

Rao, R., D. Moyer, Q.M. Ketterings, and H. Krol (2007). Suffolk Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-46. 34 pages.

Soil Sample Survey

Suffolk County

Samples analyzed by CNAL (2002-2006)



Suffolk County (photo credit: Dale Moyer, CCE of Suffolk County).

Summary compiled by

Renuka Rao, Dale Moyer, Quirine M. Ketterings, and Hettie Krol

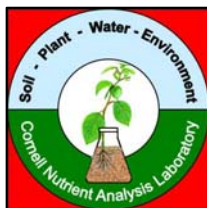
Cornell Nutrient Analysis Laboratory

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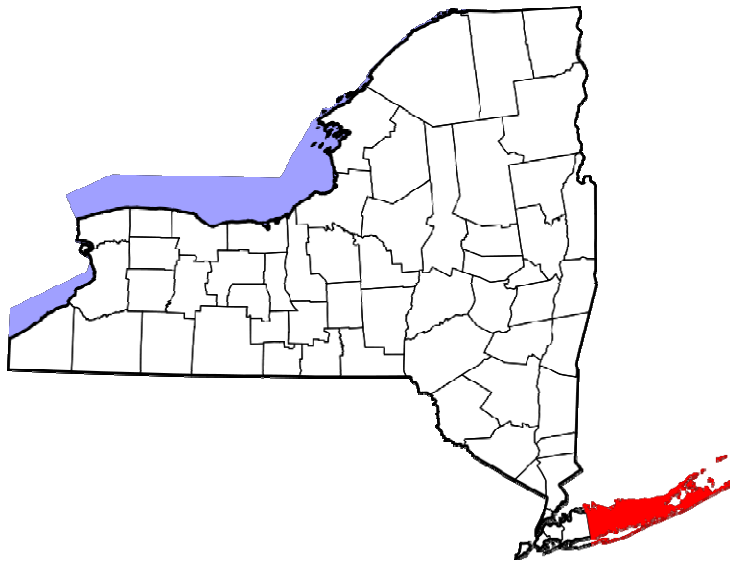


Suffolk County (photo credit: Dale Moyer, CCE of Suffolk County).



1. County Introduction

Located on the eastern two-thirds of Long Island, Suffolk County represents a number of contrasts. It is the home to 1.4 million people with 90% in highly developed, suburban



communities in the western five townships. At the same time, Suffolk County continues to be the leading agricultural county in New York based on the dollar value of its agricultural products at nearly \$250 million per year. Most of this production occurs on the eastern half of Suffolk County.

The peak production occurred just after World War II, when 120,000 acres were cultivated

in primarily potatoes, vegetables and fruit. Today approximately 600 farms produce diverse horticultural crops on 34,000 acres.

Tourism is one of the largest industries in Suffolk County with beaches and farmland within close proximity to New York City. In the summer, the population on eastern Suffolk County increases considerably due to tourist activities. Agriculture, through agritourism at farm stands, garden centers and wineries, has become a major component of tourism. Suburban sprawl and tourist activities are double-edged swords. They place pressure on land availability and cost but provide a great market opportunity for agricultural products. Agricultural vistas and retail farm outlets are important components of the appeal and the quality of life in the county.

Soils were developed from glacial outwash and are typically coarse-textured and acidic. When properly fertilized and irrigated, they are highly productive. Surface horizons range from sands to silt loams. Subsoils are most often sands or gravelly sands although clay lenses occur in some areas. The primary agricultural soil series are Haven, Riverhead and Bridgehampton.

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The influence of the Atlantic Ocean, Long Island Sound and associated bays moderates the climate. The winters are generally mild, spring temperatures are cool, and frost-free days usually number over 160. The growing season begins in late March and usually ends with a heavy frost around Thanksgiving. The number of sunny days throughout the year is greater than many locations in New York. Irrigation water is abundant from underground sources.

