

Rao, R., S.E. Hadcock, Q.M. Ketterings, and H. Krol (2007). Columbia Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-16. 35 pages.

Soil Sample Survey

Columbia County

Samples analyzed by CNAL (2002-2006)



Columbia County (photo credit: Steve Hadcock, CCE of Columbia County).

Summary compiled by
Renuka Rao, Steve Hadcock, Quirine M. Ketterings, and Hettie Krol



Cornell Nutrient Analysis Laboratory

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

&

Nutrient Management Spear Program

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October 19, 2007

Correct Citation:

Rao, R., S. Hadcock, Q.M. Ketterings, and H. Krol (2007). Soil sample survey of Columbia County. Samples analyzed by the Cornell Nutrient Analysis Laboratory (2002-2006). CSS Extension Bulletin E07-16. 35 pages.

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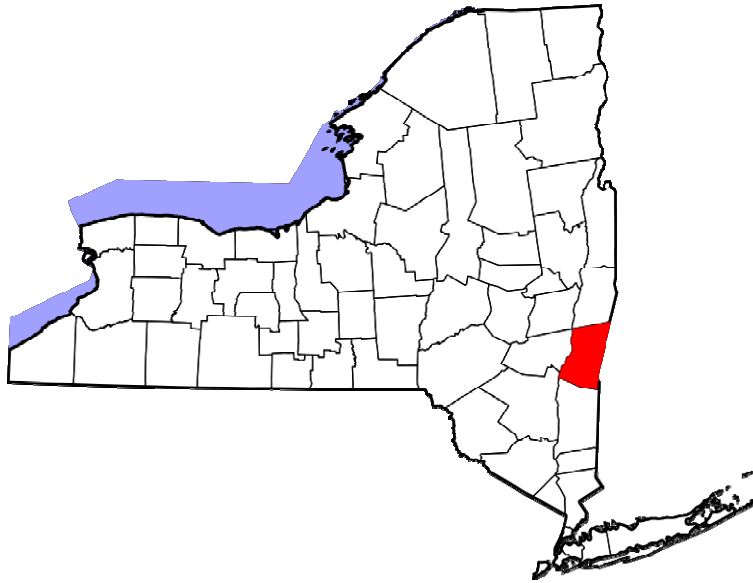
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Columbia County (photo credit: Steve Hadcock, CCE of Columbia County).

1. County Introduction

Columbia County is situated between the tidal waters of the Hudson River on the West and the 2,800-foot Taconic range shared with Massachusetts on the East. The county encompasses 643 square miles (411,520 acres). It is composed of two physiographic units. Most of the county is in the Hudson-Mohawk Valley unit. The Hudson-Mohawk valley has two major subsections. One is deep, dissected lacustrine sediments



immediately adjacent to the Hudson River. At the eastern margin of this lacustrine plain, a strand of sand and gravel beach ridge is transitional to the glacial till upland. The easternmost portion of the county is in the New England Upland – East of NYS Route 22. The far eastern portion of the county consists of the Harlem Valley with its fertile river outwash

