

Rao, R., D. Sprague, Q.M. Ketterings, and H. Krol (2007). Chautauqua Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-11. 34 pages.

# Soil Sample Survey

# Chautauqua County

**Samples analyzed by CNAL (2002-2006)**



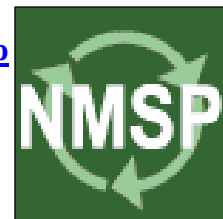
Chautauqua County (photo credit: Dean Sprague, CCE of Chautauqua County).

**Summary compiled by**  
**Renuka Rao, Dean Sprague, Quirine M. Ketterings, and Hettie Krol**



**Cornell Nutrient Analysis Laboratory**  
<http://www.css.cornell.edu/soiltest/newindex.asp>

**&**  
**Nutrient Management Spear Program**  
<http://nmssp.css.cornell.edu/>



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Summary compiled by

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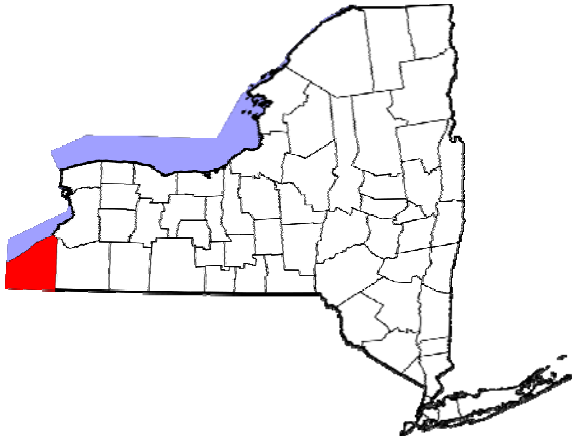


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# 1. County Introduction

Chautauqua County is the southwestern most county in New York State. It is bordered by



Pennsylvania on the southern and western sides and by Lake Erie on the north. Chautauqua County was named after its largest lake, which was called “Jad-dad-gwah” by the Seneca Indians. The lake is 20 miles long and is 1,308 feet above sea level, which makes it one of the highest navigable freshwater inland lakes in the United States. Just over one third (38%) of the county’s 679,711 acres are in farm production.

Dairy farming generates 54% of the total dollars in agriculture sales. The other major agricultural products for the county are fruits and nuts led by grape production (25% of total sales), cattle and calves (9%), vegetables (4%), and nursery and greenhouse (3%).

Two different farming enterprises are supported in the county as a result of two different physiographic providences in the county. The Erie-Ontario Plain is a belt 2 to 6 miles wide along Lake Erie ranging in elevation from 572 feet at the base of Lake Erie to about 850 feet at the base of the bordering escarpment. The Allegheny Plateau covers the remaining 80% of the county. Elevations in the Plateau area range from 1,300 to 2,100 feet. The county has less than 2,000 acres (in the southeastern corner) that were not covered by ice during the glacial period. This area also includes the highest point in the county (2,190 feet).

The main agriculture enterprise in the Plain area is grape production; however, substantial areas are used for vegetables, orchard crops, or small fruits, as well as dairy production. Chautauqua County is the leading County for grape production in New York State. The Plateau region focuses mainly on corn and hay crops for dairy farming.

