples):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	53	15	29	3	0	0	0	0	0	100
2003	0	29	30	35	5	1	0	0	0	0	100
2004	0	23	42	20	6	1	1	2	1	2	100
2005	0	27	21	39	8	2	1	0	0	2	100
2006	0	25	35	31	4	2	2	0	0	0	100
Total	0	33	26	31	5	1	1	0	0	1	100

VL = very low, L = low, M = medium, H = high, VH = very high.

8. Potassium

8.1 Homeowner Samples

Potassium (lbs K/acre Morgan extraction) in homeowner samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	2	4	3	7	16
Total (%)	0	13	25	19	44	100

Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	2	3	4	10
Total (%)	0	10	20	30	40	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	0	8	10	19
Total (%)	0	5	0	42	53	100

Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	0	2	2	5
Total (%)	0	20	0	40	40	100

Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Rao, R., M. Bessire, Q.M. Ketterings, and H. Krol (2007). Greene Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-33. 31 pages.

Potassium classification summary for homeowners:

Summary	Very Low	Low	Medium	High	Very High	Total
Number	0	5	6	16	23	50
Percentage	0	10	12	32	46	100

	2002-2006
Lowest:	58
Highest:	1582
Mean:	291
Median:	193

8.2 Commercial Samples

Potassium (lbs K/acre Morgan extraction) in commercial samples (number):

Soil Management Group 2					
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	3	6	4	14
2003	0	0	0	1	1	2
2004	0	0	0	1	0	1
2005	0	0	0	2	0	2
2006	0	0	0	4	0	4
Total (#)	0	1	3	14	5	23
Total (%)	0	4	13	61	22	100

Soil Management Group 3					
	<45	45-79	80-119	120-199	>199	Total
2002	6	16	21	20	20	83
2003	12	10	23	18	12	75
2004	1	6	6	25	27	65
2005	0	3	16	36	49	104
2006	3	5	5	6	7	26
Total (#)	22	40	71	105	115	353
Total (%)	6	11	20	30	33	100

Soil Management Group 4					
	<55	55-99	100-149	150-239	>239	Total
2002	0	0	0	0	0	0
2003	0	0	1	0	0	1
2004	0	0	0	0	0	0
2005	0	0	1	1	0	2
2006	0	0	1	2	0	3
Total (#)	0	0	3	3	0	6
Total (%)	0	0	50	50	0	100

Soil Management Group 5					
	<60	60-114	115-164	165-269	>269	Total
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	1	0	1
Total (#)	0	0	0	1	0	1
Total (%)	0	0	0	100	0	100

Rao, R., M. Bessire, Q.M. Ketterings, and H. Krol (2007). Greene Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-33. 31 pages.

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	6	17	24	26	24	25	122
2003	12	10	24	19	13	16	94
2004	1	6	6	26	27	17	83
2005	0	3	17	39	49	6	114
2006	3	5	6	13	7	14	48
Grand Total	22	41	77	123	120	78	461

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	5	14	20	21	20	20	100
2003	13	11	26	20	14	17	100
2004	1	7	7	31	33	20	100
2005	0	3	15	34	43	5	100
2006	6	10	13	27	15	29	100
Grand Total	5	9	17	27	26	17	100

	2002	2003	2004	2005	2006
Lowest:	26	28	30	58	37
Highest:	583	15083	866	1480	772
Mean:	146	319	230	284	221
Median:	107	118	188	192	176

9. Magnesium

9.1 Homeowner Samples

Magnesium (lbs Mg/acre Morgan extraction) in homeowner samples (numbers):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Number	0	0	5	11	34	50
Percentage	0	0	10	22	68	100

	2002-2006
Lowest:	75
Highest:	2341
Mean:	491
Median:	316

9.2 Commercial Samples

Magnesium (lbs Mg/acre Morgan extraction) in commercial samples (number):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	2	23	11	33	53	122
2003	0	3	12	24	55	94
2004	0	3	7	21	52	83
2005	0	0	6	31	77	114
2006	0	2	9	10	27	48
Total	2	31	45	119	264	461

	2002	2003	2004	2005	2006
Lowest:	19	47	57	71	35
Highest:	1165	7883	1584	1150	622
Mean:	212	333	288	285	234
Median:	174	217	241	247	217

Magnesium in commercial samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	2	19	9	27	43	100
2003	0	3	13	26	59	100
2004	0	4	8	25	63	100
2005	0	0	5	27	68	100
2006	0	4	19	21	56	100
Total	0	7	10	26	57	100

10. Iron

10.1 Homeowner Samples

Iron (lbs Fe/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
Total	48	2	50

Percentages:

