

Rao, R., J. Lawrence, S. Place, Q.M. Ketterings, and H. Krol (2007). Lewis Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-1. 34 pages.

# Soil Sample Survey

# Lewis County

Samples analyzed by CNAL (2002-2006)

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Lewis County (photo credit: Peggy Murray, CCE of Lewis County).

## Summary compiled by

**Renuka Rao, Joe Lawrence, Sara Place,  
Quirine M. Ketterings, and Hettie Krol**

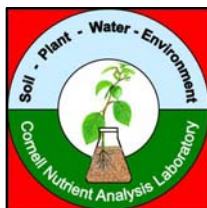
Cornell Nutrient Analysis Laboratory

<http://www.css.cornell.edu/soiltest/newindex.asp>

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Summary compiled by

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# 1. County Introduction

Lewis County is located in Northern New York, nestled between the Tug Hill Plateau to the west and the Adirondack Mountains to the east, with the Black River making its way through the center of the county as it flows north to Lake Ontario. Lewis County is bordered by Jefferson to the northwest, St. Lawrence to the northeast, Herkimer to the east, Oneida to the south and Oswego to the southwest.

The total land area in the county is 832,000 acres. Almost all of the land that is suited for agricultural production is utilized in this manner (approximately 197,000 acres or 24% of the total land area). Much of the remaining land area is forested land associated with the foothills of the Adirondack Mountains or the Tug Hill Plateau.

Dairy farming is the dominant type of agriculture; cows outnumber people 2:1. Virtually all of the land in agriculture is devoted to field and forage crops to support the dairy industry. There are approximately 300 commercial dairies that range widely in terms of acres and number of animals per farm.

Along with the dairy industry, Lewis County is well known for its production of maple syrup. In terms of value of production, New York is ranked 2<sup>nd</sup> nationally for maple syrup with Lewis County being one of the top producers in the state.

Over two-thirds of Lewis County drains into the Black River which flows north into Lake Ontario. However, there are two small areas of the county (the northeastern and southwestern corners) that do not drain to the Black River. The northeastern corner is drained by the Indian River (to Lake Ontario) and the Middle and West Branch of the Oswegatchie River (to the St. Lawrence River) while a small area in the southwestern corner drains south to the Mohawk River.

The maximum elevation is 2,012 feet above sea level (Welch Hill, 3 miles west of Turin), while the minimum elevation is approximately 700 feet above sea level (Black River Valley at the northern end of the county).

Glacial activity is responsible for depositing the parent material of the soils of Lewis County. Two very different soil regions are present in the county and they are separated



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by the Black River. Ordovician sediments made of a series of beds of limestone, black shale, gray shale, and sandstone make up the region west of the river. While very old, pre-Cambrian metamorphic and igneous materials make up the area east of the river. A majority of the agricultural land in the county is located in the central valley of the Black River. This land area consists of very fertile glacial drift soils covering underlying limestone terraces and alluvial fans that extend eastward from the base of Tug Hill. The highlands of the Tug Hill Plateau are capped by Oswego sandstone that is buried under varying depths of glacial drift. This area is generally poorly drained and wetlands are present in flats or depressions. An interesting land feature, east of the Black River particularly north of the town of Croghan, are rounded rock outcroppings made up predominately of gneiss and granite.

