

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Tioga Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-40. 30 pages.

Soil Sample Survey

Tioga County

Samples analyzed by CNAL (2002-2006)



Tioga County (photo credit: Fay Benson, CCE of Cortland County).

Summary compiled by

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

&

Nutrient Management Spear Program
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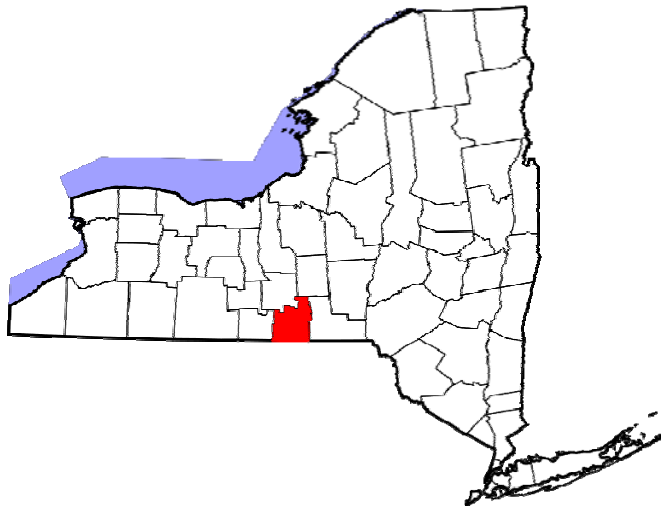
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1. County Introduction

Tioga County is located in south central NY, in the Southern Tier region. The Southern Tier refers to the counties of New York State that lie west of the Catskill Mountains and



along the northern border of Pennsylvania. Tioga County lies in the glaciated Allegheny Plateau section of the Appalachian Plateau. The Allegheny Plateau is underlain by acid shale and sandstone of the Devonian age.

Although Tioga County has benefited economically from two major corporate industrial giants: Lockheed Martin and IBM, the county remains rural with a population slightly over 500,000. Tioga County has 128,000 acres in farms, 39 percent of the county's total 331,963 acres. NYS Rte 17, which runs east to west near the southern border of the county, has long been known as a scenic byway. The highway cuts through some of the most fertile and productive soils in the county. The Tioga silt loam soil type is commonly found along this corridor. It is a deep, silty, stone free river bottom soil that is a highly productive for agriculture but makes up only about 1 percent of the county. Typical of the southern tier landscape farms are located in the valleys and hills of Tioga County. The soil types offer different management challenges from the valley floors to the rolling hills. Well-drained, highly productive gravel soils are generally located along valleys floors but can be droughty. The soils on the hills are heavier, containing more silt and clay soil particles. They typically have a natural constricted layer within two feet of the soil surface, which restricts drainage and crop rooting depth.

The Tioga County New York Soil Survey produced by the Soil Conservation Service, United States Department of Agriculture, characterizes the soils in Tioga County as, “generally lower in lime and plant nutrients than those in the high-lime belt of central

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New York. On the average they are also more stony, more strongly sloping, and some what less favorable in moisture conditions (p 24).”

Farms seeking to remain in agriculture and production but in non-traditional enterprises have developed a community of unique agricultural businesses to capitalize on the tourist/recreational aspects of agriculture. Farm enterprises range from beekeeping, berries, maple syrup and market gardens to buffalo, fallow deer, emus, alpaca, dairy goats, corn mazes, organic products, stables and horticultural products. Tioga County is also home to Leprino Foods, the world's largest supplier of mozzarella cheese.

According to the USDA Census of Agriculture there were 604 farms in the county in 2002 and 128,224 acres of cropland. There were 126 dairy farms with a total of 9104 milk cows, and 142 beef farms with a total of 2,130 beef cows. The entire cattle/calves inventory was 20,063 head. For poultry, there were 46 egg farms with a total of 2,051 layers, and 12 broiler operations with 8,357 birds. Sheep farms numbered 39 with 1,207 sheep and lambs in inventory.

