

Rao, R., N. Herendeen, Q.M. Ketterings, and H. Krol (2007). Monroe Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-35. 35 pages.

Soil Sample Survey

Monroe County

Samples analyzed by CNAL (2002-2006)



Summary compiled by

Renuka Rao, N. Herendeen, Quirine M. Ketterings, and Hettie Krol



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

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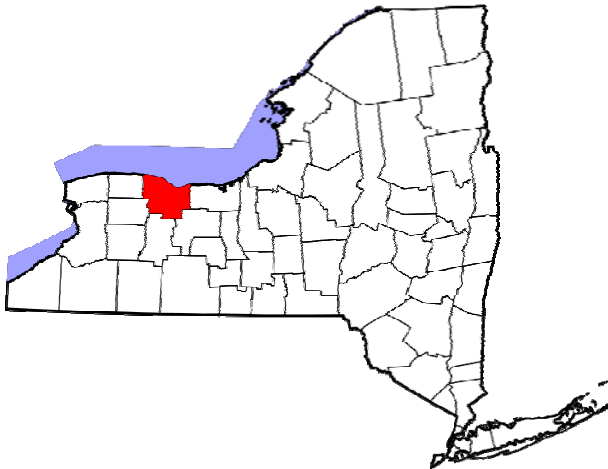
Reduced tillage systems for field and vegetable crops are being rapidly adopted by growers. These systems save fuel, sequester carbon and save farmers money. Soil testing is even more important with these systems.

(Photo credit: Nate Herendeen, Field Crops Educator, NW NY Dairy, Livestock & Field Crops Team)

1. County Introduction

Monroe County is located adjacent to Lake Ontario and includes the city of Rochester. It contains nearly 431,000 acres of land area. Approximately 100,000 acres (24% of the area) is used for farm production in any given year. Much of the county is covered with urban development around Rochester.

The county lies entirely in the Ontario and Huron Lake Plains region. The northern lake plain begins at Lake Ontario, where the elevation is 246 feet above sea level. It extends to



the foot of the Niagara escarpment. However, the escarpment is not nearly as obvious in Monroe as it is to the west. The elevation increases gradually to areas of 600 feet elevation. The Huron Plain extends from that area southward into Livingston and Ontario Counties. It has a high point of about 900 feet near the Ontario County line in the southeast part of the county.

The northward flowing Genesee River dissects the county and empties into Lake Ontario at Charlotte Harbor. This feature was responsible for the development of Rochester. The present river gorge is the post-glacial channel for the river. Two sets of waterfalls in this channel provided waterpower for the early industrial and flour milling facilities that became the hub for Rochester to develop. The pre-glacial river channel ended a few miles to the east in what is now Irondequoit Bay. It was filled in by the advancing ice sheets and never became a major drainage channel during the recession of the ice.

The soils in the north are dominated by glacial till that was greatly modified by glacial outwash and/or glacial lake sediments. The soils in the south are derived from high carbonate materials deposited by glacial advance across the Niagara dolomite limestone escarpment. However, glacial outwash materials and/or lacustrine sediments also modified much of this area. The effects of the pre and post-glacial Genesee River channels greatly modified the glacial till materials. Huge deposits of sand and gravel are

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found in the old channels and at the interface areas where the Genesee flowed into the face of the receding ice sheets.

Large areas of kame and kettle topography occur in the southern portion of the county, the result of massive outwash during the period of glacial recession. Some of these areas are preserved and protected in the Mendon Ponds and Powder Mill County Parks.

The agriculture of Monroe County is diverse. Vegetables for fresh market and processing (peas, snap beans, sweet corn, kidney beans, cabbage, pumpkins, potatoes) are the largest single generator of farm income. Next are greenhouse, nursery and ornamental production. Third is dairy and associated feed grain production. Fruit production (apples, cherries, strawberries, peaches, pears and plums) is also important for both fresh market and processing. Small-scale livestock producers market beef and sheep from Monroe County. There is also a significant pleasure horse industry in the area. Hay and grain crops not used locally are exported to areas throughout the eastern United States.