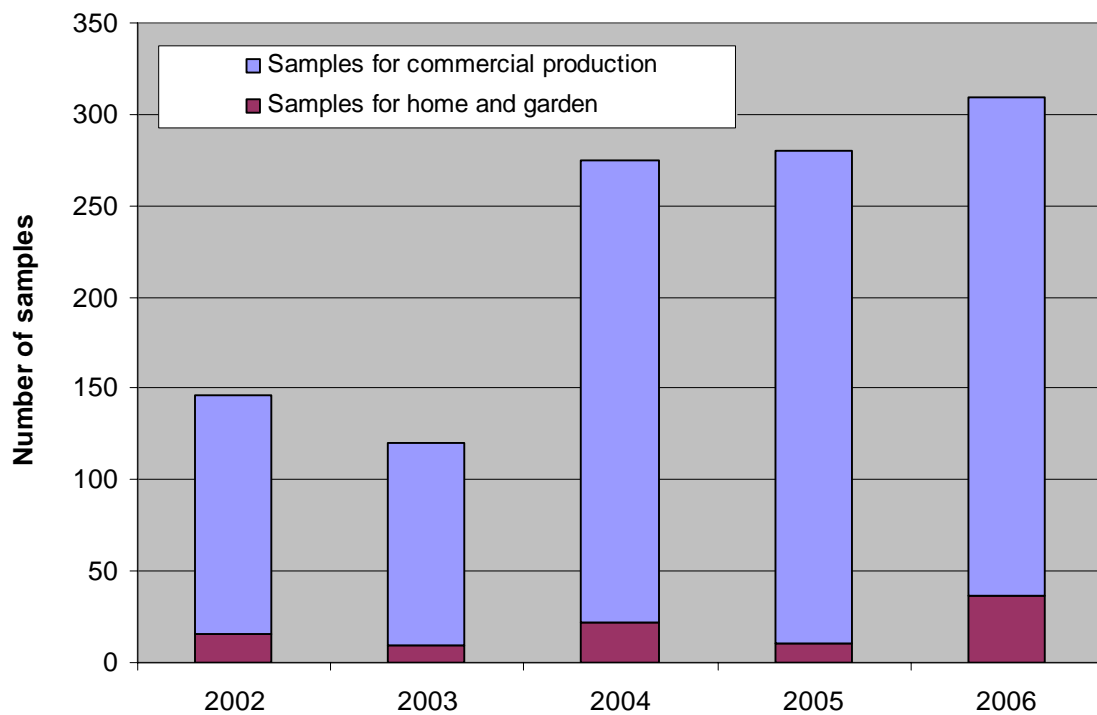
In a county dominated by animal agriculture soil testing plays a very important role in balancing optimum crop production with environmentally sound nutrient applications.

Joe Lawrence – Field Crops Educator  
Sara Place – Nutrient Management Intern  
Lewis County Cooperative Extension



## 2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Lewis County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1130. Of these, 1036 samples (92%) were submitted by commercial growers while 94 samples (8%) were submitted by homeowners. The number of samples has increased over the years.



Homeowners		Commercial		Total
2002	16	2002	130	146
2003	9	2003	111	120
2004	22	2004	253	275
2005	10	2005	270	280
<u>2006</u>	<u>37</u>	<u>2006</u>	<u>272</u>	<u>309</u>
Total	94	Total	1036	1130

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The majority (73%) of the homeowners that submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 requested fertilizer recommendations for lawns or for home garden vegetable production. Commercial growers submitted samples to grow alfalfa or alfalfa/grass mixes (24%), corn silage or grain (22%), and grass hay production (9%) while a few growers were planning to grow clover/grass mixes.

Soils tested for home and garden in Lewis County were classified as belonging to soil management group 5 (60%), group 4 (10%), group 3 (5%), or group 2 (4%). 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 (45%) belonged to soil management group 4. There were no group 1 samples. Twenty one percent belonged to group 2. Group 5 was represented by 15% of the samples while 5% were of unknown origin. There were no organic soils. Nellis was the most common soil series (20% of all samples), followed by Herkimer (8%), Galway (7%), Colton (6%) and Croghan (5%).

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to greater than 20%. For homeowners most samples had between 2 and 5% organic matter (69% of all samples), 12% testing between 5 and 6% organic matter and 13% was



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classified as soils with more than 6.9% organic matter. Of the samples submitted by commercial growers, 85% contained between 3 and 6% organic matter.

Soil pH in water (1:1 extraction ratio) varied from less than 3.9 to 8.2 for home and garden samples while 60% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 7.9 and 83% tested between 6.0 and 7.4.

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 lbs 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, 23% of the soils tested low for P, 15% tested medium, 36% tested high and 26% tested very high. This meant that 62% tested high or very high in P. For commercial growers, only 4% tested very high. In total 39% was low or very low in P, 31% tested medium for P while 27% of the submitted samples were classified as high in soil test P. This means that 31% tested high or very high in P. The number of samples testing medium in P is slowly increasing while fewer samples test low 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 8).