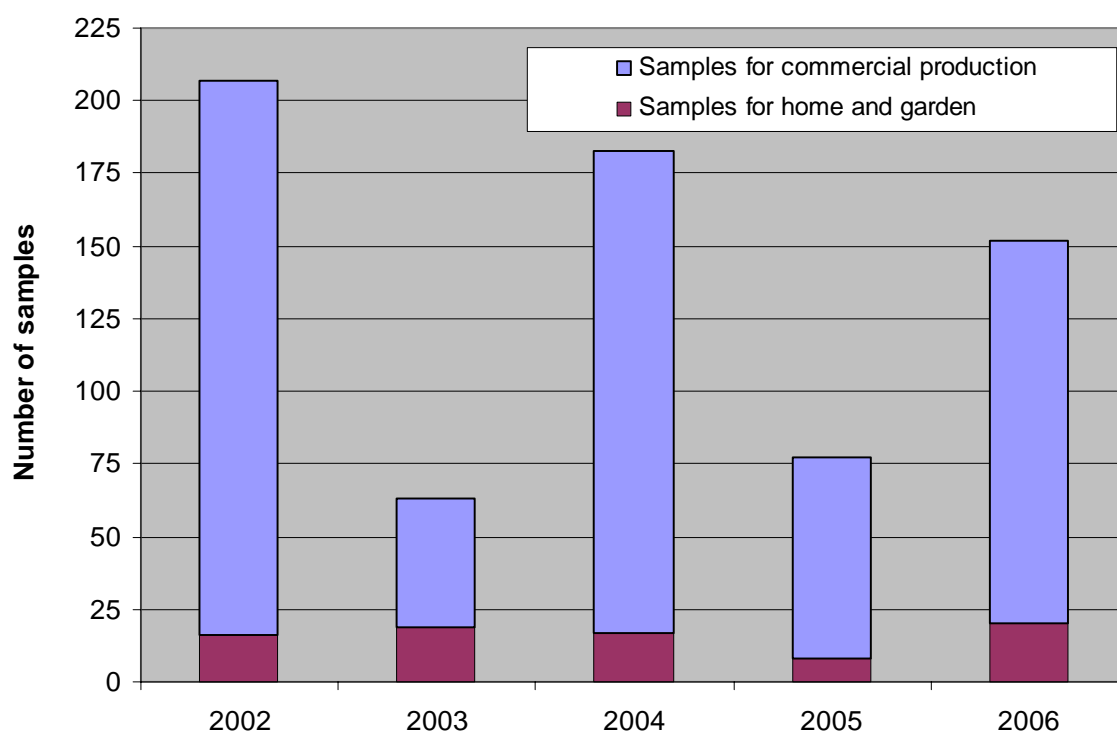
Corn was grown for silage and to a lesser extent grain, on 9,753 acres. Land used for all hay and haylage covered 44,222 acres. Small grains are grown on a limited basis with 896 acres of oats.

Regular soil tests contribute to optimized crop production while maintaining the quality of the environment through informed management of nutrients and management of soil fertility.

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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 Tioga County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 682. Of these, 602 samples (88%) were submitted by commercial growers while 80 samples (12%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	16	2002	191	207
2003	19	2003	44	63
2004	17	2004	166	183
2005	8	2005	69	77
<u>2006</u>	<u>20</u>	<u>2006</u>	<u>132</u>	<u>152</u>
Total	80	Total	602	682

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Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for home garden vegetable production (38%) and lawns (20%). Commercial growers submitted samples primarily to grow corn silage or grain (23%), alfalfa or alfalfa/grass mixes (18%), and grass hay production (18%) and pure or mixed clover-grass stands (13%).

Soils tested for home and garden in Tioga County were classified as belonging to soil management group 2 (39%), group 3 (26%), group 4 (28%), or group 5 (8%). 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, the majority (93%) belonged to soil management group 3. There were no group 1 samples. Six percent belonged to group 2, less than 1% belonged to group 4, 1% belonged to group 5, and there was sample that was classified as a group 6 soil. Mardin was the most common soil series (23% of all samples), followed by Volusia (21%), Lordstown (17%) and Howard (12%).

Organic matter levels, as measured by loss-on-ignition, ranged from 1% to almost 20%. For homeowner samples 36% had between 3 and 5% organic matter, 15% testing between 5 and 6% organic matter and 34% were classified as soils with more than 6% organic

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matter. Of the samples submitted by commercial growers, 60% contained between 3 and 5% organic matter while 22% had between 5 and 6% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.2 to 7.7 for home and garden samples while 51% tested between pH 5.5 and 6.9. For the commercial samples, the highest pH was 7.4 and 83% tested between pH 5.5 and 6.9.

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, 16% of the soils tested low for P, 14% tested medium, 30% tested high and 40% tested very high. This meant that 70% tested high or very high in P. For commercial growers, 8% tested very high. In total 34% were low in P, 22% tested medium for P while 37% of the samples were classified as high in soil test P. This means that 45% 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 below).