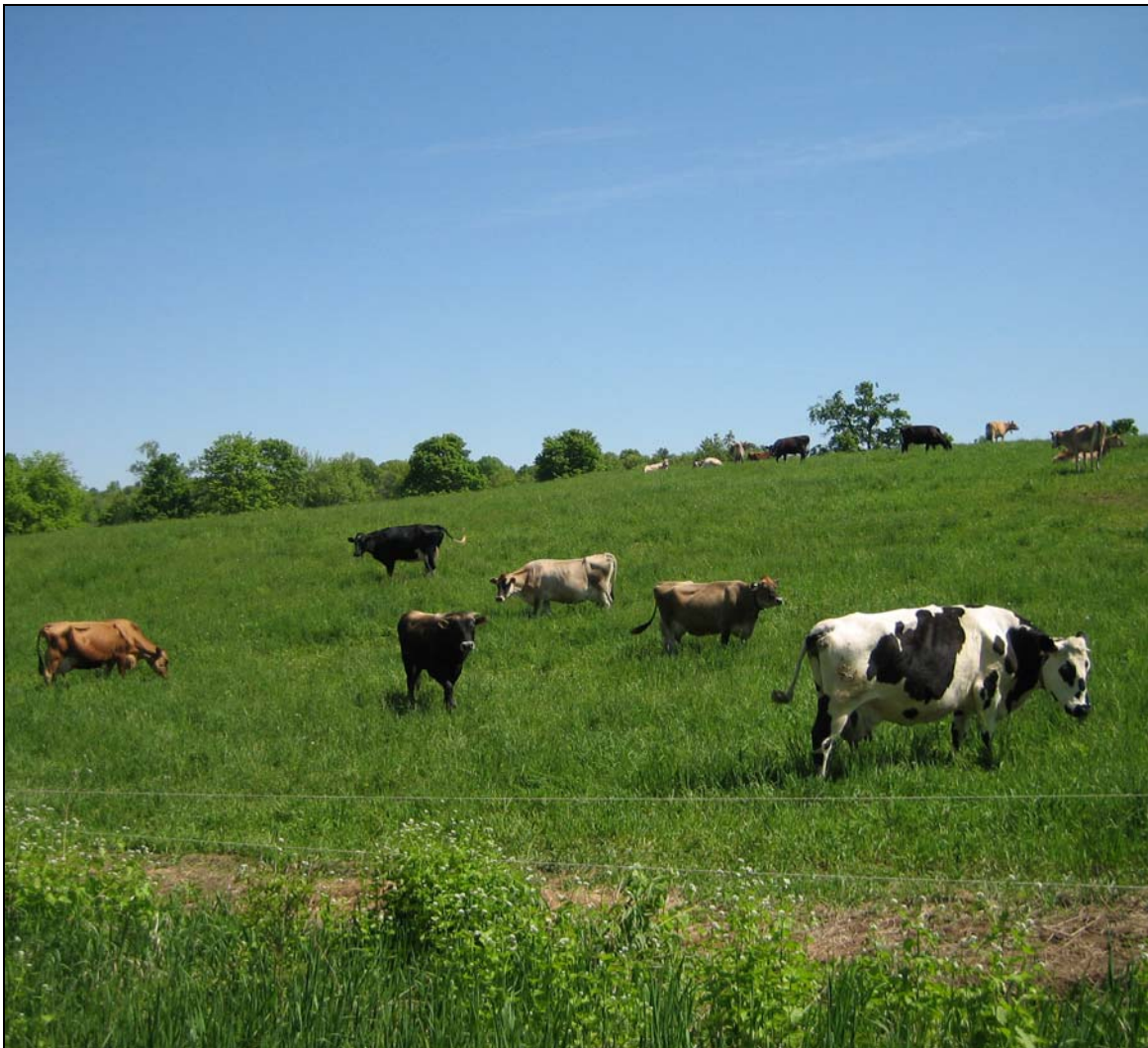
soils sandwiched between steep uplands. The central part of the county is underlain by folded shale bedrock. Glacial till deposits are thin on the North-South oriented ridgetops of this region.

The agriculture in Columbia County is quite diverse. Forty three percent of the county's agricultural sales come from dairy farming while fourteen percent originates from fruits and berries and a significant portion comes from cash crops (i.e., corn, small grains etc.) There are farms in each town in the county. The dairy farms are mainly concentrated in the two northwestern townships and the two southeastern townships. Soils in sections of these townships lend themselves better to forage production than other types of crops. Most fruit production is located in the western portion of the county where soils and climate are more favorable for this type of production. Apples, cherries, peaches, pears and plums are the most important generator of fruit farm income. Small fruits such as strawberries, brambles, ribes and blueberries are grown for fresh market sales.

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Due to the county's close proximity to Albany and New York City, the county is experiencing home development pressure. In response to growing communities, farmers' markets, roadside stands, and specialty horticultural farms are rapidly increasing in number.