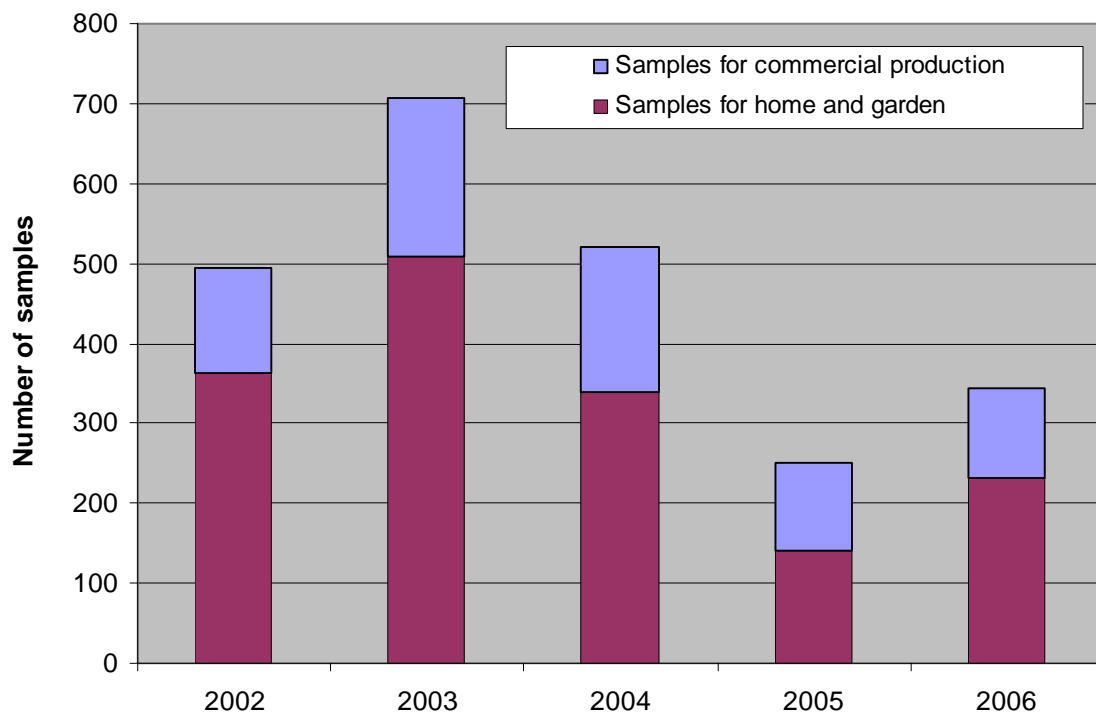
The combination of productive soils, long growing seasons, ample irrigation, mild winters and closeness to market is the main reason for the diversity of crops grown. Because of high land values the land is intensively farmed with high value crops. Although over 8,000 acres of potatoes, vegetables and small and tree fruits are still grown in Suffolk County, wine grapes and ornamental crops have been the major crops for expansion over the past twenty-five years. Approximately 2,500 acres of wine grapes are currently in production, producing most of the premium vinifera wines for New York State. The county represents close to 50% of the total production of greenhouse and nursery stock in New York State with 300 acres of greenhouses, 6,000 acres of nursery crops, over 3,000 acres of sod production and 700 acres of perennial plant and cultivated flower production. Much of the produce and plants are sold directly to consumers. Wholesale products are sold primarily in the New York metropolitan area, although some sales extend into the South and Midwest.

As farmers continue to operate on Long Island, major efforts have been made to preserve the farmland and protect the underlying aquifer and surrounding surface waters. A Farmland Preservation Program was instituted in 1974 as the first ever purchase of development rights program (PDR). This has enabled the county and local townships to preserve over 15,000 acres of farmland along with the fertile, well-drained soils. A Suffolk County Agricultural Environmental Stewardship program has promoted best management practices to protect our sensitive environment and natural resources while maintaining a strong, viable agricultural industry in Suffolk.

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2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Suffolk County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 2315. Of these, 731 samples (32%) were submitted by commercial growers while 1584 samples (68%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	364	2002	130	494
2003	509	2003	197	706
2004	339	2004	182	521
2005	140	2005	111	251
<u>2006</u>	<u>232</u>	<u>2006</u>	<u>111</u>	<u>343</u>
Total	1584	Total	731	2315

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (40%), perennials (11%), home garden vegetable production (10%), and cemeteries and fairways (7% each). Commercial growers submitted samples primarily to grow grapes (37%) and vegetables (32%).