Potassium classifications for Lewis County soils varied from very low (9% of the homeowner soils and 4% of the commercial growers' soils) to very high (20% of the homeowner soils and 22% of the commercial growers' soils). For homeowners, 27% tested low in K, 16% tested medium, and 29% tested high for potassium. For commercial growers' soils, 19% tested low, 25% tested medium and 24% 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 1 to more than 2500 lbs Mg/acre. There were only two soils that tested very low for Mg within the homeowner samples while 1% of the samples for commercial production tested very low in Mg. Most soils tested high or very high for Mg (75% of the homeowner soils and 92% of the soils of the commercial growers). In total 24% of the homeowner soils and 7% 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 91-96% in the normal range with only 4% of the homeowner soils and 9% of the commercial grower soils testing excessive for Fe. Similarly, most soils (99%) 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, 94% tested high for Zn while 4% tested medium. Of the commercial growers' samples, 4% tested low, 22% tested medium while 73% was 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 are requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ATF	2	0	1	0	0	3	3
BLU	0	1	1	1	2	5	5
BNS	0	0	0	0	1	1	1
EGG	0	0	0	0	1	1	1
FLA	1	0	2	0	0	3	3
GEN	0	0	0	0	1	1	1
LAW	7	3	4	3	7	24	26
MVG	6	3	11	4	20	44	47
OTH	0	0	1	1	0	2	2
PER	0	1	1	1	1	4	4
POT	0	0	1	0	0	1	1
RSP	0	0	0	0	1	1	1
SQW	0	0	0	0	1	1	1
STR	0	1	0	0	0	1	1
SWC	0	0	0	0	2	2	2
Total	16	9	22	10	37	94	100

Note: See Appendix for Cornell crop codes.

### 3.2 Commercial Samples

Crops for which recommendations are requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE/ABT	0	0	1	0	0	1	0
AGE/AGT	65	30	58	50	34	237	23
ALE/ALT	2	5	3	3	1	14	1
APP	0	1	0	0	0	1	0
BCT	0	0	0	1	0	1	0
BET	0	1	0	0	0	1	0
BGE	0	1	0	0	0	1	0
BLB	0	0	1	0	1	2	0
BTT	0	0	1	0	0	1	0
CBP	0	1	0	0	0	1	0
CBS	1	0	0	0	0	1	0
CGE/CGT	3	5	8	2	10	28	3
CKS	1	0	0	0	0	1	0
CLE/CLT	3	20	1	0	14	38	4
COG/COS	37	19	52	48	67	223	22
GIE/GIT	0	1	2	0	9	12	1
GPV	0	0	0	0	1	1	0
GRE/GRT	15	11	9	27	18	80	8
IDL	0	0	0	0	6	6	1
MIX	2	1	1	0	5	9	1
OAS	0	0	1	0	0	1	0
OTH	0	0	74	14	1	89	9
PGE/PGT	0	0	2	0	0	2	0
PIE/PIT	0	0	2	0	0	2	0
PNE/PNT	0	0	1	0	0	1	0
POT	0	1	0	0	0	1	0
PUM	0	1	0	0	0	1	0
RSF	0	0	0	0	1	1	0
SOF	0	1	0	0	0	1	0
SOY	0	0	0	0	2	2	0
SSH	0	1	0	1	0	2	0
SWC	0	0	1	0	1	2	0
TOM	0	1	0	0	0	1	0
TRE/TRT	0	0	1	3	1	5	0
WHT	0	0	0	1	0	1	0
Unknown	1	10	34	120	100	265	26
Total	130	111	253	270	272	1036	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)	3	0	0	1	0	4	4
SMG 3 (silt loam)	1	0	1	2	1	5	5
SMG 4 (sandy loam)	3	2	10	1	13	29	31
SMG 5 (sandy)	9	7	11	6	23	56	60
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	16	9	22	10	37	94	100