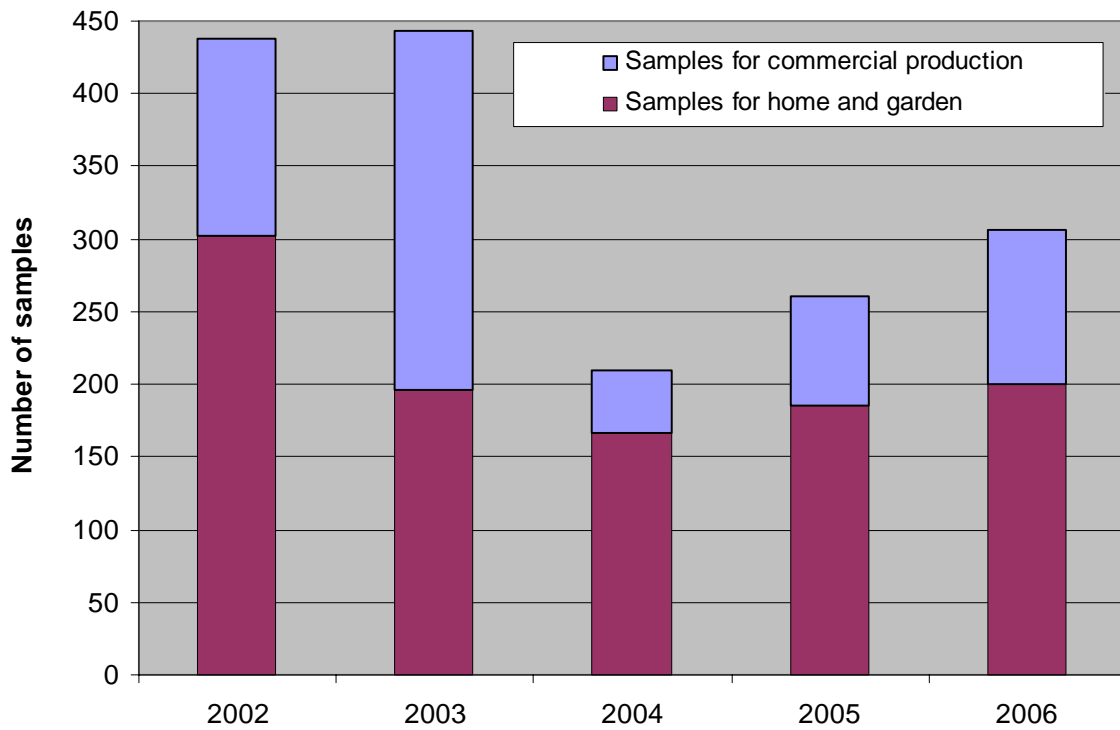
Monroe County is home to several large vegetable production farms, especially producers of cabbage. Stored cabbage is marketed throughout the eastern United States all year-round.

All the above industries rely heavily on soil testing to maintain optimum production while protecting the agricultural environment from nutrient runoff.

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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 Monroe County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1658. Of these, 609 samples (37%) were submitted by commercial growers while 1049 samples (63%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	302	2002	136	438
2003	196	2003	247	443
2004	166	2004	44	210
2005	185	2005	76	261
<u>2006</u>	<u>200</u>	<u>2006</u>	<u>106</u>	<u>306</u>
Total	1049	Total	609	1658

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Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (45%) or for home garden vegetable production (14%). Commercial growers submitted samples primarily to grow corn silage or grain (20%) or alfalfa or alfalfa/grass mixes (16%).

Soils tested for home and garden in Monroe County were classified as belonging to soil management group 2 (29%), group 3 (24%), group 4 (22%), or group 5 (24%). 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 (54%) belonged to soil management group 2. Groups 1, 3, 4 and 5 were represented with 2, 24, 15 and 6% of all samples. Ontario was the most common soil series (16% of all samples), followed by Collamer (15%), Hilton (11%) and Cazenovia (6%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to greater than 30%. For homeowners most samples had between 2 and 4% organic matter (51% of all samples), 19% testing between 4 and 6% organic matter and 19% had less than 2% organic matter. Of the samples submitted by commercial growers, 51% contained between 2 and 3% organic matter while 20% had 3 to 4% organic matter and 28% had less than 2% organic matter.