Soils tested for home and garden in Suffolk County were classified as belonging to soil management group 2 (9%), group 3 (13%), group 4 (48%), or group 5 (31%). 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, 84% belonged to soil management group 4. There were no group 1, 2 or 6 samples. Eleven percent belonged to group 3 while two samples were group 5 soils and the remaining samples were of unknown origin. Riverhead was the most common soil series (37% of all samples), followed by Haven (33%), Bridgehampton and Plymouth (11% each).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to greater than 30%. For homeowner samples, 28% had less than 2% organic matter, 32% had between 2 and 3% organic matter, and 40% tested 3% or greater in organic matter. Of the samples submitted by commercial growers, 73% contained less than 2% organic

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matter, 21% had between 2 and 3% organic matter, while the remaining 6% had more than 3% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.1 to 9.4 for home and garden samples while 55% tested between pH 6.0 and 7.0. For the commercial samples, the highest pH was 8.6 and 65% tested between 6.0 and 7.0.

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, 7% of the soils tested low for P, 12% tested medium, 50% tested high and 30% tested very high. This meant that 80% tested high or very high in P. For commercial growers, 68% tested very high. In total 6% were low in P, 8% tested medium for P while 18% of the submitted samples were classified as high in soil test P. This means that 86% 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 Suffolk County soils varied from very low (9% of the homeowner soils and 8% of the commercial growers' soils) to very high (26% of the homeowner soils and 28% of the commercial growers' soils). For homeowners, 18% tested low in K, 19% tested medium, and 28% tested high for potassium. For commercial growers' soils, 10% tested low, 17% tested medium and 32% tested high in K and the remainder was of unknown soil series and could therefore not be classified for 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 9 to more than 3000 lbs Mg/acre. There were only three homeowner samples and four commercial grower samples that tested very low for Mg. Most soils tested high or very high for Mg (89% of the homeowner soils and 85% 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 92-99% in the normal range with 8% of the homeowner soils and 1% of the commercial grower soils testing excessive for Fe. All samples 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, 89% tested high for Zn while 7% tested medium and 4% were low in Zn. Of the commercial growers' samples, 5% tested low, 19% tested medium while 76% 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	2003	2004	2005	2006	Total	%
ALG	12	16	6	11	8	53	3
APR	0	0	1	1	0	2	0
ATF	3	4	3	0	2	12	1
BLU	1	1	1	0	0	3	0
CEM	0	1	48	0	63	112	7
FAR	6	106	6	0	0	118	7
FLA	4	1	9	7	3	24	2
GEN	9	60	29	1	0	99	6
GPV	1	0	0	0	0	1	0
GRA	3	2	4	5	1	15	1
HRB	1	1	1	2	1	6	0
IDL	0	0	1	0	0	1	0
LAW	178	196	118	40	95	627	40
MVG	49	29	34	26	21	159	10
OTH	11	22	3	2	8	46	3
PER	17	24	20	7	4	72	5
PTO	2	0	0	0	0	2	0
PUM	0	1	0	0	0	1	0
ROD	0	0	0	3	0	3	0
ROS	4	7	12	5	2	30	2
SAG	57	33	37	21	19	167	11
SPB	0	0	1	0	0	1	0
STR	0	0	1	0	0	1	0
SUB	0	0	1	0	0	1	0
TOM	1	0	0	0	0	1	0
TRF	4	2	1	9	5	21	1
Unknown	1	3	2	0	0	6	0
Total	364	509	339	140	232	1584	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	%
ABT	0	0	0	0	1	1	0
AGE	0	0	0	0	2	2	0
ALE	1	0	0	0	0	1	0
APP	4	1	0	0	1	6	1
ASP	0	0	1	2	0	3	0
BET	0	0	0	0	1	1	0
BKB	0	2	1	0	0	3	0
BLB	1	1	0	0	1	3	0
BNS	0	0	1	1	1	3	0
BRP	0	0	0	0	3	3	0
BUK	4	3	2	1	0	10	1
CPB	0	0	0	1	0	1	0
CLE	0	1	0	0	0	1	0
COG/COS	6	10	4	4	9	33	5
GIT	0	0	0	0	2	2	0
GPA	0	0	12	0	0	12	2
GPF	1	1	0	0	0	2	0
GPV	58	100	84	16	1	259	35
GRA	0	3	0	0	0	3	0
GRE/GRT	2	1	1	1	1	6	1
HRB	0	1	0	0	0	1	0
IDL	0	0	0	1	0	1	0
LAW	0	0	1	0	0	1	0
LET	0	0	0	0	1	1	0
MIL	0	0	0	1	0	1	0
MIX	32	41	51	65	42	231	32
NUR	0	0	0	0	2	2	0
OAS	0	1	0	0	0	1	0
OAT	0	0	2	0	0	2	0
ONP	0	0	0	0	1	1	0
OTH	0	5	4	0	6	15	2
PCH	0	0	0	0	1	1	0
PEP	0	0	1	0	0	1	0
PGE/PGT	5	8	2	0	7	22	3
PIE/PIT	2	2	0	0	4	8	1
PLE/PLT	1	2	0	0	0	3	0
PNT	6	1	3	0	0	10	1