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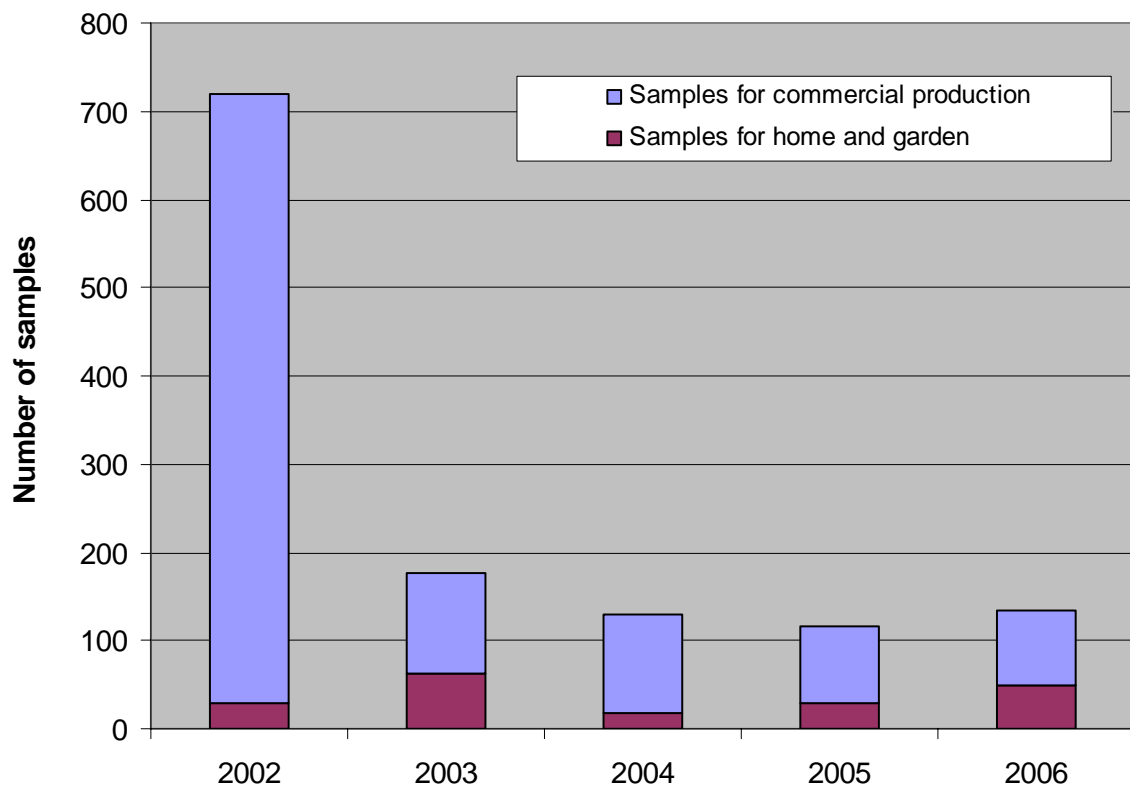


Chautauqua County (photo credit: Dean Sprague, CCE of Chautauqua County).



## 2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Chautauqua County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1275. Of these, 1088 samples (85%) were submitted by commercial growers while 187 samples (15%) were submitted by homeowners. An exceptionally large number of commercial grower samples were submitted in 2002.



Homeowners		Commercial		Total
2002	28	2002	691	719
2003	62	2003	114	176
2004	18	2004	112	130
2005	29	2005	87	116
<u>2006</u>	<u>50</u>	<u>2006</u>	<u>84</u>	<u>134</u>
<b>Total</b>	<b>187</b>	<b>Total</b>	<b>1088</b>	<b>1275</b>

Homeowners predominantly submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 to request fertilizer recommendations for lawns (54%) or for home garden vegetable production (20%). Commercial growers submitted samples to grow corn silage or grain (25%), grapes (20%), grass hay production (17%), and alfalfa or alfalfa/grass mixes (8%), while a few growers were planning to grow other crops.

Soils tested for home and garden in Chautauqua County were classified as belonging to soil management group 2 (12%), group 3 (55%), group 4 (27%), or group 5 (6%). 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, 1% belonged to soil management group 1, 15% to group 2, 75% to group 3, 6% to group 4 and 1% to group 5 while the remainder was of unknown origin. There were no organic soils. Chenango was the most common soil series (19% of all samples), followed by Chautauqua (14%), Busti (14%), Fremont (10%) and Volusia (1%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 2% to almost 25%. For homeowner samples, 51% had between 3 and 5% organic matter, 20% testing between 5 and 6% organic matter and 15% was classified as soils with more than



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6.9% organic matter. Of the samples submitted by commercial growers, 80% contained between 3 and 6% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.1 to 8.1 for home and garden samples while 58% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 7.8 and 76% tested between pH 5.5 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, 16% of the soils tested low for P, 22% tested medium, 22% tested high and 20% tested very high. This meant that 61% tested high or very high in P. For commercial growers, only 2% tested very high. In total 43% were low in P, 28% tested medium for P while 27% of the submitted samples were classified as high in soil test P. This means that 29% 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 Chautauqua County soils varied from very low (1% of the homeowner soils and 1% of the commercial growers' soils) to very high (52% of the homeowner soils and 40% of the commercial growers' soils). For homeowners, 3% tested low in K, 10% tested medium, and 35% tested high for potassium. For commercial growers' soils, 9% tested low, 20% tested medium and 29% tested 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 21 to 2264 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (99% of the homeowner soils and 96% of the soils of the commercial growers). In total 1% of the homeowner soils and 4% of the commercial growers' soil tested low or medium in Mg.