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Soil pH in water (1:1 soil:water extraction ratio) varied from less than 3.9 to almost 12 for home and garden samples. It is unknown what type of material was submitted for the two samples with pH greater than 8.5. Of the homeowner samples 58% had a pH between 6.0 and 7.4. For the commercial samples, the highest pH was 8.4 and 79% tested between pH 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 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, 8% of the soils tested low for P, 13% tested medium, 40% tested high and 39% tested very high. This meant that 79% tested high or very high in P. For commercial growers, 8% tested very high. In total 17% were low in P, 26% tested medium for P while 49% of the submitted samples were classified as high in soil test P. This means that 57% 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 Monroe County soils varied from very low (1% of the homeowner soils and 2% of the commercial growers' soils) to very high (41% of the homeowner soils and 38% of the commercial growers' soils). For homeowners, 6% tested low in K, 16% tested medium, and 36% tested high for potassium. For commercial growers' soils, 12% tested low, 17% tested medium and 31% 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 15 to almost 5000 lbs Mg/acre. There was only one soil that tested very low for Mg (commercial grower sample). Most soils tested high or very high for Mg (98% of the homeowner soils and 96% of the soils of the commercial growers).

Soils with more than 50 lbs Morgan extractable Fe per acre test excessive for Fe. Anything lower than 50 lbs Fe/acre is considered normal. Iron levels ranged from 94-99% in the normal range with 6% of the homeowner soils and 1% of the commercial grower soils testing excessive for Fe. Similarly, most soils (97-98%) 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, 91% tested high for Zn while 8% tested medium and 1% was low in Zn. Of the commercial growers' samples, 9% tested low, 26% tested medium while 65% 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 are requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ALG	7	2	3	7	11	30	3
ATF	15	7	8	20	22	72	7
BLU	1	4	3	3	2	13	1
CEM	0	0	3	0	0	3	0
FAR	0	3	0	0	0	3	0
FLA	6	3	2	4	1	16	2
GEN	5	2	1	0	9	17	2
GRA	1	0	0	0	1	2	0
HRB	1	0	0	1	0	2	0
IDL	0	0	1	0	0	1	0
LAW	155	91	80	72	77	475	45
MVG	35	34	22	32	24	147	14
OTH	25	5	10	8	8	56	5
PER	14	14	13	12	13	66	6
POT	0	0	0	1	0	1	0
PRK	0	0	1	0	0	1	0
ROD	7	1	0	0	0	8	1
ROS	3	0	1	2	7	13	1
ROU	0	1	0	0	0	1	0
RSP	1	0	1	0	0	2	0
SAG	21	18	17	22	20	98	9
SOD	0	1	0	0	0	1	0
STR	1	0	0	0	0	1	0
TRF	1	0	0	1	3	5	0
Unknown	3	10	0	0	2	15	1
Total	302	196	166	185	200	1049	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	0	0	3	0	0	3	0
AGE/AGT	1	22	3	5	11	42	7
ALE/ALT	23	19	1	9	1	53	9
APP	0	26	0	3	4	33	5
BCE	0	0	0	0	1	1	0
BDR	0	0	0	0	1	1	0
BGE/BGT	0	0	0	0	3	3	0
BLB	1	0	2	0	0	3	0
BND	10	0	0	0	0	10	2
BNS	0	0	0	2	0	2	0
CBP	4	22	0	4	2	32	5
CGE/CGT	1	16	0	2	3	22	4
CHS	0	0	0	1	0	1	0
CLE/CLT	1	0	4	0	0	5	1
COG/COS	48	49	3	6	15	121	20
EGG	0	0	0	1	0	1	0
GIE/GIT	0	0	0	3	14	17	3
GPA	0	0	0	2	0	2	0
GPV	2	0	0	0	0	2	0
GRE/GRT	0	4	2	2	2	10	2
IDL	0	0	0	1	1	2	0
MIX	8	5	1	0	1	15	2
NEC	0	0	0	1	0	1	0
NUR	0	0	0	0	3	3	0
OAS	0	1	0	0	0	1	0
OAT	1	1	0	0	1	3	0
ONP	0	1	0	0	0	1	0
OTH	0	7	1	3	1	12	2
PAR	0	1	0	0	0	1	0
PCH	0	3	0	3	0	6	1
PEA	0	2	0	0	3	5	1
PEP	0	0	0	2	0	2	0
PGE/PGT	0	1	2	0	1	4	1
PLT	0	1	0	0	0	1	0
PNT	0	3	0	0	0	3	0
POT	2	2	0	0	0	4	1