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Current year crop	2002	2003	2004	2005	2006	Total	%
POT	0	2	0	5	1	8	1
PUM	1	1	3	0	4	9	1
RAD	0	0	0	0	1	1	0
RSS	0	1	0	0	0	1	0
RYC	0	0	6	0	6	12	2
SOG	0	0	0	2	0	2	0
SPS	0	0	0	0	1	1	0
SQW	0	0	0	1	1	2	0
SSH	0	2	0	0	5	7	1
STS	0	1	0	3	0	4	1
SUN	0	1	1	0	0	2	0
SWC	0	0	1	4	2	7	1
TME	0	0	0	1	0	1	0
TOM	0	1	1	1	2	5	1
Unknown	6	4	0	1	1	12	2
Total	130	197	182	111	111	731	100

Note: See Appendix for Cornell crop codes.



Suffolk County (photo credit: Dale Moyer, CCE of Suffolk County).

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002	2003	2004	2005	2006	Total	%
SMG 1 (clayey)	0	0	0	0	0	0	0
SMG 2 (silty)	44	17	37	21	18	137	9
SMG 3 (silt loam)	57	59	41	13	29	199	13
SMG 4 (sandy loam)	124	282	180	44	134	764	48
SMG 5 (sandy)	139	151	81	62	51	484	31
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	364	509	339	140	232	1584	100



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4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Bridgehampton	3	20	9	29	12	13	83	11
Carver	5	0	0	2	0	0	2	0
Haven	4	43	91	76	16	17	243	33
Montauk	4	8	5	4	3	2	22	3
Plymouth	4	11	17	10	19	24	81	11
Pompton	4	0	0	0	1	2	3	0
Riverhead	4	44	71	57	60	37	269	37
Scio	3	0	0	0	0	1	1	0
Venango	3	0	0	1	0	0	1	0
Unknown	-	4	4	3	0	15	26	4
Total	-	130	197	182	111	111	731	100



Suffolk County (photo credit: Dale Moyer, CCE of Suffolk County).

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
2002	24	81	117	72	33	12	10	15	364
2003	36	116	192	79	45	23	8	10	509
2004	12	95	103	62	34	14	9	10	339
2005	10	39	45	16	10	14	3	3	140
2006	9	22	45	79	34	15	8	20	232
Total	91	353	502	308	156	78	38	58	1584

	2002	2003	2004	2005	2006
Lowest:	0.1	0.1	0.2	0.3	0.5
Highest:	21.0	21.6	17.9	10.3	17.9
Mean:	3.0	2.8	2.9	2.8	3.8
Median:	2.6	2.3	2.5	2.5	3.5

Organic matter in homeowner 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	7	22	32	20	9	3	3	4	100
2003	7	23	38	16	9	5	2	2	100
2004	4	28	30	18	10	4	3	3	100
2005	7	28	32	11	7	10	2	2	100
2006	4	9	19	34	15	6	3	9	100
Total	6	22	32	19	10	5	2	4	100