0-49	>49	Total
Normal	Excessive	
96	4	100

	2002-2006
Lowest:	1
Highest:	272
Mean:	16
Median:	8

10.2 Commercial Samples

Iron (lbs Fe/acre Morgan extraction) in commercial samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	93	29	122
2003	85	9	94
2004	70	13	83
2005	98	16	114
2006	33	15	48
Total	379	82	461

Percentages:

	0-49	>49	Total
	Normal	Excessive	
2002	76	24	100
2003	90	10	100
2004	84	16	100
2005	86	14	100
2006	69	31	100
Total	82	18	100

	2002	2003	2004	2005	2006
Lowest:	1	2	1	2	2
Highest:	792	183	301	303	413
Mean:	51	23	33	28	60
Median:	10	12	21	18	19

11. Manganese

11.1 Homeowner Samples

Manganese (lbs Mn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
Total	47	3	50

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	94	6	100

	2002-2006
Lowest:	15
Highest:	192
Mean:	49
Median:	41

Rao, R., M. Bessire, Q.M. Ketterings, and H. Krol (2007). Greene Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-33. 31 pages.

11.2 Commercial Samples

Manganese (lbs Mn/acre Morgan extraction) in commercial samples:

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	112	10	122
2003	84	10	94
2004	67	16	83
2005	89	25	114
2006	34	14	48
Total	386	75	461

Percentages:

	0-99	>99	Total
	Normal	Excessive	
92	8	100
89	11	100
81	19	100
78	22	100
71	29	100
84	16	100

	2002	2003	2004	2005	2006
Lowest:	6	18	10	13	17
Highest:	206	521	157	699	510
Mean:	44	72	58	74	97
Median:	28	50	47	47	55

12. Zinc

12.1 Homeowner Samples

Zinc (lbs Zn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
Total	0	8	42	50

Percentages:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
	0	16	84	100

	2002-2006
Lowest:	0.5
Highest:	46.7
Mean:	6.2
Median:	3.2

12.2 Commercial Samples

Zinc (lbs Zn/acre Morgan extraction) in commercial samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	3	21	98	122
2003	0	6	88	94
2004	3	12	68	83
2005	3	12	99	114
2006	5	8	35	48
Total	14	59	388	461

Percentages:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	2	17	80	100
2003	0	6	94	100
2004	4	14	82	100
2005	3	11	87	100
2006	10	17	73	100
Total	3	13	84	100

	2002	2003	2004	2005	2006
Lowest:	0.4	0.5	0.3	0.1	0.3
Highest:	70.1	237.5	32.7	35.4	33.0
Mean:	4.0	6.8	3.5	4.1	7.7
Median:	2.1	2.8	2.3	2.2	2.5

Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description
	Alfalfa
ABE	Alfalfa trefoil grass, Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
	Birdsfoot
BCE	Birdsfoot trefoil clover, Establishment
BCT	Birdsfoot trefoil clover, Established
BGE	Birdsfoot trefoil grass, Establishment
BGT	Birdsfoot trefoil grass, Established
BSE	Birdsfoot trefoil seed, Establishment
BST	Birdsfoot trefoil seed, Established
BTE	Birdsfoot trefoil, Establishment
BTT	Birdsfoot trefoil, Established
	Barley
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
	Clover
CGE	Clover grass, Establishment
CGT	Clover grass, Established
CLE	Clover, Establishment
CLT	Clover, Established
CSE	Clover seed production, Establishment
CST	Clover seed production, Established

Crop Code	Crop Description
	Corn
COG	Corn grain
COS	Corn silage
	Grasses, pastures, covercrops
CVE	Crownvetch, Establishment
CVT	Crownvetch, Established
GIE	Grasses intensively managed, Establishment
GIT	Grasses intensively managed, Established
GRE	Grasses, Establishment
GRT	Grasses, Established
PGE	Pasture, Establishment
PGT	Pasture improved grasses, Established
PIE	Pasture intensively grazed, Establishment
PIT	Pasture intensively grazed, Established
PLE	Pasture with legumes, Establishment
PLT	Pasture with legumes, Established
PNT	Pasture native grasses
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
	Small grains
MIL	Millet
OAS	Oats seeded with legume
OAT	Oats
SOF	Sorghum forage
SOG	Sorghum grain
SOY	Soybeans
SSH	Sorghum sudan hybrid
SUD	Sudangrass
WHS	Wheat with legume
WHT	Wheat
	Others
ALG	Azalea
APP	Apples
ATF	Athletic field

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Crop Code	Crop Description
BDR/DND	Beans-dry
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
MIX/MVG	Mixed vegetables
PER	Perennials
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Establishment
TRF	Turf
TRT	Christmas trees, Topdressing