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 80-89% in the normal range with 11% of the homeowner soils and 20% of the commercial grower soils testing excessive for Fe. Similarly, most soils (95-96%) 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, 91% tested high for Zn while 7% tested medium. Of the commercial growers' samples, 2% tested low, 13% tested medium while 86% 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	0	1	0	1	0	2	1
ATF	1	11	0	0	0	12	6
BLU	0	0	1	0	1	2	1
FLA	0	0	4	0	2	6	3
GEN	0	0	0	1	0	1	1
GRA	0	1	0	0	0	1	1
HRB	0	0	0	0	1	1	1
LAW	23	31	7	17	23	101	54
MIX	0	0	1	0	1	2	1
MVG	3	6	4	8	16	37	20
OTH	0	1	0	0	0	1	1
PER	0	4	1	1	0	6	3
PTO	1	1	0	0	0	2	1
ROU	0	0	0	0	4	4	2
SAG	0	5	0	1	1	7	4
TOM	0	0	0	0	1	1	1
Unknown	0	1	0	0	0	1	1
Total	28	62	18	29	50	187	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/ABT	1	0	0	3	0	4	0
AGE/AGT	67	1	7	9	4	88	8
ALE/ALT	3	0	2	0	0	5	0
APP	1	0	0	0	3	4	0
BCE/BCT	2	0	2	0	5	9	1
BGE/BGT	3	3	1	2	1	10	1
BLB	3	0	2	0	2	7	1
BNS	0	0	0	0	1	1	0
BSP	0	0	1	0	0	1	0
BSS	0	0	1	0	0	1	0
BUK	0	2	0	0	0	2	0
CBS	0	0	0	0	1	1	0
CGE/CGT	42	19	13	8	11	93	9
CLE/CLT	0	5	2	7	1	15	1
COG/COS	243	3	12	7	7	272	25
CST	1	0	0	0	0	1	0
GIE/GIT	151	0	0	1	1	153	14
GPA	73	56	50	19	9	207	19
GPV	2	1	0	0	7	10	1
GRE/GRT	5	4	8	8	3	28	3
IDL	2	0	0	1	1	4	0
MIX	1	1	2	0	2	6	1
NUR	0	0	0	0	1	1	0
OAS	38	0	0	0	0	38	3
OAT	0	0	0	1	3	4	0
OTH	2	7	1	3	8	21	2
PGE/PGT	8	0	1	2	3	14	1
PIE/PIT	14	0	3	1	0	18	2
PLE/PLT	5	0	0	1	1	7	1
PNT	11	1	1	1	1	15	1
PUM	1	2	0	1	0	4	0
RSS	0	0	1	0	0	1	0
SOF	1	0	0	0	0	1	0
SOY	0	1	0	0	0	1	0
SQW	1	0	0	0	0	1	0
SSH	0	0	0	1	0	1	0
STS	3	0	0	0	1	4	0
SUN	0	0	0	0	1	1	0

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Current year crop	2002	2003	2004	2005	2006	Total	%
SWC	1	6	0	10	3	20	2
TOM	0	0	1	0	0	1	0
TRE	0	1	0	0	0	1	0
TUR	0	1	0	0	1	2	0
WHT	0	0	0	0	2	2	0
WPT	0	0	1	0	0	1	0
Unknown	6	0	0	1	0	7	1
Total	691	114	112	87	84	1088	100

Note: See Appendix for Cornell crop codes.