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	39	52	27	9	2	0	0	1	130
2003	55	81	53	5	1	0	0	2	197
2004	41	99	35	4	2	1	0	0	182
2005	55	40	14	2	0	0	0	0	111
2006	21	53	22	11	1	0	0	3	111
Total	211	325	151	31	6	1	0	6	731

	2002	2003	2004	2005	2006
Lowest:	0.1	0.1	0.4	0.4	0.5
Highest:	7.7	14.2	5.2	3.0	33.3
Mean:	1.6	1.6	1.5	1.2	2.3
Median:	1.4	1.5	1.5	1.0	1.6

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	30	40	21	7	2	0	0	1	100
2003	28	41	27	3	1	0	0	1	100
2004	23	54	19	2	1	1	0	0	100
2005	50	36	13	2	0	0	0	0	100
2006	19	48	20	10	1	0	0	3	100
Total	29	44	21	4	1	0	0	1	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
2002	1	6	37	66	85	95	55	12	3	4	0	364
2003	5	17	59	88	129	159	40	11	1	0	0	509
2004	1	7	25	77	97	99	29	3	0	0	1	339
2005	2	4	26	21	30	32	17	7	1	0	0	140
2006	0	3	29	43	77	60	17	3	0	0	0	232
Total	9	37	176	295	418	445	158	36	5	4	1	1584

	2002	2003	2004	2005	2006
Lowest:	4.1	4.0	4.4	4.1	4.7
Highest:	9.4	8.0	7.8	8.1	7.6
Mean:	-	-	-	-	-
Median:	6.4	6.3	6.3	6.3	6.2

pH of homeowner of 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	0	2	10	18	23	26	15	3	1	1	0	100
2003	1	3	12	17	25	31	8	2	0	0	0	100
2004	0	2	7	23	29	29	9	1	0	0	0	100
2005	1	3	19	15	21	23	12	5	1	0	0	100
2006	0	1	13	19	33	26	7	1	0	0	0	100
Total	1	2	11	19	26	28	10	2	0	0	0	100

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	5	3	7	23	51	29	8	3	0	1	130
2003	0	3	16	64	59	38	16	1	0	0	197
2004	0	1	5	55	57	53	10	1	0	0	182
2005	0	1	4	8	77	19	2	0	0	0	111
2006	0	4	4	12	62	28	0	1	0	0	111
Total	5	12	36	162	306	167	36	6	0	1	731

	2002	2003	2004	2005	2006
Lowest:	3.9	4.9	4.6	4.9	4.6
Highest:	8.6	7.5	7.5	7.0	7.6
Mean:	-	-	-	-	-
Median:	6.2	6.0	6.2	6.2	6.3

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	4	2	5	18	39	22	6	2	0	1	100
2003	0	2	8	32	30	19	8	1	0	0	100
2004	0	1	3	30	31	29	5	1	0	0	100
2005	0	1	4	7	69	17	2	0	0	0	100
2006	0	4	4	11	56	25	0	1	0	0	100
Total	1	2	5	22	42	23	5	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	
2002	0	15	28	209	51	12	16	16	5	12	364
2003	0	22	57	261	77	57	3	8	7	17	509
2004	0	44	57	148	31	19	12	18	4	6	339
2005	0	11	18	66	15	6	7	7	5	5	140
2006	0	24	36	109	24	10	9	6	6	8	232
Total	0	116	196	793	198	104	47	55	27	48	1584

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	521	620	520	471	564
Mean:	46	45	37	47	41
Median:	26	27	17	25	20

Phosphorus in homeowner 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	4	8	57	14	3	4	4	1	3	100
2003	0	4	11	51	15	11	1	2	1	3	100
2004	0	13	17	44	9	6	4	5	1	2	100
2005	0	8	13	47	11	4	5	5	4	4	100
2006	0	10	16	47	10	4	4	3	3	3	100
Total	0	7	12	50	13	7	3	3	2	3	100