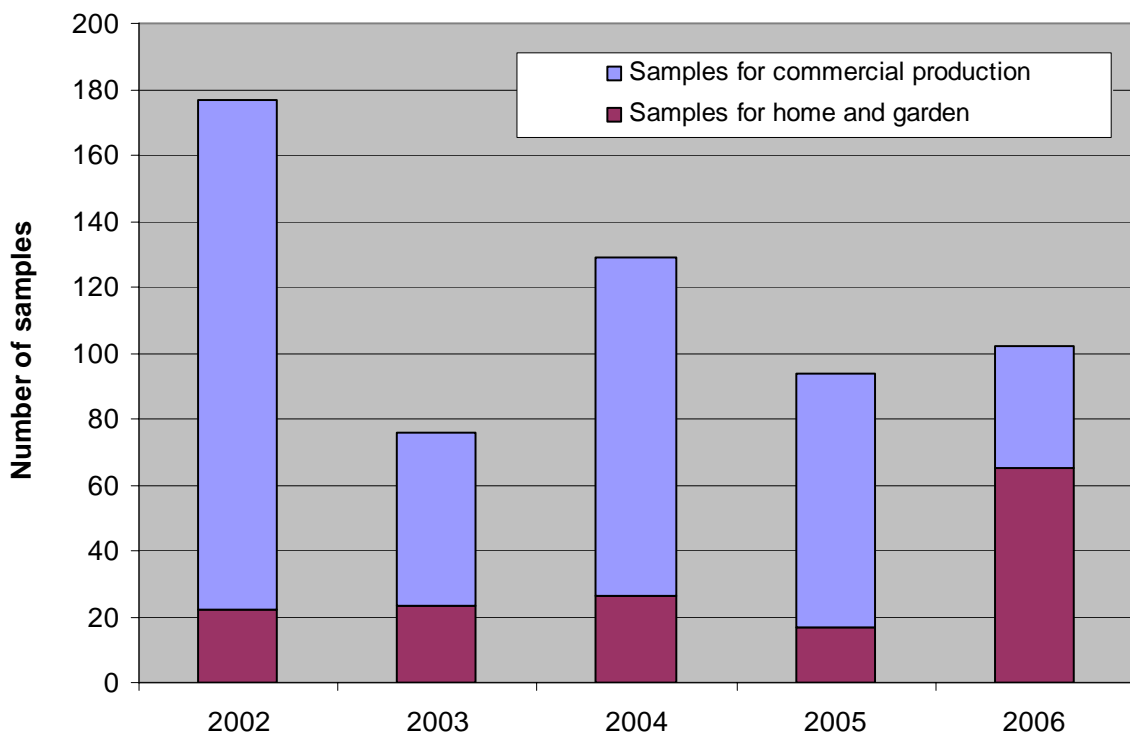
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Columbia County (photo credit: Steve Hadcock, CCE of Columbia County).

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Columbia County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 578. Of these, 425 samples (74%) were submitted by commercial growers while 153 samples (26%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	22	2002	155	177
2003	23	2003	53	76
2004	26	2004	103	129
2005	17	2005	77	94
<u>2006</u>	<u>65</u>	<u>2006</u>	<u>37</u>	<u>102</u>
Total	153	Total	425	578

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for home garden vegetable production (29%), lawns (28%) and perennials (12%). Commercial growers submitted samples to grow vegetables (15%), corn silage or grain (12%), alfalfa or alfalfa/grass mixes (10%), and grass hay production (8%) while a few growers were planning to grow other crops.

Soils tested for home and garden in Columbia County were classified as belonging to soil management group 2 (20%), group 3 (27%), group 4 (41%), or group 5 (11%). 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, 49% belonged to soil management group 3. Three percent were group 1 soils. Four percent belonged to group 2. Group 4 was represented by 39% of the samples while 4% were group 5 soils. There were no organic soils. Stockbridge was the most common soil series (13% of all samples), followed by Linthlithgo (13%), Pittstown (10%), Blasdell (10%) and Occum (9%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to 22.7%. For homeowner samples 55% had between 2 and 5% organic matter, 10% testing between 5 and 6% organic matter and 20% was classified as soils with more than 6.9%