## 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)	5	10	3	1	4	23	12
SMG 3 (silt loam)	16	29	9	18	31	103	55
SMG 4 (sandy loam)	7	19	4	8	12	50	27
SMG 5 (sandy)	0	4	2	2	3	11	6
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	28	62	18	29	50	187	100

## 4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Albia	3	1	0	0	0	0	1	0
Allard	3	23	0	0	1	0	24	2
Alton	5	1	0	0	0	0	1	0
Amboy	4	1	0	0	0	0	1	0
Barcelona	3	3	0	6	0	4	13	1
Blasdell	3	6	2	2	0	1	11	1
Braceville	4	0	0	1	0	0	1	0
Busti	3	104	11	6	12	21	154	14
Canadaigua	3	1	0	4	2	1	8	1
Canaseraga	3	0	0	0	1	0	1	0
Castile	4	1	0	0	0	0	1	0
Chadakoin	3	1	0	0	0	0	1	0
Chaumont	1	0	0	0	0	1	1	0
Chautauqua	3	110	7	13	9	12	151	14
Chenango	3	113	33	24	20	14	204	19
Chippewa	3	0	0	0	1	0	1	0
Churchville	2	3	0	0	0	0	3	0
Collamer	3	1	2	0	0	1	4	0
Colonie	5	0	1	0	0	0	1	0
Cosad	4	1	0	0	0	0	1	0
Dalton	3	5	0	0	0	0	5	0
Darien	2	13	0	3	0	0	16	1
Dunkirk	3	7	0	0	0	0	7	1
Elnora	5	1	4	1	1	0	7	1
Erie	3	16	5	13	1	1	36	3
Farnham	4	4	5	7	4	1	21	2
Fremont	2	77	14	4	5	7	107	10
Getzville	3	1	0	0	0	0	1	0
Hamlin	2	1	1	0	0	0	2	0
Hornell	2	1	4	1	1	0	7	1
Howard	3	0	1	0	0	2	3	0
Hudson	2	1	1	0	1	2	5	0
Ivory	2	0	0	0	1	0	1	0
Lamson	4	1	0	0	1	0	2	0
Langford	3	18	0	0	3	0	21	2
Mardin	3	15	0	0	0	0	15	1

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Marilla	3	0	0	0	0	3	3	0
Middlebury	3	3	0	1	0	1	5	0
Mineola	4	0	0	0	0	1	1	0
Minoa	4	2	1	0	1	1	5	0
Niagara	3	7	1	16	0	1	25	2
Opark	2	6	0	1	1	0	8	1
Pompton	4	15	0	0	5	0	20	2
Raynham	3	4	2	1	1	1	9	1
Red Hook	4	8	5	0	2	0	15	1
Rhinebeck	2	5	5	3	1	2	16	1
Schuyler	3	4	5	0	1	0	10	1
Scio	3	1	0	0	0	0	1	0
Swormville	1	9	2	0	0	0	11	1
Teel	2	1	0	0	0	1	2	0
Towerville	3	2	0	0	0	0	2	0
Unadilla	3	3	0	0	0	0	3	0
Valois	3	42	0	0	3	0	45	4
Volusia	3	43	1	5	5	2	56	5
Unknown	-	5	1	0	3	3	12	1
Total	-	691	114	112	87	84	1088	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
2002	0	1	0	9	6	9	1	2	28
2003	0	1	2	13	27	6	7	6	62
2004	0	0	1	4	4	6	1	2	18
2005	0	0	2	2	10	8	3	4	29
2006	0	1	3	8	13	8	3	14	50
Total	0	3	8	36	60	37	15	28	187

	2002	2003	2004	2005	2006
Lowest:	1.8	1.8	2.7	2.4	1.7
Highest:	8.4	10.7	23.0	13.3	24.2
Mean:	4.7	4.9	5.8	5.3	6.2
Median:	4.5	4.5	4.9	5.0	5.0

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	0	4	0	32	21	32	4	7	100
2003	0	2	3	21	44	10	11	10	100
2004	0	0	6	22	22	33	6	11	100
2005	0	0	7	7	34	28	10	14	100
2006	0	2	6	16	26	16	6	28	100
Total	0	2	4	19	32	20	8	15	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	0	3	32	94	214	265	77	6	691
2003	0	2	9	41	29	20	7	6	114
2004	0	5	12	32	33	19	7	4	112
2005	0	1	9	21	23	19	5	9	87
2006	0	0	14	16	23	17	6	8	84
Total	0	11	76	204	322	340	102	33	1088

	2002	2003	2004	2005	2006
Lowest:	1.6	1.9	1.7	1.9	2.1
Highest:	7.8	17.9	9.2	14.5	23.9
Mean:	4.8	4.5	4.2	4.7	4.9
Median:	5.0	4.1	4.1	4.5	4.7