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Current year crop	2002	2003	2004	2005	2006	Total	%
PUM	11	7	2	4	2	26	4
RSS	0	1	1	0	0	2	0
SOY	0	9	0	1	10	20	3
SQW	0	0	0	0	13	13	2
SSH	0	0	0	2	0	2	0
STS	4	6	3	4	4	21	3
SUN	0	0	1	2	0	3	0
SWC	1	5	12	8	0	26	4
TME	0	0	0	1	0	1	0
TOM	0	0	0	1	0	1	0
TRE	3	0	2	0	4	9	1
TRT	0	1	0	0	3	4	1
WHS	6	0	1	0	0	7	1
WHT	9	12	0	3	2	26	4
Unknown	0	20	0	0	0	20	3
Total	136	247	44	76	106	609	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)	84	56	57	48	58	303	29
SMG 3 (silt loam)	84	32	38	48	55	257	24
SMG 4 (sandy loam)	59	49	38	43	47	236	22
SMG 5 (sandy)	75	59	33	46	40	253	24
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	302	196	166	185	200	1049	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Alton	5	1	5	0	3	4	13	2
Appleton	2	1	2	0	1	1	5	1
Arkport	4	4	2	0	0	1	7	1
Benson	4	1	0	0	0	0	1	0
Brockport	1	0	0	1	1	0	2	0
Burdett	2	3	0	0	0	0	3	0
Canandaigua	3	3	2	0	0	0	5	1
Cayuga	2	9	16	0	0	0	25	4
Cazenovia	2	3	1	1	4	27	36	6
Churchville	2	4	2	1	0	1	8	1
Claverack	4	4	9	2	0	1	16	3
Collamer	3	15	51	0	5	17	89	15
Colonie	5	1	3	0	0	1	5	1
Cosad	4	0	1	0	0	0	1	0
Dunkirk	3	1	4	0	0	0	5	1
Elnora	5	3	7	0	7	0	17	3
Fremont	2	0	0	0	0	1	1	0
Galen	4	5	7	0	0	6	18	3
Halsey	4	1	0	0	0	0	1	0
Hamlin	2	0	0	0	0	3	3	0
Hilton	2	10	29	5	17	8	69	11
Homer	2	0	0	0	1	1	2	0
Honeoye	2	6	5	0	0	0	11	2
Lairdsville	2	0	0	0	2	0	2	0
Lakemont	1	1	1	0	0	0	2	0
Lima	2	10	5	7	4	3	29	5
Lockport	2	3	1	0	0	1	5	1
Madrid	4	4	25	1	3	0	33	5
Massena	4	3	3	0	0	0	6	1
Minoa	4	2	0	0	0	1	3	0
Niagara	3	5	8	1	1	0	15	2
Odessa	2	0	17	0	0	0	17	3
Ontario	2	20	26	13	14	25	98	16
Ovid	2	1	0	0	3	2	6	1
Palmyra	3	2	4	0	3	1	10	2
Phelps	3	1	0	0	1	1	3	0

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Riga	2	0	0	0	2	0	2	0
Schoharie	1	0	4	1	3	0	8	1
Teel	2	2	2	0	0	0	4	1
Venango	3	0	1	0	0	0	1	0
Wampsville	3	5	3	8	0	0	16	3
Wassaic	4	1	1	0	1	0	3	0
Wayland	2	0	0	1	0	0	1	0
Westland	2	1	0	0	0	0	1	0
Unknown	-	0	0	1	0	0	1	0
Total	-	136	247	44	76	106	609	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	14	39	77	88	38	22	8	16	302
2003	8	25	59	50	24	11	7	12	196
2004	5	33	43	34	24	14	1	12	166
2005	7	30	41	44	20	10	6	27	186
2006	11	29	61	38	27	8	10	16	200
Total	45	156	281	254	133	65	32	83	1049

	2002	2003	2004	2005	2006
Lowest:	0.5	0.6	0.5	0.4	0.1
Highest:	32.2	11.6	19.2	15.8	23.4
Mean:	3.5	3.4	3.6	4.0	3.7
Median:	3.2	3.1	3.1	3.3	2.9