## 4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Adams	5	1	0	1	10	10	22	2
Amenia	4	1	8	13	12	9	43	4
Angola	2	0	0	1	1	0	2	0
Appleton	2	0	0	0	1	0	1	0
Atherton	3	2	0	0	3	0	5	0
Arkport	4	0	0	0	4	0	4	0
Belgrade	3	0	0	0	0	1	1	0
Benson	4	0	1	0	1	0	2	0
Buxton	2	0	1	1	3	8	13	1
Camroden	3	5	1	2	11	17	36	3
Canandaigua	3	3	0	0	0	0	3	0
Charlton	4	1	18	2	9	15	45	4
Colton	5	9	12	11	3	28	63	6
Croghan	5	8	14	4	11	16	53	5
Danley	2	2	0	2	5	0	9	1
Darien	2	4	1	3	3	5	16	2
Deerfield	5	0	0	0	2	3	5	0
Duane	4	2	0	1	0	8	11	1
Dunkirk	3	1	2	0	3	0	6	1
Elmwood	4	0	0	0	3	0	3	0
Empeyville	4	2	1	3	0	0	6	1
Farmington	3	6	0	15	20	3	44	4
Galen	4	0	0	2	0	0	2	0
Galway	4	18	0	30	17	9	74	7
Genesee	2	0	0	1	0	0	1	0
Hartland	4	7	0	1	2	1	11	1
Herkimer	3	7	2	21	34	15	79	8
Homer	2	0	0	3	0	2	5	0
Howard	3	0	0	1	1	0	2	0
Hudson	2	1	0	1	0	0	2	0
Ilion	2	0	0	0	0	1	1	0
Junius	5	0	0	1	0	0	1	0
Kars	4	0	0	0	3	0	3	0
Kendaia	2	3	1	1	6	5	16	2
Lansing	2	1	6	13	2	3	25	2
Lobdell	3	0	0	4	0	0	4	0
Lyons	2	0	0	1	1	0	2	0



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Name	SMG	2002	2003	2004	2005	2006	Total	%
Manheim	2	0	1	2	0	0	3	0
Marcy	3	1	0	0	0	0	1	0
Massena	4	0	1	1	0	0	2	0
Melrose	4	1	0	0	8	0	9	1
Minoa	4	0	0	0	0	1	1	0
Mohawk	2	2	2	5	1	8	18	2
Naumburg	5	1	0	0	0	1	2	0
Nellis	4	21	24	65	44	51	205	20
Newstead	4	0	0	0	1	0	1	0
Niagara	3	0	0	0	1	0	1	0
Paxton	4	0	0	1	0	2	3	0
Phelps	3	0	0	0	0	1	1	0
Pinckney	3	2	1	7	4	12	26	3
Pittsfield	4	1	0	0	1	4	6	1
Plainfield	5	3	0	0	2	1	6	1
Pootatuck	4	0	0	0	0	1	1	0
Raynham	3	1	0	1	0	1	3	0
Rhinebeck	2	2	2	2	1	3	10	1
Ridgebury	4	1	3	0	0	0	4	0
Rumney	2	0	0	0	0	1	1	0
Saugatuc	5	0	0	1	1	1	3	0
Scantic	2	2	0	1	8	5	16	2
Scarboro	4	1	1	0	0	0	2	0
Scituate	4	2	0	0	0	5	7	1
Scriba	4	0	0	0	1	0	1	0
Swanton	4	0	0	0	1	4	5	0
Teel	2	1	0	2	0	1	4	0
Tuller	3	1	0	0	5	0	6	1
Walpole	4	0	0	2	0	2	4	0
Westbury	4	0	0	3	0	0	3	0
Whitman	4	0	0	0	0	2	2	0
Windsor	5	0	0	0	0	1	1	0
Worth	4	1	0	3	0	0	4	0
Unknown	-	2	8	18	20	5	53	5
Total	-	130	111	253	270	272	1036	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	2	1	6	3	4	0	0	16
2003	0	0	2	2	0	3	2	0	9
2004	1	0	6	9	3	1	0	2	22
2005	0	0	2	3	2	1	1	1	10
2006	1	2	4	13	9	2	1	5	37
Total	2	4	15	33	17	11	4	8	94

	2002	2003	2004	2005	2006
Lowest:	1.8	2.1	0.9	2.1	0.8
Highest:	5.9	6.2	9.4	14.3	21.7
Mean:	4.0	4.5	3.8	5.1	4.9
Median:	3.9	5.1	3.5	4.1	3.8