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	0	5	14	31	38	11	1	100
2003	0	2	8	36	25	18	6	5	100
2004	0	4	11	29	29	17	6	4	100
2005	0	1	10	24	26	22	6	10	100
2006	0	0	17	19	27	20	7	10	100
Total	0	1	7	19	30	31	9	3	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	0	2	7	5	4	4	5	0	1	0	28
2003	1	0	7	9	22	13	5	5	0	0	62
2004	0	1	1	3	5	6	1	1	0	0	18
2005	0	0	6	6	8	5	3	1	0	0	29
2006	0	1	10	12	11	11	5	0	0	0	50
Total	1	4	31	35	50	39	19	7	1	0	187

	2002	2003	2004	2005	2006
Lowest:	4.7	4.1	4.6	5.1	4.7
Highest:	8.1	7.7	7.7	7.6	7.4
Mean:	-	-	-	-	-
Median:	6.0	6.2	6.4	6.2	6.1

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	7	25	18	14	14	18	0	4	0	100
2003	2	0	11	15	35	21	8	8	0	0	100
2004	0	6	6	17	28	33	6	6	0	0	100
2005	0	0	21	21	28	17	10	3	0	0	100
2006	0	2	20	24	22	22	10	0	0	0	100
Total	1	2	17	19	27	21	10	4	1	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	14	17	72	194	263	120	9	2	0	0	691
2003	5	17	35	32	15	6	3	1	0	0	114
2004	1	11	19	35	32	12	2	0	0	0	112
2005	0	7	21	22	22	12	3	0	0	0	87
2006	3	2	15	41	19	4	0	0	0	0	84
Total	23	54	162	324	351	154	17	3	0	0	1088

	2002	2003	2004	2005	2006
Lowest:	4.0	3.8	4.4	4.5	4.0
Highest:	7.8	7.6	7.3	7.0	6.8
Mean:	-	-	-	-	-
Median:	6.0	5.4	5.8	5.7	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	2	2	10	28	38	17	1	0	0	0	100
2003	4	15	31	28	13	5	3	1	0	0	100
2004	1	10	17	31	29	11	2	0	0	0	100
2005	0	8	24	25	25	14	3	0	0	0	100
2006	4	2	18	49	23	5	0	0	0	0	100
Total	2	5	15	30	32	14	2	0	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	5	2	18	1	0	0	1	0	1	28
2003	0	13	16	23	2	1	2	3	1	1	62
2004	0	2	3	4	3	2	0	0	1	3	18
2005	0	4	4	15	4	0	0	0	1	1	29
2006	0	6	17	15	0	1	4	2	0	5	50
Total	0	30	42	75	10	4	6	6	3	11	187

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

	2002	2003	2004	2005	2006
Lowest:	1	1	2	2	1
Highest:	416	651	1209	277	367
Mean:	33	34	132	34	51
Median:	13	9	37	19	10

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	18	7	64	4	0	0	4	0	4	100
2003	0	21	26	37	3	2	3	5	2	2	100
2004	0	11	17	22	17	11	0	0	6	17	100
2005	0	14	14	52	14	0	0	0	3	3	100
2006	0	12	34	30	0	2	8	4	0	10	100
Total	0	16	22	22	5	2	3	3	2	6	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	304	204	180	3	0	0	0	0	0	691
2003	0	57	24	30	1	0	0	2	0	0	114
2004	0	42	27	39	2	2	0	0	0	0	112
2005	0	32	30	19	2	2	1	0	0	1	87
2006	0	33	23	21	4	1	1	0	1	0	84
Total	0	468	308	289	12	5	2	2	1	1	1088

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	58	135	70	394	195
Mean:	7	9	9	14	13
Median:	4	3	6	5	4