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	5	13	25	29	13	7	3	5	100
2003	4	13	30	26	12	6	4	6	100
2004	3	20	26	20	14	8	1	7	100
2005	4	16	22	24	11	5	3	15	100
2006	6	15	31	19	14	4	5	8	100
Total	4	15	27	24	13	6	3	8	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	1	31	66	32	4	1	0	1	136
2003	0	41	149	48	6	2	1	0	247
2004	0	19	12	8	1	3	0	1	44
2005	1	36	31	6	2	0	0	0	76
2006	0	39	51	12	2	1	0	1	106
Total	2	166	309	106	15	7	1	3	609

	2002	2003	2004	2005	2006
Lowest:	0.6	1.1	1.0	0.8	1.0
Highest:	9.7	6.3	21.8	4.9	9.1
Mean:	2.5	2.6	2.9	2.1	2.4
Median:	2.4	2.5	2.2	2.1	2.3

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	1	23	49	24	3	1	0	1	100
2003	0	17	60	19	2	1	0	0	100
2004	0	43	27	18	2	7	0	2	100
2005	1	47	41	8	3	0	0	0	100
2006	0	37	48	11	2	1	0	1	100
Total	0	27	51	17	2	1	0	0	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	5	13	21	30	26	84	85	36	2	0	302
2003	2	0	9	11	19	35	57	61	2	0	0	196
2004	1	2	8	13	15	28	59	34	3	1	2	166
2005	1	3	4	16	18	38	67	38	0	0	0	185
2006	0	4	6	15	22	40	69	42	2	0	0	200
Total	4	14	40	76	104	167	336	260	43	3	2	1049

	2002	2003	2004	2005	2006
Lowest:	4.5	3.2	3.8	4.3	4.7
Highest:	10.5	8.1	11.6	7.9	8.1
Mean:	-	-	-	-	-
Median:	7.3	7.2	7.1	7.1	7.1

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	2	4	7	10	9	28	28	12	1	100
2003	1	0	5	6	10	18	29	31	1	0	100
2004	1	1	5	8	9	17	36	20	2	1	100
2005	1	2	2	9	10	21	36	21	0	0	100
2006	0	2	3	8	11	20	35	21	1	0	100
Total	0	1	4	7	10	16	32	25	4	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	1	5	10	34	39	28	10	8	0	0	136
2003	0	0	2	19	75	78	63	9	0	0	1	247
2004	0	0	4	2	11	8	11	7	1	0	0	44
2005	0	3	4	12	21	19	16	1	0	0	0	76
2006	0	0	7	20	33	38	7	1	0	0	0	106
Total	1	4	22	63	174	182	125	28	9	0	1	609

	2002	2003	2004	2005	2006
Lowest:	4.1	5.3	5.0	4.6	5.1
Highest:	8.3	7.7	8.4	7.5	7.6
Mean:	-	-	-	-	-
Median:	6.7	6.7	6.8	6.4	6.4

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	4	7	25	29	21	7	6	0	0	100
2003	0	0	1	8	30	32	26	4	0	0	0	100
2004	0	0	9	5	25	18	25	16	2	0	0	100
2005	0	4	5	16	28	25	21	1	0	0	0	100
2006	0	0	7	19	31	36	7	1	0	0	0	100
Total	0	1	4	10	29	30	21	5	1	0	0	100

7. Phosphorus

7.1 Homeowner Samples

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	39	41	113	34	15	18	17	7	18	302
2003	0	10	17	89	29	11	10	12	5	13	196
2004	0	7	25	73	17	11	6	10	8	9	166
2005	0	8	29	71	18	13	6	9	5	26	185
2006	0	20	25	69	26	15	6	14	6	19	200
Total	0	84	137	415	124	65	46	62	31	85	1049

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

	2002	2003	2004	2005	2006
Lowest:	1	1	2	1	1
Highest:	1037	570	736	661	796
Mean:	56	58	61	90	70
Median:	25	32	25	30	28

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	13	14	37	11	5	6	6	2	6	100
2003	0	5	9	45	15	6	5	6	3	7	100
2004	0	4	15	44	10	7	4	6	5	5	100
2005	0	4	16	38	10	7	3	5	3	14	100
2006	0	10	13	35	13	8	3	7	3	10	100
Total	0	8	13	40	12	6	4	6	3	8	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	22	29	68	10	3	2	0	1	1	136
2003	0	53	65	111	12	2	1	2	0	1	247
2004	0	5	10	25	2	1	0	0	0	1	44
2005	0	11	28	31	3	2	1	0	0	0	76
2006	0	14	25	63	2	0	0	1	1	0	106
Total	0	105	157	298	29	8	4	3	2	3	609