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	13	6	38	19	25	0	0	100
2003	0	0	22	22	0	33	22	0	100
2004	5	0	27	41	14	5	0	9	100
2005	0	0	20	30	20	10	10	10	100
2006	3	5	11	35	24	5	3	14	100
Total	2	4	16	35	18	12	4	9	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	1	12	24	42	36	10	5	130
2003	0	0	12	19	19	31	19	11	111
2004	0	1	18	31	81	70	35	17	253
2005	0	1	11	61	104	67	19	7	270
2006	0	2	30	53	85	71	20	11	272
Total	0	5	83	188	331	275	103	51	1036

	2002	2003	2004	2005	2006
Lowest:	1.9	2.0	1.5	1.9	1.6
Highest:	23	12.5	15.6	13.1	15.5
Mean:	4.8	5.1	5.1	4.7	4.6
Median:	4.6	5.1	4.9	4.6	4.6

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	0	1	9	18	32	28	8	4	100
2003	0	0	11	17	17	28	17	10	100
2004	0	0	7	12	32	28	14	7	100
2005	0	0	4	23	39	25	7	3	100
2006	0	1	11	19	31	26	7	4	100
Total	0	0	8	18	32	27	10	5	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	0	1	3	4	2	3	1	2	0	16
2003	0	0	1	2	2	1	3	0	0	0	9
2004	1	0	2	2	3	5	5	4	0	0	22
2005	0	0	1	0	2	4	2	1	0	0	10
2006	0	2	1	6	1	8	12	7	0	0	37
Total	1	2	6	13	12	20	25	13	2	0	94

	2002	2003	2004	2005	2006
Lowest:	5.2	5.4	3.9	5.3	4.7
Highest:	8.2	7.4	7.8	7.5	7.6
Mean:	-	-	-	-	-
Median:	6.5	6.3	6.8	6.6	7.0

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	0	6	19	25	13	19	6	13	0	100
2003	0	0	11	22	22	11	33	0	0	0	100
2004	5	0	9	9	14	23	23	18	0	0	100
2005	0	0	10	0	20	40	20	10	0	0	100
2006	0	5	3	16	3	22	32	19	0	0	100
Total	1	2	6	14	13	21	27	14	2	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	1	3	6	18	55	27	13	7	0	0	130
2003	0	0	10	14	38	35	13	1	0	0	111
2004	0	1	12	25	95	94	25	1	0	0	253
2005	0	0	4	34	104	93	33	2	0	0	270
2006	0	2	6	30	83	103	46	2	0	0	272
Total	1	6	38	121	375	352	130	13	0	0	1036

	2002	2003	2004	2005	2006
Lowest:	3.7	5.0	4.7	5.3	4.8
Highest:	7.9	7.5	7.5	7.6	7.6
Mean:	-	-	-	-	-
Median:	6.3	6.4	6.4	6.4	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	2	5	14	42	21	11	5	0	0	100
2003	0	0	9	13	34	32	12	1	0	0	100
2004	0	0	5	10	38	37	10	0	0	0	100
2005	0	0	1	13	39	34	12	1	0	0	100
2006	0	1	2	11	31	38	17	1	0	0	100
Total	0	1	4	12	36	34	13	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	4	2	8	0	1	1	0	0	0	16
2003	0	5	0	2	2	0	0	0	0	0	9
2004	0	5	3	6	2	2	0	2	2	0	22
2005	0	3	1	4	1	0	0	0	0	1	10
2006	0	5	8	14	3	1	3	1	0	2	37
Total	0	22	14	34	8	4	4	3	2	3	94

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	98	59	193	158	409
Mean:	21	19	49	40	42
Median:	10	3	29	16	13

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	25	13	50	0	6	6	0	0	0	100
2003	0	56	0	22	22	0	0	0	0	0	100
2004	0	23	14	27	9	9	9	9	9	0	100
2005	0	30	10	40	10	0	0	0	0	10	100
2006	0	14	22	38	8	3	3	3	0	5	100
Total	0	23	15	36	9	4	4	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	62	31	34	3	0	0	0	0	0	130
2003	0	54	28	25	0	0	0	3	1	0	111
2004	0	81	76	78	8	2	1	2	2	3	253
2005	0	103	89	73	3	1	0	1	0	0	270
2006	7	94	97	67	5	1	0	1	0	0	272
Total	7	394	321	277	19	4	1	7	3	3	1036