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	44	30	26	0	0	0	0	0	0	100
2003	0	50	21	26	1	0	0	2	0	0	100
2004	0	38	24	35	2	2	0	0	0	0	100
2005	0	37	34	22	2	2	1	0	0	1	100
2006	0	39	27	25	5	1	1	0	1	0	100
Total	0	43	28	27	1	0	0	0	0	0	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 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	0	4	5
2003	0	1	2	1	6	10
2004	0	0	0	2	1	3
2005	0	0	0	0	1	1
2006	0	0	0	2	2	4
Total (#)	0	1	3	5	14	23
Total (%)	0	4	13	22	61	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	0	0	3	4	9	16
2003	0	0	3	9	17	29
2004	0	0	0	0	9	9
2005	0	0	1	5	12	18
2006	0	0	2	11	18	31
Total (#)	0	0	9	29	65	103
Total (%)	0	0	9	28	63	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	0	0	0	3	4	7
2003	0	0	2	14	3	19
2004	0	0	0	2	2	4
2005	0	1	0	4	3	8
2006	0	1	1	7	3	12
Total (#)	0	2	3	30	15	50
Total (%)	0	4	6	60	30	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
2002	0	0	0	0	0	0
2003	0	1	0	2	1	4
2004	0	0	1	0	1	2
2005	1	0	0	0	1	2
2006	0	1	2	0	0	3
Total (#)	1	2	3	2	3	11
Total (%)	9	18	27	18	27	100



Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	0	0	4	7	17	28
2003	0	2	7	26	27	62
2004	0	0	1	4	13	18
2005	1	1	1	9	17	29
2006	0	2	5	20	23	50
Grand Total	1	5	18	66	97	187

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	0	0	14	25	61	100
2003	0	3	11	42	44	100
2004	0	0	6	22	72	100
2005	3	3	3	31	59	100
2006	0	4	10	40	46	100
Grand Total	1	3	10	35	52	100

	2002	2003	2004	2005	2006
Lowest:	89	60	125	55	80
Highest:	839	789	10339	786	2395
Mean:	297	245	869	291	363
Median:	227	203	292	220	204

## 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	3	0	1	5	9
2003	0	0	1	0	1	2
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	1	0	1
Total (#)	0	3	1	2	6	12
Total (%)	0	25	8	17	50	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	1	17	23	31	36	108
2003	0	3	2	8	12	25
2004	0	1	1	5	5	12
2005	0	0	3	2	5	10
2006	0	0	0	6	6	12
Total (#)	1	21	29	52	64	167
Total (%)	1	13	17	31	38	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	4	52	123	144	211	534
2003	1	5	12	25	27	70
2004	0	10	9	17	55	91
2005	0	1	10	22	27	60
2006	0	3	8	26	28	65
Total (#)	5	71	162	234	348	820
Total (%)	1	9	20	29	42	100

Rao, R., D. Sprague, Q.M. Ketterings, and H. Krol (2007). Chautauqua Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-11. 34 pages.

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	3	1	11	9	9	33
2003	1	2	2	3	3	11
2004	0	4	0	3	1	8
2005	0	1	6	4	2	13
2006	0	0	1	1	1	3
Total (#)	4	8	20	20	16	68
Total (%)	6	12	29	29	24	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	1	1	2
2003	0	0	1	1	3	5
2004	0	0	0	1	0	1
2005	0	0	1	0	0	1
2006	0	0	0	0	0	0
Total (#)	0	0	2	3	4	9
Total (%)	0	0	22	33	44	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 (%)	0	0	0	0	0	0

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	8	73	157	186	262	5	691
2003	2	10	18	37	46	1	114
2004	0	15	10	26	61	0	112
2005	0	2	20	28	34	3	87
2006	0	3	9	34	35	3	84
Grand Total	10	103	214	311	438	12	1088

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	1	11	23	27	38	1	100
2003	2	9	16	32	40	1	100
2004	0	13	9	23	54	0	100
2005	0	2	23	32	39	3	100
2006	0	4	11	40	42	4	100
Grand Total	1	9	20	29	40	1	100

	2002	2003	2004	2005	2006
Lowest:	28	24	45	73	72
Highest:	1036	1500	903	4616	925
Mean:	197	201	256	278	227
Median:	160	176	215	172	183

## 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	0	0	0	6	22	28
2003	0	0	0	5	57	62
2004	0	0	0	2	16	18
2005	0	0	0	2	27	29
2006	0	0	1	8	41	50
Total	0	0	1	23	163	187

	2002	2003	2004	2005	2006
Lowest:	115	104	162	104	82
Highest:	1121	1553	2264	759	2061
Mean:	342	379	589	399	408
Median:	275	329	496	356	326