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	301	525	287	88	169
Mean:	20	17	30	16	15
Median:	12	9	16	8	10

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	16	21	50	7	2	1	0	1	1	100
2003	0	21	26	45	5	1	0	1	0	0	100
2004	0	11	23	57	5	2	0	0	0	2	100
2005	0	14	37	41	4	3	1	0	0	0	100
2006	0	13	24	59	2	0	0	1	1	0	100
Total	0	17	26	49	5	1	1	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 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	0	4	5
2004	0	0	0	1	1	2
2005	0	0	0	1	3	4
2006	0	0	0	0	0	0
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	4	32	38	74
2003	0	4	8	41	53	106
2004	0	0	0	16	12	28
2005	1	1	5	14	27	48
2006	1	3	15	31	23	73
Total (#)	2	8	32	134	153	329
Total (%)	1	2	10	41	47	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	10	9	13	32
2003	0	2	14	23	34	73
2004	0	0	1	2	7	10
2005	0	1	3	4	2	10
2006	0	2	2	11	4	19
Total (#)	0	5	30	49	60	144
Total (%)	0	3	21	34	42	100

Rao, R., N. Herendeen, Q.M. Ketterings, and H. Krol (2007). Monroe Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-35. 35 pages.

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	5	6	8	5	24
2003	1	7	16	13	11	48
2004	0	1	0	1	1	3
2005	0	1	2	0	1	4
2006	0	3	3	1	2	9
Total (#)	1	17	27	23	20	88
Total (%)	1	19	31	26	23	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	3	0	2	5
2003	0	4	1	5	5	15
2004	0	0	0	0	0	0
2005	1	4	3	2	0	10
2006	0	1	0	1	3	5
Total (#)	1	9	7	8	10	35
Total (%)	3	26	20	23	29	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 (%)	-	-	-	-	-	-

Rao, R., N. Herendeen, Q.M. Ketterings, and H. Krol (2007). Monroe Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-35. 35 pages.

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	0	5	23	50	58	0	136
2003	1	17	40	82	107	0	247
2004	0	1	1	20	21	1	44
2005	2	7	13	21	33	0	76
2006	1	9	20	44	32	0	106
Grand Total	4	39	97	217	251	1	609

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	0	4	17	37	43	0	100
2003	0	7	16	33	43	0	100
2004	0	2	2	45	48	2	100
2005	3	9	17	28	43	0	100
2006	1	8	19	42	30	0	100
Grand Total	1	6	16	36	41	0	100

	2002	2003	2004	2005	2006
Lowest:	66	47	67	39	39
Highest:	1702	1033	10630	471	568
Mean:	211	210	436	179	165
Median:	165	172	172	158	143

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	6	5	28	45	84
2003	0	1	9	17	29	56
2004	0	4	6	15	32	57
2005	0	0	3	10	35	48
2006	0	4	4	20	30	58
Total (#)	0	15	27	90	171	303
Total (%)	0	5	9	30	56	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	2	4	11	25	42	84
2003	0	0	8	12	12	32
2004	0	6	14	6	12	38
2005	0	2	5	20	21	48
2006	0	4	5	13	33	55
Total (#)	2	16	43	76	120	257
Total (%)	1	6	17	30	47	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	13	12	15	19	59
2003	0	6	10	23	10	49
2004	4	1	7	11	15	38
2005	1	3	8	12	19	43
2006	0	0	11	20	16	47
Total (#)	5	23	48	81	79	236
Total (%)	2	10	20	34	33	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	6	24	11	23	11	75
2003	3	13	21	14	8	59
2004	4	10	7	10	2	33
2005	0	11	15	15	5	46
2006	5	10	11	11	3	40
Total (#)	18	68	65	73	29	253
Total (%)	7	27	26	29	11	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	Total
2002	8	47	39	91	117	302
2003	3	20	48	66	59	196
2004	8	21	34	42	61	166
2005	1	16	31	57	80	185
2006	5	18	31	64	82	200
Grand Total	25	122	183	320	399	1049

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	3	16	13	30	39	100
2003	2	10	24	34	30	100
2004	5	13	20	25	37	100
2005	1	9	17	31	43	100
2006	3	9	16	32	41	100
Grand Total	2	12	17	31	38	100