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organic matter. Of the samples submitted by commercial growers, 80% contained between 2 and 5% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from less than 4.1 to 8.3 for home and garden samples while 55% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 8.7 and 80% 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, 12% of the soils tested low for P, 16% tested medium, 31% tested high and 41% tested very high. This meant that 72% tested high or very high in P. For commercial growers, 8% tested very high. In total 24% were low or very low in P, 28% tested medium for P while 40% of the submitted samples were classified as high in soil test P. This means that 48% 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 Columbia County soils varied from very low (less than 1% of the homeowner soils and 1% of the commercial growers' soils) to very high (56% of the homeowner soils and 44% of the commercial growers' soils). For homeowners, 8% tested low in K, 10% tested medium, and 25% tested high for potassium. For commercial growers' soils, 11% tested low, 18% 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 23 to almost 7000 lbs Mg/acre. There were no two soils that tested very low for Mg. Most soils tested high or very high for Mg (97% of the homeowner soils and 96% of the soils of the commercial growers). In total 3% 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 97-99% in the normal range with only 3% of the homeowner soils and 1% of the commercial grower soils testing excessive for Fe. Similarly, most soils (91-98%) 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, 86% tested high for Zn while 9% tested medium and 5% were low in Zn. Of the commercial growers' samples, 6% tested low, 20% tested medium while 74% 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 were requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ALG	0	0	0	1	2	3	2
ATF	0	0	4	0	0	4	3
BLU	0	0	0	0	2	2	1
FLA	1	1	1	0	3	6	4
HRB	0	0	1	2	1	4	3
LAW	3	6	1	3	30	43	28
MVG	12	7	10	6	9	44	29
OTH	1	0	2	0	2	5	3
PER	3	6	2	0	3	14	9
ROS	0	1	0	1	0	2	1
ROU	0	0	1	0	0	1	1
SAG	2	2	4	3	8	19	12
SUB	0	0	0	0	1	1	1
TRF	0	0	0	1	4	5	3
Total	22	23	26	17	65	153	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	9	0	3	0	0	12	3
AGE/AGT	19	8	0	2	1	30	7
ALE	2	0	0	0	0	2	0
APP	4	0	4	1	0	9	2
BET	0	0	0	1	0	1	0
BGE/BGT	2	0	0	0	1	3	1
BLB	2	1	0	0	0	3	1
BNS	0	0	0	1	0	1	0
BRP	0	0	1	0	0	1	0
BSP	2	0	0	0	0	2	0
BTT	1	0	0	0	0	1	0
BUK	0	0	0	1	0	1	0
BWI	1	0	2	0	0	3	1
CAR	0	0	1	0	0	1	0
CBP	0	0	0	3	0	3	1
CGE/CGT	14	0	1	5	1	21	5
CHC	1	0	0	0	0	1	0
CKP	1	0	0	0	0	1	0
CLE/CLT	1	1	7	0	0	9	2
COG/COS	26	10	7	8	0	51	12
CUR	0	1	0	0	0	1	0
GOO	0	0	0	0	1	1	0
GPA	3	0	0	0	0	3	1
GPV	1	0	0	0	0	1	0
GRE/GRT	19	6	7	1	1	34	8
IDL	0	2	0	3	0	5	1
LET	2	0	0	9	0	11	3
MIX	17	8	28	8	2	63	15
MVG	1	1	0	0	0	2	0
OAS	0	0	1	0	0	1	0
OAT	1	0	0	0	1	2	0
ONP	1	0	0	2	0	3	1
OTH	1	6	2	14	2	25	6
PEP	0	0	1	1	0	2	0
PGE/PGT	3	0	3	0	9	15	4
PIE/PIT	1	3	21	1	0	26	6
PLE/PLT	5	0	0	0	6	11	3
PNT	0	0	3	0	3	6	1