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

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	17	14	29	22	13	11	22	2	0	130
2003	0	17	28	45	24	34	19	27	3	0	197
2004	0	8	8	24	38	40	33	27	4	0	182
2005	0	0	5	8	19	15	5	35	20	4	111
2006	0	2	0	28	30	12	8	25	3	3	111
Total	0	44	55	134	133	114	76	136	32	7	731

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	5	2
Highest:	159	179	175	257	916
Mean:	51	53	68	103	78
Median:	44	48	69	109	60

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	13	11	22	17	10	8	17	2	0	100
2003	0	9	14	23	12	17	10	14	2	0	100
2004	0	4	4	13	21	22	18	15	2	0	100
2005	0	0	5	7	17	14	5	32	18	4	100
2006	0	2	0	25	27	11	7	23	3	3	100
Total	0	6	8	18	18	16	10	19	4	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	
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	0	0	0
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	
2002	1	1	4	17	21	44
2003	1	0	1	5	10	17
2004	0	3	4	8	22	37
2005	0	1	3	9	8	21
2006	1	1	5	8	3	18
Total (#)	3	6	17	47	64	137
Total (%)	2	4	12	34	47	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	6	19	30	57
2003	3	5	10	23	18	59
2004	0	5	7	16	13	41
2005	0	1	3	5	4	13
2006	0	2	11	12	4	29
Total (#)	3	15	37	75	69	199
Total (%)	2	8	19	38	35	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	5	18	27	37	37	124
2003	36	64	36	62	84	282
2004	15	31	49	56	29	180
2005	0	6	8	15	15	44
2006	2	7	18	60	47	134
Total (#)	58	126	138	230	212	764
Total (%)	8	16	18	30	28	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	22	49	26	26	16	139
2003	27	33	39	33	19	151
2004	15	23	19	17	7	81
2005	9	18	15	11	9	62
2006	6	15	10	8	12	51
Total (#)	79	138	109	95	63	484
Total (%)	16	29	23	20	13	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
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	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	28	70	63	99	104	364
2003	67	102	86	123	131	509
2004	30	62	79	97	71	339
2005	9	26	29	40	36	140
2006	9	25	44	88	66	232
Grand Total	143	285	301	447	408	1584

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	8	19	17	27	29	100
2003	13	20	17	24	26	100
2004	9	18	23	29	21	100
2005	6	19	21	29	26	100
2006	4	11	19	38	28	100
Grand Total	9	18	19	28	26	100

	2002	2003	2004	2005	2006
Lowest:	12	3	7	20	33
Highest:	4674	5888	785	1246	3136
Mean:	214	182	166	201	231
Median:	156	149	142	149	180

8.2 Commercial Samples

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
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	0	0	0
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	
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	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	5	2	2	2	9	20
2003	3	0	3	1	2	9
2004	0	1	2	16	11	30
2005	0	0	0	6	6	12
2006	1	2	2	1	8	14
Total (#)	9	5	9	26	36	85
Total (%)	11	6	11	31	42	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	16	17	18	33	22	106
2003	27	26	39	58	34	184
2004	5	18	36	68	20	147
2005	1	2	14	25	57	99
2006	1	8	10	25	38	82
Total (#)	50	71	117	209	171	618
Total (%)	8	11	19	34	28	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	2	0	0	0	0	2
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	2	0	0	0	0	2
Total (%)	100	0	0	0	0	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
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	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	21	19	20	35	31	4	130
2003	30	26	42	59	36	4	197
2004	7	19	38	84	31	3	182
2005	1	2	14	31	63	0	111
2006	2	10	12	26	46	15	111
Grand Total	61	76	126	235	207	26	731

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	16	15	15	27	24	3	100
2003	15	13	21	30	18	2	100
2004	4	10	21	46	17	2	100
2005	1	2	13	28	57	0	100
2006	2	9	11	23	41	14	100
Grand Total	8	10	17	32	28	41	100

	2002	2003	2004	2005	2006
Lowest:	8	11	40	50	44
Highest:	823	779	574	726	12587
Mean:	177	165	172	249	351
Median:	159	146	166	245	239