	2002	2003	2004	2005	2006
Lowest:	27	29	21	50	26
Highest:	3098	1445	2879	1659	1478
Mean:	227	219	227	271	230
Median:	180	168	161	179	182

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	5	34	261	302
2003	0	1	2	17	176	196
2004	0	1	3	19	143	166
2005	0	1	3	17	164	185
2006	0	4	5	16	175	200
Total	0	9	18	103	919	1049

	2002	2003	2004	2005	2006
Lowest:	28	55	55	52	26
Highest:	3830	1600	3312	2024	4683
Mean:	505	482	521	534	529
Median:	440	445	477	462	421

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	1	2	11	86	100
2003	0	1	1	9	90	100
2004	0	1	2	11	86	100
2005	0	1	2	9	89	100
2006	0	2	3	8	88	100
Total	0	1	2	10	88	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	1	3	6	22	104	136
2003	0	2	3	32	210	247
2004	0	0	0	4	40	44
2005	0	3	5	23	45	76
2006	0	2	4	26	74	106
Total	1	10	18	107	473	609

	2002	2003	2004	2005	2006
Lowest:	15	33	152	43	31
Highest:	1348	1793	4864	1474	991
Mean:	410	423	614	288	308
Median:	365	369	406	225	281

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	1	2	4	16	76	100
2003	0	1	1	13	85	100
2004	0	0	0	9	91	100
2005	0	4	7	30	59	100
2006	0	2	4	25	70	100
Total	0	2	3	18	78	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	297	5	302
2003	191	5	196
2004	158	8	166
2005	182	3	185
2006	191	9	200
Total	1019	30	1049

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	98	2	100
	97	3	100
	95	5	100
	98	2	100
	96	5	100
	97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	2	2	1
Highest:	139	95	162	57	148
Mean:	9	10	15	12	14
Median:	5	6	7	8	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	134	2	136
2003	246	1	247
2004	44	0	44
2005	72	4	76
2006	101	5	106
Total	597	12	609

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	99	1	100
	100	0	100
	100	0	100
	95	5	100
	95	5	100
	98	2	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	2
Highest:	101	54	48	72	87
Mean:	9	9	8	15	16
Median:	5	7	4	8	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	
2002	289	13	302
2003	186	10	196
2004	152	14	166
2005	176	9	185
2006	187	13	200
Total	990	59	1049

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	96	4	100
	95	5	100
	92	8	100
	95	5	100
	94	7	100
	94	6	100

	2002	2003	2004	2005	2006
Lowest:	3	7	5	7	2
Highest:	345	372	353	192	549
Mean:	39	44	46	43	46
Median:	32	34	34	37	35

11.2 Commercial Samples

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

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	135	1	136
2003	246	1	247
2004	42	2	44
2005	74	2	76
2006	105	1	106
Total	602	7	609

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	99	1	100
	100	0	100
	95	5	100
	97	3	100
	99	1	100
	99	1	100

	2002	2003	2004	2005	2006
Lowest:	7	2	10	5	8
Highest:	103	105	160	209	108
Mean:	26	23	35	35	29
Median:	23	22	28	29	26

12. Zinc

12.1 Homeowner Samples

Zinc (lbs Zn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	2	18	282	302
2003	0	13	183	196
2004	0	16	150	166
2005	7	18	160	185
2006	4	20	176	200
Total	13	85	951	1049

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	6	93	100
0	7	93	100
0	10	90	100
4	10	86	100
2	10	88	100
1	8	91	100

	2002	2003	2004	2005	2006
Lowest:	0.4	0.5	0.5	0.1	0.1
Highest:	245.7	143.4	306.4	351.7	178.7
Mean:	13.0	11.0	12.4	14.4	9.5
Median:	4.0	5.2	4.3	4.2	3.9

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	2	34	100	136
2003	7	67	173	247
2004	0	14	30	44
2005	3	21	52	76
2006	43	25	38	106
Total	55	161	393	609

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	25	74	100
3	27	70	100
0	32	68	100
4	28	68	100
41	24	36	100
9	26	65	100

	2002	2003	2004	2005	2006
Lowest:	0.4	0.1	0.6	0.4	0.1
Highest:	47.5	59.0	22.0	20.5	29.1
Mean:	2.1	2.4	2.3	2.1	1.5
Median:	1.4	1.6	1.4	1.2	0.6

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