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Current year crop	2002	2003	2004	2005	2006	Total	%
POT	3	0	1	1	2	7	2
RSF	0	0	1	0	0	1	0
RSP	0	1	0	0	0	1	0
RSS	0	0	0	0	1	1	0
RYC	2	3	0	5	0	10	2
RYS	3	0	0	1	0	4	1
SOY	0	0	1	0	0	1	0
SQS	0	0	0	2	0	2	0
SQW	2	0	2	2	0	6	1
SSH	1	0	0	0	0	1	0
STE	0	0	2	1	0	3	1
STS	2	0	0	2	0	4	1
SWC	1	0	1	1	0	3	1
TME	0	1	0	1	0	2	0
TOM	0	0	2	0	0	2	0
TRE	0	0	0	0	6	6	1
Unknown	1	1	1	0	0	3	1
Total	155	53	103	77	37	425	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)	8	1	4	2	16	31	20
SMG 3 (silt loam)	4	9	10	10	9	42	27
SMG 4 (sandy loam)	7	11	9	4	32	63	41
SMG 5 (sandy)	3	2	3	1	8	17	11
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	22	23	26	17	65	153	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Bernardston	4	7	0	1	0	0	8	2
Blasdell	3	18	9	12	5	0	44	10
Canadaigua	3	0	0	0	0	1	1	0
Castile	4	0	0	3	0	0	3	1
Cazenovia	2	0	1	0	0	0	1	0
Chenango	3	0	1	0	0	0	1	0
Collamer	3	0	0	0	0	1	1	0
Farmington	3	1	1	0	0	0	2	0
Fredon	4	1	0	1	0	0	2	0
Georgia	4	1	1	1	1	5	9	2
Halsey	4	0	1	0	0	0	1	0
Hamlin	2	0	1	0	0	0	1	0
Hilton	2	0	0	1	0	0	1	0
Hoosic	4	9	3	9	6	5	32	8
Howard	3	0	1	0	0	0	1	0
Hudson	2	1	4	3	0	0	8	2
Kingsbury	1	1	5	2	3	1	12	3
Knickerbocker	5	4	1	7	5	0	17	4
Limerick	3	1	0	0	0	0	1	0
Lintlithgo	3	15	7	8	20	4	54	13
Lordstown	3	0	1	0	0	0	1	0
Manlius	3	11	0	12	2	0	25	6
Mardin	3	0	0	0	0	2	2	0
Massena	4	0	0	0	0	1	1	0
Middlebury	3	0	0	0	0	2	2	0
Minoa	4	0	0	2	0	0	2	0
Nassau	4	12	3	7	0	3	25	6
Nunda	2	0	1	0	0	0	1	0
Occum	4	18	1	13	5	1	38	9
Odessa	2	0	0	1	0	0	1	0
Pittstown	4	15	0	8	15	5	43	10
Punsit	3	7	0	1	1	0	9	2
Raynham	3	0	1	0	0	0	1	0
Rhinebeck	2	2	0	0	0	1	3	1
Riverhead	4	0	0	0	0	1	1	0
Scio	3	2	0	0	1	0	3	1

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Stockbridge	3	26	6	10	11	4	57	13
Unadilla	3	2	0	1	1	0	4	1
Valois	3	0	1	0	0	0	1	0
Unknown	-	1	3	0	1	0	5	1
Total	-	155	53	103	77	37	425	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	2	5	5	1	2	5	22
2003	0	0	3	5	3	2	4	6	23
2004	0	0	6	2	6	5	2	5	26
2005	1	1	0	3	5	1	1	5	17
2006	0	9	9	17	13	6	2	9	65
Total	1	12	20	32	32	15	11	30	153

	2002	2003	2004	2005	2006
Lowest:	1.1	2.3	2.1	0.7	1.0
Highest:	15.2	16.4	13.7	22.7	17.2
Mean:	5.4	6.1	5.3	6.1	4.4
Median:	4.2	5.6	4.6	4.8	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	9	9	23	23	5	9	23	100
2003	0	0	13	22	13	9	17	26	100
2004	0	0	23	8	23	19	8	19	100
2005	6	6	0	18	29	6	6	29	100
2006	0	14	14	26	20	9	3	14	100
Total	1	8	13	21	21	10	7	20	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	2	32	53	38	24	6	0	155
2003	1	2	8	18	13	8	1	2	53
2004	0	5	28	24	32	7	2	5	103
2005	0	4	15	27	23	5	3	0	77
2006	1	1	8	11	13	3	0	0	37
Total	2	14	91	133	119	47	12	7	425

	2002	2003	2004	2005	2006
Lowest:	1.9	0.9	1.0	1.6	0.6
Highest:	6.8	13.0	48.7	6.6	5.2
Mean:	3.9	4.0	4.3	3.7	3.6
Median:	3.8	3.8	3.9	3.6	3.8

*Next highest sample was 15.1% organic matter.