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	0	0	21	79	100
2003	0	0	0	8	92	100
2004	0	0	0	11	89	100
2005	0	0	0	7	93	100
2006	0	0	2	16	82	100
Total	0	0	1	12	87	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	0	7	9	65	610	691
2003	0	1	3	29	81	114
2004	0	5	5	19	83	112
2005	0	2	6	18	61	87
2006	0	2	6	13	63	84
Total	0	17	29	144	898	1088

	2002	2003	2004	2005	2006
Lowest:	21	31	26	48	35
Highest:	891	935	668	2095	892
Mean:	351	300	287	329	307
Median:	341	264	271	254	251

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	0	1	1	9	88	100
2003	0	1	3	25	71	100
2004	0	4	4	17	74	100
2005	0	2	7	21	70	100
2006	0	2	7	15	75	100
Total	0	2	3	13	83	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	23	5	28
2003	56	6	62
2004	17	1	18
2005	26	3	29
2006	44	6	50
Total	166	21	187

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	82	18	100
	90	10	100
	94	6	100
	90	10	100
	88	12	100
	89	11	100

	2002	2003	2004	2005	2006
Lowest:	5	2	3	2	4
Highest:	100	119	189	82	283
Mean:	27	23	24	25	31
Median:	13	15	15	18	19

## 10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	612	79	691
2003	70	44	114
2004	65	47	112
2005	64	23	87
2006	56	28	84
Total	867	221	1088

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	89	11	100
	61	39	100
	58	42	100
	74	26	100
	67	33	100
	80	20	100

	2002	2003	2004	2005	2006
Lowest:	1	3	5	4	5
Highest:	306	422	927	413	419
Mean:	25	55	62	48	58
Median:	16	37	40	24	32



## 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	27	1	28	96	4	100
2003	60	2	62	97	3	100
2004	16	2	18	89	11	100
2005	27	2	29	93	7	100
2006	48	2	50	96	4	100
Total	178	9	187	95	5	100

	2002	2003	2004	2005	2006
Lowest:	14	17	20	15	11
Highest:	106	103	172	127	466
Mean:	52	50	52	60	57
Median:	48	48	36	58	40

## 11.2 Commercial Samples

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

Total number of samples:				Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	683	8	691	99	1	100
2003	109	5	114	96	4	100
2004	102	10	112	91	9	100
2005	80	7	87	92	8	100
2006	68	16	84	81	19	100
Total	1042	46	1088	96	4	100

	2002	2003	2004	2005	2006
Lowest:	6	2	3	10	13
Highest:	177	351	429	171	809
Mean:	37	57	56	56	95
Median:	33	54	38	50	49

## 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	0	0	28	28
2003	1	9	52	62
2004	0	0	18	18
2005	0	1	28	29
2006	2	4	44	50
Total	3	14	170	187

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	0	100	100
2	15	84	100
0	0	100	100
0	3	97	100
4	8	88	100
2	7	91	100

	2002	2003	2004	2005	2006
Lowest:	1.6	0.3	1.7	1.0	0.3
Highest:	40.0	1220.8	175.8	92.1	111.6
Mean:	14.6	28.6	21.6	10.9	10.5
Median:	11.1	4.3	9.0	4.9	5.8

## 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	1	107	583	691
2003	1	5	108	114
2004	2	8	102	112
2005	3	13	71	87
2006	10	4	70	84
Total	17	137	934	1088

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	15	84	100
1	4	95	100
2	7	91	100
3	15	82	100
12	5	83	100
2	13	86	100

	2002	2003	2004	2005	2006
Lowest:	0.3	0.4	0.2	0.1	0.1
Highest:	54.4	43.8	219.6	34.8	28.2
Mean:	2.4	4.4	6.5	3.0	3.4
Median:	1.8	3.2	2.2	2.1	2.3

## Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description
<b>Alfalfa</b>	
ABE	Alfalfa trefoil grass, Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
<b>Birdsfoot</b>	
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
<b>Barley</b>	
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
<b>Clover</b>	
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
	<b>Corn</b>
COG	Corn grain
COS	Corn silage
	<b>Grasses, pastures, covercrops</b>
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
	<b>Small grains</b>
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
	<b>Others</b>
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