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

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Potassium classifications for Tioga County soils varied from very low (just one commercial grower soil) to very high (63% of the homeowner soils and 35% of the commercial growers' soils). For homeowners, 6% tested low in K, 13% tested medium, and 19% tested high for potassium. For commercial growers' soils, 12% tested low, 26% tested medium and 27% tested high in K.

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 59 to almost 4500 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (98% of the homeowner soils and 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 88-94% in the normal range with 6% of the homeowner soils and 12% of the commercial grower soils testing excessive for Fe. Similarly, most soils (88-96%) 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, 90% tested high for Zn while 6% tested medium and 4% were low in Zn. Of the commercial growers' samples, 6% tested low, 17% tested medium while 77% 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	%
ALG	1	1
ATF	2	3
BLU	5	6
FAR	6	8
FLA	1	1
GRA	1	1
LAW	16	20
MIX	1	1
MVG	30	38
OTH	4	5
PER	3	4
ROS	3	4
SAG	3	4
TRF	4	5
Total	80	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	6	0	0	0	4	10	2
AGE/AGT	16	0	23	6	13	58	10
ALE/ALT	2	2	14	8	11	37	6
ASP	1	0	0	0	0	1	0
BCE	1	1	0	0	0	2	0
BET	1	0	0	0	0	1	0
BGE	1	0	0	0	0	1	0
BLB	4	0	7	0	0	11	2
BNS	0	0	0	0	1	1	0
BSP	0	0	0	1	0	1	0
BSS	0	2	0	0	3	5	1
BTE	0	0	0	1	0	1	0
CGE/CGT	43	2	11	11	8	75	12
CLE/CLT	0	1	1	2	4	8	1
COG/COS	54	1	37	14	31	137	23
FLA	0	1	0	0	0	1	0
GIE/GIT	0	0	0	1	5	6	1
GPF	0	0	0	2	0	2	0
GRE/GRT	25	21	32	13	13	104	17
IDL	0	0	1	0	0	1	0
LAW	0	2	0	0	0	2	0
MIX	7	1	3	4	2	17	3
OAS	0	0	0	0	1	1	0
ONP	1	0	0	0	0	1	0
ONS	0	0	0	0	1	1	0
OTH	0	1	0	0	1	2	0
PGE/PGT	0	0	9	0	0	9	1
PIE/PIT	10	0	6	3	0	19	3
PLE/PLT	0	5	1	0	1	7	1
PNT	2	0	8	0	0	10	2
POT	2	0	1	2	9	14	2
PUM	0	0	1	0	0	1	0
RSS	1	0	0	0	0	1	0
RYC	1	2	1	0	2	6	1
RYS	0	0	0	0	1	1	0
SOF	0	0	0	0	1	1	0

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Current year crop	2002	2003	2004	2005	2006	Total	%
SOY	0	0	6	0	1	7	1
SQW	0	0	0	0	1	1	0
STS	0	0	1	0	0	1	0
SWC	1	0	2	0	4	7	1
TOM	0	2	0	0	5	7	1
TRT	0	0	0	1	1	2	0
Unknown	12	0	1	0	8	21	3
Total	191	44	166	69	132	602	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)	31	39
SMG 3 (silt loam)	21	26
SMG 4 (sandy loam)	22	28
SMG 5 (sandy)	6	8
SMG 6 (mucky)	0	0
Total	80	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Alluvial land	3	0	0	0	0	1	1	0
Alton	5	0	0	6	0	0	6	1
Chenango	3	0	2	17	4	10	33	5
Chippeny	6	1	0	0	0	0	1	0
Chippewa	3	0	0	2	0	2	4	1
Fredon	4	0	0	0	1	0	1	0
Fremont	2	11	0	4	1	9	25	4
Hamlin	2	6	0	0	0	0	6	1
Howard	3	15	4	15	12	25	71	12
Lordstown	3	17	13	31	14	25	100	17
Mardin	3	40	16	40	16	28	140	23
Middlebury	3	2	0	3	2	3	10	2
Phelps	3	0	0	0	2	0	2	0
Pope	4	0	0	0	0	1	1	0
Red Hook	4	0	0	1	0	0	1	0
Teel	2	0	0	0	1	0	1	0
Tioga	3	5	0	7	2	15	29	5
Unadilla	3	23	4	1	0	4	32	5
Valois	3	0	0	2	0	1	3	0
Volusia	3	71	5	37	12	3	128	21
Wallington	3	0	0	0	0	5	5	1
Wayland	2	0	0	0	2	0	2	0
Total	-	191	44	166	69	132	602	100