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	21	34	25	15	4	0	100
2003	2	4	15	34	25	15	2	4	100
2004	0	5	27	23	31	7	2	5	100
2005	0	5	19	35	30	6	4	0	100
2006	3	3	22	30	35	8	0	0	100
Total	0	3	21	31	28	11	3	2	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	1	1	2	1	6	8	2	1	0	22
2003	0	0	3	7	0	5	4	3	1	0	23
2004	0	0	3	7	2	5	7	2	0	0	26
2005	1	0	1	6	3	1	4	1	0	0	17
2006	0	1	3	18	6	18	14	5	0	0	65
Total	1	2	11	40	12	35	37	13	2	0	153

	2002	2003	2004	2005	2006
Lowest:	4.9	5.1	5.2	4.1	4.8
Highest:	8.1	8.3	7.9	7.8	7.7
Mean:	-	-	-	-	-
Median:	6.9	6.6	6.6	6.1	6.6

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	5	5	9	5	27	36	9	5	0	100
2003	0	0	13	30	0	22	17	13	4	0	100
2004	0	0	12	27	8	19	27	8	0	0	100
2005	6	0	6	35	18	6	24	6	0	0	100
2006	0	2	5	28	9	28	22	8	0	0	100
Total	1	1	7	26	8	23	24	8	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	1	3	17	48	48	30	6	2	0	0	0	155
2003	0	1	6	8	7	22	8	0	0	0	1	53
2004	0	0	4	32	35	28	3	0	0	1	0	103
2005	0	0	2	7	15	34	18	1	0	0	0	77
2006	0	0	10	14	5	5	2	0	1	0	0	37
Total	1	4	39	109	110	119	37	3	1	1	1	425

	2002	2003	2004	2005	2006
Lowest:	3.6	4.9	5.1	5.2	5.0
Highest:	7.7	7.3	8.7*	7.5	8.1
Mean:	-	-	-	-	-
Median:	6.1	6.6	6.1	6.7	5.8

*sample with almost 50% organic matter.

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	11	31	31	19	4	1	0	0	0	100
2003	0	2	11	15	13	42	15	0	0	0	2	100
2004	0	0	4	31	34	27	3	0	0	1	0	100
2005	0	0	3	9	19	44	23	1	0	0	0	100
2006	0	0	27	38	14	14	5	0	3	0	0	100
Total	0	1	9	26	26	28	9	1	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	3	3	6	1	0	1	2	2	4	22
2003	0	4	2	4	1	0	1	4	3	4	23
2004	0	5	5	4	2	3	0	1	1	5	26
2005	0	1	2	6	5	0	0	1	0	2	17
2006	0	5	13	27	6	0	5	3	1	5	65
Total	0	18	25	47	15	3	7	11	7	20	153

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	3	1
Highest:	445	833	479	348	973
Mean:	99	137	98	63	64
Median:	33	91	34	31	23

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	14	14	27	5	0	5	9	9	18	100
2003	0	17	9	17	4	0	4	17	13	17	100
2004	0	19	19	15	8	12	0	4	4	19	100
2005	0	6	12	35	29	0	0	6	0	12	100
2006	0	8	20	42	9	0	8	5	2	8	100
Total	0	12	16	31	10	2	5	7	5	13	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	51	41	53	7	0	1	1	1	0	155
2003	0	11	18	17	1	0	0	0	1	5	53
2004	0	20	29	43	2	1	0	3	0	5	103
2005	0	9	16	50	1	0	0	0	1	0	77
2006	0	13	13	6	4	1	0	0	0	0	37
Total	0	104	117	169	15	2	1	4	3	10	425

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	153	507	1976*	177	71
Mean:	13	46	50	15	12
Median:	7	8	9	11	5

*sample with almost 50% organic matter. Next highest sample was 644 lbs/acre.