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	174	357	103	125
Mean:	8	11	17	8	8
Median:	4	4	6	5	5

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	48	24	26	2	0	0	0	0	0	100
2003	0	49	25	23	0	0	0	3	1	0	100
2004	0	32	30	31	3	1	0	1	1	1	100
2005	0	38	33	27	1	0	0	0	0	0	100
2006	3	35	36	25	2	0	0	0	0	0	100
Total	1	38	31	27	2	0	0	1	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 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	3	0	3
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	1	1
2006	0	0	0	0	0	0
Total (#)	0	0	0	3	1	4
Total (%)	0	0	0	75	25	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	0	0	0	1
2003	0	0	0	0	0	0
2004	0	1	0	0	0	1
2005	0	0	1	0	1	2
2006	0	0	0	0	1	1
Total (#)	0	2	1	0	2	5
Total (%)	0	40	20	0	40	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	1	0	0	3
2003	0	0	0	1	1	2
2004	0	1	2	4	3	10
2005	0	0	0	0	1	1
2006	0	1	1	7	4	13
Total (#)	0	4	4	12	9	29
Total (%)	0	14	14	41	31	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	1	2	1	2	3	9
2003	0	3	0	3	1	7
2004	2	4	2	1	2	11
2005	1	3	1	1	0	6
2006	4	7	6	5	1	23
Total (#)	8	19	10	12	7	56
Total (%)	14	34	18	21	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	1	5	2	6	3	16
2003	0	3	0	3	2	9
2004	2	6	4	5	5	22
2005	1	3	2	1	3	10
2006	4	8	7	12	6	37
Grand Total	8	25	15	27	19	94

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	6	29	12	35	18	100
2003	0	38	0	38	25	100
2004	9	27	18	23	23	100
2005	10	30	20	10	30	100
2006	11	22	19	32	16	100
Grand Total	9	27	16	29	20	100

	2002	2003	2004	2005	2006
Lowest:	55	69	34	57	46
Highest:	558	436	1178	526	565
Mean:	170	177	232	195	177
Median:	125	150	142	123	161

## 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	2	4	3	9	18
2003	0	4	7	2	1	14
2004	0	3	9	12	15	39
2005	0	2	5	11	14	32
2006	0	2	11	15	14	42
Total (#)	0	13	36	43	53	145
Total (%)	0	9	25	30	37	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	10	7	10	29
2003	0	1	1	0	4	6
2004	1	3	7	16	24	51
2005	0	7	22	25	28	82
2006	0	5	12	23	10	50
Total (#)	1	18	52	71	76	218
Total (%)	0	8	24	33	35	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	3	13	12	14	14	59
2003	4	19	8	18	8	57
2004	3	33	42	26	23	127
2005	5	21	33	28	20	107
2006	4	27	32	26	25	114
Total (#)	19	113	127	112	90	461
Total (%)	4	25	27	24	19	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	2	9	7	3	1	22
2003	6	7	5	5	3	26
2004	2	8	3	4	1	18
2005	7	10	8	4	0	29
2006	8	21	19	8	5	61
Total (#)	25	45	42	24	10	156
Total (%)	16	35	27	15	6	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	5	29	33	27	34	2	130
2003	10	31	21	25	16	8	111
2004	6	47	61	58	63	18	253
2005	12	40	68	68	62	20	270
2006	12	55	74	72	54	5	272
Grand Total	45	202	257	250	229	53	1036

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	4	22	25	21	26	2	100
2003	9	28	19	23	14	7	100
2004	2	19	24	23	25	7	100
2005	4	15	25	25	23	7	100
2006	4	20	27	26	20	2	100
Grand Total	4	19	25	24	22	5	100

	2002	2003	2004	2005	2006
Lowest:	35	20	16	16	42
Highest:	822	1019	2160	683	644
Mean:	173	173	225	173	161
Median:	142	122	141	142	128

## 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	2	1	4	9	16
2003	0	1	2	2	4	9
2004	0	2	3	7	11	22
2005	0	0	0	2	8	10
2006	2	8	4	11	12	37
Total	2	13	9	26	44	94