5. Organic Matter

5.1 Homeowner Samples

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

	<1.0	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	0	5	7	13	16	12	3	24	80
Percentage	0	6	9	16	20	15	4	30	100

	2002-2006
Lowest:	1.2
Highest:	19.8
Mean:	5.8
Median:	4.7

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	0	9	45	96	27	10	4	191
2003	0	0	2	7	13	16	3	3	44
2004	0	1	9	28	51	59	12	6	166
2005	0	0	4	19	23	16	4	3	69
2006	0	8	28	39	38	13	4	2	132
Total	0	9	52	138	221	131	33	18	602

	2002	2003	2004	2005	2006
Lowest:	2.4	2.6	1.3	2.3	1.4
Highest:	9.0	14.3	9.4	7.6	9.2
Mean:	4.5	5.1	4.8	4.5	3.8
Median:	4.4	4.9	4.9	4.6	3.8

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	24	50	14	5	2	100
2003	0	0	5	16	30	36	7	7	100
2004	0	1	5	17	31	36	7	4	100
2005	0	0	6	28	33	23	6	4	100
2006	0	6	21	30	29	10	3	2	100
Total	0	1	9	23	37	22	5	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
Number	2	2	5	11	14	16	24	6	0	0	80
Percentage	3	3	6	14	18	20	30	8	0	0	100

	2002-2006
Lowest:	4.2
Highest:	7.7
Mean:	-
Median:	6.7

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	2	2	23	51	60	41	12	0	0	0	191
2003	1	3	2	9	5	18	6	0	0	0	44
2004	3	5	25	49	52	31	1	0	0	0	166
2005	0	0	5	19	18	24	3	0	0	0	69
2006	0	0	3	28	31	62	8	0	0	0	132
Total	6	10	58	156	166	176	30	0	0	0	602

	2002	2003	2004	2005	2006
Lowest:	4.1	4.4	4.1	5.1	5.1
Highest:	7.4	7.4	7.0	7.1	7.3
Mean:	-	-	-	-	-
Median:	6.1	6.6	6.0	6.2	6.5

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	1	1	12	27	31	21	6	0	0	0	100
2003	2	7	5	20	11	41	14	0	0	0	100
2004	2	3	15	30	31	19	1	0	0	0	100
2005	0	0	7	28	26	35	4	0	0	0	100
2006	0	0	2	21	23	47	6	0	0	0	100
Total	1	2	10	26	28	29	5	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	
Number	0	13	11	24	4	2	2	3	6	15	80
Percentage	0	16	14	30	5	3	3	4	8	19	100

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

	2002-2006
Lowest:	1
Highest:	818
Mean:	111
Median:	25

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	74	36	66	7	4	0	3	1	0	191
2003	0	10	5	22	3	1	1	0	0	2	44
2004	0	79	45	36	2	4	0	0	0	0	166
2005	0	19	16	26	2	0	2	2	0	2	69
2006	0	20	30	70	8	0	0	0	0	4	132
Total	0	202	132	220	22	9	3	5	1	8	602

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	151	469	76	333	608
Mean:	15	40	9	24	29
Median:	6	19	4	8	11

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	39	19	35	4	2	0	2	1	0	100
2003	0	23	11	50	7	2	2	0	0	5	100
2004	0	48	27	22	1	2	0	0	0	0	100
2005	0	28	23	38	3	0	3	3	0	3	100
2006	0	15	23	53	6	0	0	0	0	3	100
Total	0	34	22	37	4	1	0	1	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	0	2	5	24	31
Total (%)	0	0	6	16	77	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	2	4	6	9	21
Total (%)	0	10	19	29	43	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	3	2	3	14	22
Total (%)	0	14	9	14	64	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	2	1	3	6
Total (%)	0	0	33	17	50	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., J. Degni, Q.M. Ketterings, and H. Krol (2007). Tioga Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-40. 30 pages.