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	33	26	34	5	0	1	1	1	0	100
2003	0	21	21	32	2	0	0	0	2	9	100
2004	0	19	19	42	2	1	0	3	0	5	100
2005	0	12	12	65	1	0	0	0	1	0	100
2006	0	35	35	16	11	3	0	0	0	0	100
Total	0	24	28	40	4	0	0	1	2	2	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	1	0	3	4	8
2003	0	0	0	0	1	1
2004	0	0	1	2	1	4
2005	0	0	0	0	2	2
2006	0	0	1	6	9	16
Total (#)	0	1	2	11	17	31
Total (%)	0	3	6	35	55	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	2	2	4
2003	1	3	0	1	4	9
2004	0	1	2	3	4	10
2005	0	1	0	3	6	10
2006	0	0	0	4	5	9
Total (#)	1	5	2	13	21	42
Total (%)	2	12	5	31	50	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	2	0	5	7
2003	0	0	1	1	9	11
2004	0	1	3	0	5	9
2005	0	0	1	1	2	4
2006	0	2	3	10	17	32
Total (#)	0	3	10	12	38	63
Total (%)	0	5	16	19	60	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	0	0	2	3
2003	0	0	0	1	1	2
2004	0	0	1	1	1	3
2005	0	0	0	0	1	1
2006	0	2	1	1	4	8
Total (#)	0	3	2	3	9	17
Total (%)	0	18	12	18	53	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	0	2	2	5	13	22
2003	1	3	1	3	15	23
2004	0	2	7	6	11	26
2005	0	1	1	4	11	17
2006	0	4	5	21	35	65
Grand Total	1	12	16	39	85	153

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	0	9	9	23	59	100
2003	4	13	4	13	65	100
2004	0	8	27	23	42	100
2005	0	6	6	24	65	100
2006	0	6	8	32	54	100
Grand Total	1	8	10	25	56	100

	2002	2003	2004	2005	2006
Lowest:	59	44	70	78	73
Highest:	1445	5553	1367	545	1241
Mean:	388	617	305	276	270
Median:	237	326	170	241	226

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	1	0	1
2003	0	0	1	2	2	5
2004	0	0	0	0	2	2
2005	0	0	0	0	3	3
2006	0	0	0	0	1	1
Total (#)	0	0	1	3	8	12
Total (%)	0	0	8	25	67	100
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	3	3
2003	0	0	1	1	5	7
2004	0	0	2	2	1	5
2005	0	0	0	0	0	0
2006	0	0	0	0	1	1
Total (#)	0	0	3	3	10	16
Total (%)	0	0	19	19	63	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	1	9	13	19	41	83
2003	0	4	6	7	11	28
2004	0	3	8	9	24	44
2005	1	3	4	10	23	41
2006	0	2	0	4	8	14
Total (#)	2	21	31	49	107	210
Total (%)	1	10	15	23	51	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	1	17	19	11	15	63
2003	2	2	2	1	2	9
2004	0	6	9	5	25	45
2005	0	1	2	14	10	27
2006	1	1	6	5	8	21
Total (#)	4	27	38	36	60	165
Total (%)	2	16	23	22	36	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	2	1	4
2003	0	0	1	0	0	1
2004	0	0	1	5	1	7
2005	0	0	2	3	0	5
2006	0	0	0	0	0	0
Total (#)	0	0	5	10	2	17
Total (%)	0	0	29	59	12	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	2	26	33	33	60	1	155
2003	2	6	11	11	20	3	53
2004	0	9	20	21	53	0	103
2005	1	4	8	27	36	1	77
2006	1	3	6	9	18	0	37
Grand Total	6	48	78	101	187	5	425

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	1	17	21	21	39	1	100
2003	4	11	21	21	38	6	100
2004	0	9	19	20	51	0	100
2005	1	5	10	35	47	1	100
2006	3	8	16	24	49	0	100
Grand Total	1	11	18	24	44	1	100

	2002	2003	2004	2005	2006
Lowest:	38	30	57	38	49
Highest:	946	1303	60020*	1109	570
Mean:	227	246	873	228	248
Median:	172	166	225	211	209

*sample with almost 50% organic matter. Next highest sample was 754 lbs/acre.