	2002	2003	2004	2005	2006
Lowest:	48	24	53	106	15
Highest:	947	692	1053	585	789
Mean:	262	273	306	318	210
Median:	245	186	205	294	140

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	13	6	25	56	100
2003	0	11	22	22	44	100
2004	0	9	9	32	50	100
2005	0	0	0	20	80	100
2006	5	22	11	30	32	100
Total	2	14	10	28	47	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	11	4	35	80	130
2003	0	13	5	28	65	111
2004	2	7	11	73	160	253
2005	0	1	98	57	201	270
2006	6	10	5	62	189	272
Total	8	42	36	255	695	1036

	2002	2003	2004	2005	2006
Lowest:	21	21	15	60	1
Highest:	1029	1435	1413	884	2503
Mean:	275	294	288	291	307
Median:	233	243	239	270	255

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	8	3	27	62	100
2003	0	12	5	25	59	100
2004	1	3	4	29	63	100
2005	0	0	4	21	74	100
2006	2	4	2	23	69	100
Total	1	4	3	25	67	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	16	0	16
2003	9	0	9
2004	20	2	22
2005	10	0	10
2006	35	2	37
Total	90	4	94

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	100	0	100
	100	0	100
	91	9	100
	100	0	100
	95	5	100
	96	4	100

	2002	2003	2004	2005	2006
Lowest:	3	3	2	2	2
Highest:	25	37	668	16	301
Mean:	8	12	43	7	21
Median:	6	9	7	5	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	121	9	130
2003	89	22	111
2004	233	20	253
2005	256	14	270
2006	244	28	272
Total	943	93	1036

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	93	7	100
	80	20	100
	92	8	100
	95	5	100
	90	10	100
	91	9	100

	2002	2003	2004	2005	2006
Lowest:	1	1	2	1	1
Highest:	682	337	197	90	159
Mean:	25	32	19	15	20
Median:	6	10	10	9	11

## 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	16	0	16	100	0	100
2003	9	0	9	100	0	100
2004	21	1	22	95	5	100
2005	10	0	10	100	0	100
2006	37	0	37	100	0	100
Total	93	1	94	99	1	100

	2002	2003	2004	2005	2006
Lowest:	6	3	3	7	5
Highest:	71	65	188	60	66
Mean:	25	22	28	23	24
Median:	17	21	17	13	18

## 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	127	3	130	98	2	100
2003	110	1	111	99	1	100
2004	252	1	253	100	0	100
2005	269	1	270	100	0	100
2006	271	1	272	100	0	100
Total	1029	7	1036	99	1	100

	2002	2003	2004	2005	2006
Lowest:	2	4	3	2	2
Highest:	263	168	135	185	164
Mean:	22	24	28	28	20
Median:	17	18	26	26	18

## 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	1	15	16
2003	1	1	7	9
2004	0	1	21	22
2005	0	0	10	10
2006	1	1	35	37
Total	2	4	88	94

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	6	94	100
11	11	78	100
0	5	56	100
0	0	100	100
3	3	95	100
2	4	94	100

	2002	2003	2004	2005	2006
Lowest:	0.8	0.4	0.9	1.6	0.2
Highest:	70.4	73.9	617.5	25.7	143.8
Mean:	12.0	19.5	35.3	8.3	10.1
Median:	5.2	5.4	5.0	6.3	3.5



## 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	5	34	91	130
2003	2	21	88	111
2004	10	66	177	253
2005	18	58	194	270
2006	11	51	210	272
Total	46	230	760	1036

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	26	70	100
2	19	79	100
4	26	70	100
7	21	72	100
4	19	77	100
4	22	73	100

	2002	2003	2004	2005	2006
Lowest:	0.3	0.3	0.1	0.1	0.1
Highest:	23.1	32.2	10.4	17.5	25.3
Mean:	2.3	3.1	1.8	1.9	2.4
Median:	1.5	1.8	1.4	1.5	1.8

## 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
BDR/DND	Beans-dry

Crop Code	Crop Description
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, Established
TRF	Turf
TRT	Christmas trees, Topdressing