Potassium classification summary for homeowners:

Summary	Very Low	Low	Medium	High	Very High	Total
Number	0	5	10	15	50	80
Percentage	0	6	13	19	63	100

	2002-2006
Lowest:	54
Highest:	2288
Mean:	419
Median:	287

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	5	6	3	3	17
2003	0	0	0	0	0	0
2004	0	0	0	0	4	4
2005	0	0	0	0	4	4
2006	0	0	0	4	5	9
Total (#)	0	5	6	7	16	34
Total (%)	0	15	18	21	47	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	0	20	38	39	76	173
2003	0	8	21	7	8	44
2004	1	17	45	51	41	155
2005	0	8	13	18	25	64
2006	0	8	31	40	43	122
Total (#)	1	61	148	155	193	558
Total (%)	0	11	27	28	35	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	1	0	0	1
2005	0	0	0	1	0	1
2006	0	0	0	1	0	1
Total (#)	0	0	1	2	0	3
Total (%)	0	0	33	67	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	3	3	0	0	6
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	3	3	0	0	6
Total (%)	0	50	50	0	0	100

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Tioga Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-40. 30 pages.

Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	0	0	0	1
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	1	0	0	0	1
Total (%)	0	100	0	0	0	100

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	0	26	44	42	79	191
2003	0	8	21	7	8	44
2004	1	20	49	51	45	166
2005	0	8	13	19	29	69
2006	0	8	31	45	48	132
Grand Total	1	70	158	164	209	602

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	0	14	23	22	41	100
2003	0	18	48	16	18	100
2004	1	12	30	31	27	100
2005	0	12	19	28	42	100
2006	0	6	23	34	36	100
Grand Total	0	12	26	27	35	100

	2002	2003	2004	2005	2006
Lowest:	49	54	40	58	50
Highest:	1520	449	571	864	1715
Mean:	241	219	173	242	211
Median:	157	109	138	167	158

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	2	10	68	80
Percentage	0	0	3	13	85	100

	2002-2006
Lowest:	89
Highest:	4471
Mean:	538
Median:	363

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	0	4	12	175	191
2003	0	1	1	2	40	44
2004	0	0	2	30	134	166
2005	0	1	2	9	57	69
2006	0	0	1	12	119	132
Total	0	2	10	65	525	602

	2002	2003	2004	2005	2006
Lowest:	84	59	68	61	71
Highest:	1035	2859	750	1053	2655
Mean:	418	623	357	460	464
Median:	395	572	337	449	412

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	0	2	6	92	100
2003	0	2	2	5	91	100
2004	0	0	1	18	81	100
2005	0	1	3	13	83	100
2006	0	0	1	9	90	100
Total	0	0	2	11	87	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	75	5	80

Percentages:

0-49	>49	Total
Normal	Excessive	
94	6	100

	2002-2006
Lowest:	2
Highest:	113
Mean:	16
Median:	9

10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	182	9	191
2003	37	7	44
2004	122	44	166
2005	64	5	69
2006	125	7	132
Total	530	72	602

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	95	5	100
	84	16	100
	73	27	100
	93	7	100
	95	5	100
	88	12	100

	2002	2003	2004	2005	2006
Lowest:	1	2	1	1	2
Highest:	150	252	275	202	236
Mean:	15	26	38	20	15
Median:	9	7	20	11	9

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	70	10	80

Percentages:

0-99	>99	Total
Normal	Excessive	
87.5	12.5	100

	2002-2006
Lowest:	11
Highest:	270
Mean:	57
Median:	43

11.2 Commercial Samples

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

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	186	5	191
2003	39	5	44
2004	159	7	166
2005	66	3	69
2006	129	3	132
Total	592	23	602

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	97	3	100
	89	11	100
	96	4	100
	96	4	100
	98	2	100
	96	4	100

	2002	2003	2004	2005	2006
Lowest:	11	15	12	13	12
Highest:	118	198	437	241	240
Mean:	45	50	45	43	35
Median:	41	34	37	34	30

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	3	5	72	80

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	6	90	100

	2002-2006
Lowest:	0.2
Highest:	288.0
Mean:	10.0
Median:	3.0

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	27	163	191
2003	1	1	42	44
2004	3	34	129	166
2005	1	16	52	69
2006	28	25	79	132
Total	34	103	465	602

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	14	85	100
2	2	95	100
2	20	78	100
1	23	75	100
21	19	60	100
6	17	77	100

	2002	2003	2004	2005	2006
Lowest:	0.4	0.4	0.3	0.2	0.1
Highest:	117.5	20.3	257.2	32.0	40.4
Mean:	4.2	3.8	6.6	3.4	2.5
Median:	1.8	2.4	1.9	1.7	1.2

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