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	1	0	4	17	22
2003	0	1	1	2	19	23
2004	0	0	0	2	24	26
2005	0	0	0	1	16	17
2006	0	2	0	14	49	65
Total	0	4	1	23	125	153

	2002	2003	2004	2005	2006
Lowest:	33	37	127	165	40
Highest:	1397	2287	1330	889	2547
Mean:	492	652	496	375	404
Median:	341	468	367	343	294

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	5	0	18	77	100
2003	0	4	4	9	83	100
2004	0	0	0	8	92	100
2005	0	0	0	6	94	100
2006	0	3	0	22	75	100
Total	0	3	1	15	82	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	3	4	37	111	155
2003	0	1	1	9	42	53
2004	0	0	1	24	78	103
2005	0	1	0	9	67	77
2006	0	2	2	13	20	37
Total	0	7	8	92	318	425

	2002	2003	2004	2005	2006
Lowest:	23	60	88	42	54
Highest:	691	1216	6878*	1076	686
Mean:	298	396	391	321	258
Median:	273	327	256	284	220

*sample with almost 50% organic matter. Next highest sample was 2630 lbs/acre.

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	2	3	24	72	100
2003	0	2	2	17	79	100
2004	0	0	1	23	76	100
2005	0	1	0	12	87	100
2006	0	5	5	35	54	100
Total	0	2	2	22	75	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	22	0	22
2003	23	0	23
2004	26	0	26
2005	15	2	17
2006	63	2	65
Total	149	4	153

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	100	0	100
	100	0	100
	100	0	100
	88	12	100
	97	3	100
	97	3	100

	2002	2003	2004	2005	2006
Lowest:	2	2	2	3	1
Highest:	29	20	28	459	154
Mean:	8	9	10	39	13
Median:	5	7	7	10	7

10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	153	2	155
2003	52	1	53
2004	103	0	103
2005	75	2	77
2006	37	0	37
Total	420	5	425

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	99	1	100
	98	2	100
	100	0	100
	97	3	100
	100	0	100
	99	1	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	3
Highest:	585	58	48	87	47
Mean:	10	8	10	7	16
Median:	4	4	8	4	14

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	19	3	22	86	14	100
2003	22	1	23	96	4	100
2004	24	2	26	92	8	100
2005	13	4	17	76	24	100
2006	61	4	65	94	6	100
Total	139	14	153	91	9	100

	2002	2003	2004	2005	2006
Lowest:	17	21	11	31	17
Highest:	167	105	118	493	182
Mean:	56	56	53	98	50
Median:	40	55	48	68	41

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	153	2	155	99	1	100
2003	51	2	53	96	4	100
2004	101	2	103	98	2	100
2005	76	1	77	99	1	100
2006	35	2	37	95	5	100
Total	416	9	425	98	2	100

	2002	2003	2004	2005	2006
Lowest:	11	13	13	16	14
Highest:	174	143	190*	146	148
Mean:	38	42	42	37	51
Median:	35	35	38	32	41

*sample with almost 50% organic matter. Next highest sample was 174 lbs/acre.

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	2	20	22
2003	0	0	23	23
2004	0	3	23	26
2005	0	0	17	17
2006	8	9	48	65
Total	8	14	131	153

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	9	91	100
0	0	100	100
0	12	88	100
0	0	100	100
12	14	74	100
5	9	86	100

	2002	2003	2004	2005	2006
Lowest:	0.6	1.2	0.5	1.1	0.1
Highest:	115.5	30.5	24.1	88.3	512.6
Mean:	13.5	8.2	5.9	12.7	16.9
Median:	5.2	4.8	3.6	5.4	2.7

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	23	131	155
2003	1	7	45	53
2004	3	25	75	103
2005	10	20	47	77
2006	11	9	17	37
Total	26	84	315	425

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	15	85	100
2	13	85	100
3	24	73	100
13	26	61	100
30	24	46	100
6	20	74	100

	2002	2003	2004	2005	2006
Lowest:	0.3	0.3	0.2	0.2	0.1
Highest:	43.6	47.3	38.1	14.0	10.2
Mean:	2.8	3.6	3.5	1.9	1.5
Median:	1.7	1.7	1.8	1.3	0.9

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, Establishment
TRF	Turf
TRT	Christmas trees, Topdressing