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	
2002	1	12	28	104	219	364
2003	2	22	37	139	309	509
2004	0	13	21	100	205	339
2005	0	5	13	48	74	140
2006	0	20	3	25	184	232
Total	3	72	102	416	991	1584

	2002	2003	2004	2005	2006
Lowest:	19	9	21	20	20
Highest:	1877	2621	1121	1021	1675
Mean:	288	275	278	237	375
Median:	244	235	232	206	306

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	3	8	29	60	100
2003	0	4	7	27	61	100
2004	0	4	6	29	60	100
2005	0	4	9	34	53	100
2006	0	9	1	11	79	100
Total	0	5	6	26	63	100

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	13	11	54	50	130
2003	2	23	22	84	66	197
2004	0	7	20	88	67	182
2005	0	1	3	52	55	111
2006	0	3	5	52	51	111
Total	4	47	61	330	289	731

	2002	2003	2004	2005	2006
Lowest:	10	15	34	63	47
Highest:	1098	1013	796	500	3232
Mean:	205	179	193	216	254
Median:	153	149	167	199	185

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	10	8	42	38	100
2003	1	12	11	43	34	100
2004	0	4	11	48	37	100
2005	0	1	3	47	50	100
2006	0	3	5	47	46	100
Total	1	6	8	45	40	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	
2002	344	20	364
2003	468	41	509
2004	295	44	339
2005	134	6	140
2006	224	8	232
Total	1465	119	1584

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	95	5	100
	92	8	100
	87	13	100
	96	4	100
	97	3	100
	92	8	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	2	1
Highest:	147	204	279	109	240
Mean:	14	18	22	15	16
Median:	8	8	12	9	10

10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	127	3	130
2003	194	3	197
2004	182	0	182
2005	111	0	111
2006	110	1	111
Total	724	7	731

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	98	2	100
	98	2	100
	100	0	100
	100	0	100
	99	1	100
	99	1	100

	2002	2003	2004	2005	2006
Lowest:	1	2	1	2	1
Highest:	514	117	32	21	422
Mean:	15	10	8	6	10
Median:	4	6	7	5	5

11. Manganese

11.1 Homeowner Samples

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

Total number of samples:				Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	363	1	364	100	0	100
2003	508	1	509	100	0	100
2004	339	0	339	100	0	100
2005	140	0	140	100	0	100
2006	232	0	232	100	0	100
Total	1582	2	1584	100	0	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	2	1
Highest:	110	108	84	95	76
Mean:	13	11	13	17	12
Median:	9	10	10	14	9

11.2 Commercial Samples

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

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	130	0	130
2003	196	1	197
2004	182	0	182
2005	111	0	111
2006	110	1	111
Total	729	2	731

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	100	0	100
	99	1	100
	100	0	100
	100	0	100
	99	1	100
	100	0	100

	2002	2003	2004	2005	2006
Lowest:	1	1	2	3	1
Highest:	70	220	30	30	184
Mean:	11	9	10	12	9
Median:	9	6	8	12	6

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	
2002	2	9	353	364
2003	44	40	425	509
2004	6	30	303	339
2005	2	8	130	140
2006	7	20	205	232
Total	61	107	1416	1584

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	2	97	100
9	8	83	100
2	9	89	100
1	6	93	100
3	9	88	100
4	7	89	100

	2002	2003	2004	2005	2006
Lowest:	0.4	0.1	0.2	0.3	0.1
Highest:	314.3	1040.1	129.3	163.9	204.6
Mean:	10.6	9.4	6.7	9.4	9.3
Median:	4.9	4.1	3.8	5.0	3.3

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	6	22	102	130
2003	15	51	131	197
2004	9	38	135	182
2005	3	17	91	111
2006	3	10	98	111
Total	36	138	557	731

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
5	17	78	100
8	26	66	100
5	21	74	100
3	15	82	100
3	9	88	100
5	19	76	100

	2002	2003	2004	2005	2006
Lowest:	0.3	0.2	0.2	0.1	0.1
Highest:	651.9	202.4	48.1	23.3	61.3
Mean:	9.7	4.2	2.9	6.3	5.1
Median:	2.8	1.6	1.5	6.0	3.3

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

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