

Rao, R., R. Tindell, Q.M. Ketterings, and H. Krol (2008). Erie Soil Sample Survey (2002-2006). CSS Extension Bulletin E08-1. 28 pages.

Soil Sample Survey

Erie County

Samples analyzed by CNAL (2002-2006)



Erie County (photo credit: Sharon Webber, CCE of Erie County).

Summary compiled by

Renuka Rao, Richard Tindell, Quirine M. Ketterings, and Hettie Krol



Cornell Nutrient Analysis Laboratory

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

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Nutrient Management Spear Program

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Erie County (photo credit: Diane Held, CCE of Erie County).

1. County Introduction

Erie County is located in the westernmost part of the State bordered by Lake Erie. Adjacent counties include Niagara, Genesee, Wyoming, Cattaraugus and Chautauqua. Erie has a wide variety of urban, suburban and rural areas. The City of Buffalo is the second largest city in New York State and the County's 2002 population of 950,265 was the seventh highest in the State. Agriculture is quite diverse ranging from conventional vegetable, crop, dairy, beef, poultry, fruit, greenhouse, horse, swine and sheep farms to nontraditional operations. Farm size also varies dramatically.

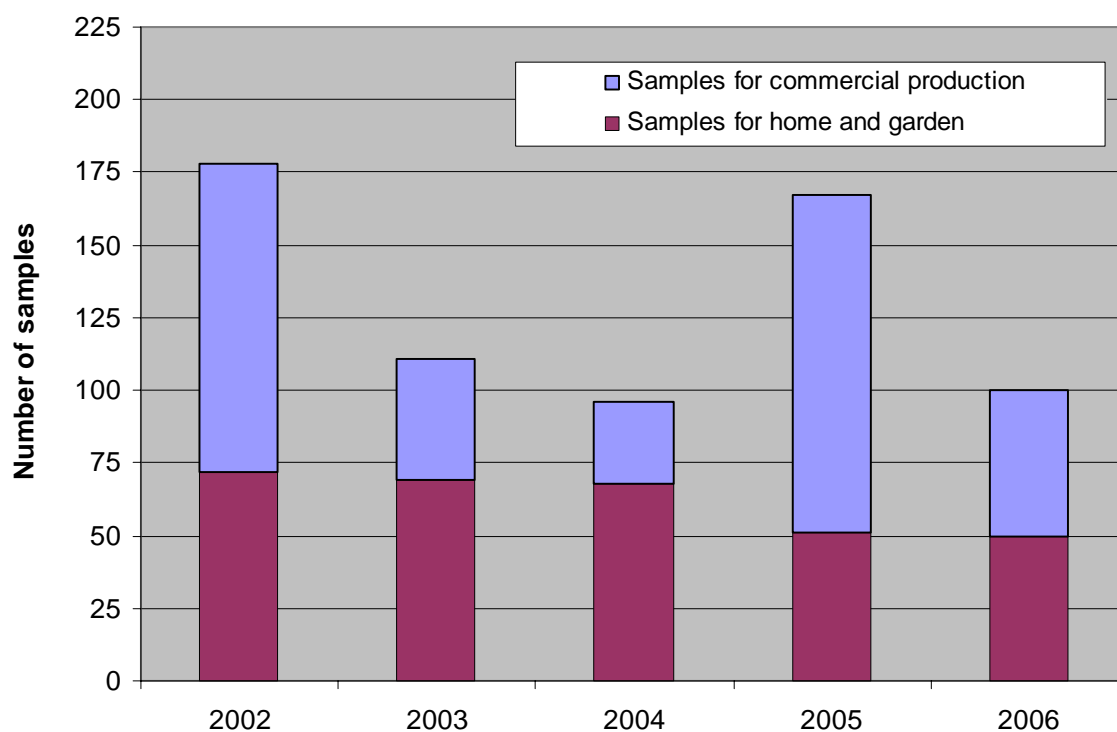
In 2003, there were 161,600 acres in 1,285 farms which is 24% of the County's total acreage. The County ranks 4th in New York State for the number of farms and 21st for farm acreage. The total market value of all agricultural products sold from County farms was \$92.4 million in 2002. The leading agricultural products were dairy, nursery and greenhouse, vegetables, fruits and nuts, and horses.

Soil quality and fertility are critical factors that have a significant impact on the crops and plants that are grown. Important soil characteristics include texture, pH, fertility, and drainage. To learn more about the soil types on a property, a useful tool is the USDA-NRCS Soil Survey that consists of soil maps and descriptions of soil characteristics and capabilities. The Cornell Nutrient Analysis Laboratory can test soil for nutrients and pH, and provide quality improvement information.

Richard L. Tindell
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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 Erie County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 652. Of these, 342 samples (52%) were submitted by commercial growers while 310 samples (48%) were submitted by homeowners. The number of samples has increased over the years.



Homeowners		Commercial		Total
2002	72	2002	106	178
2003	69	2003	42	111
2004	68	2004	28	96
2005	51	2005	116	167
<u>2006</u>	<u>50</u>	<u>2006</u>	<u>50</u>	<u>100</u>
Total	310	Total	342	652

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Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (33%), for home garden vegetable production or perennials (15% each). Commercial growers submitted samples primarily to grow corn silage or grain (32%), alfalfa or alfalfa/grass mixes (14%), and grass hay production (9%).

Soils tested for home and garden in Erie County were classified as belonging to soil management group 2 (42%), group 3 (28%), group 4 (20%), or group 5 (9%). 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, 55% belonged to soil management group 3. Two percent were group 1 samples, 31% belonged to group 2, 10% were group 4 soils, and 2% belonged to group 5. There were no organic soils. Chenango and Erie were the most common soil series (8% of all samples), followed by Blasdell (7%), Farnham (6%), and Mardin, Orpark, Rhinebeck, and Volusia (5% each).

Organic matter levels, as measured by loss-on-ignition, ranged from 1.3% to almost 50% (more likely potting soil). For homeowners 47% of the samples had between 2 and 5% organic matter, 11% testing between 5 and 6% organic matter and 26% were classified as

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soils with more than 6.9% organic matter. Of the samples submitted by commercial growers, 76% contained between 3 and 6% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.4 to 8.5 for home and garden samples while 60% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 8.3 and 60% 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 lb P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and anything higher is classified as very high. For homeowners, 16% of the soils tested low for P, 15% tested medium, 30% tested high and 40% tested very high. This meant that 70% tested high or very high in P. For commercial growers, 8% tested very high. In total 40% were low in P, 20% tested medium for P while 31% of the submitted samples were classified as high in soil test P. This means that 39% 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 5).

Potassium classifications for Erie County soils varied from very low (1% of the homeowner soils) to very high (59% of the homeowner soils and 42% of the commercial growers' soils). For homeowners, 6% tested low in K, 12% tested medium, and 22% tested high for potassium. For commercial growers' soils, 4% tested low, 23% tested medium and 31% 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 more than 6541 lbs Mg/acre. There was only one soil that tested very low for Mg. Most soils tested high or very high for Mg (99% of the homeowner soils and 97% 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 80-89% in the normal range with 11% of the homeowner soils and 20% of the commercial grower soils testing excessive for Fe. Similarly, most soils (90-95%) 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, 96% tested high for Zn while 3% tested medium and only 2 soils were low in Zn. Of the commercial growers' samples, 7% tested low, 17% tested medium while 76% 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	3	1	3	8	0	15	5
ATF	2	12	2	0	0	16	5
BLU	1	1	2	0	2	6	2
FLA	7	0	3	2	2	14	5
LAW	19	25	17	19	23	103	33
MVG	9	10	13	10	6	48	15
OTH	1	7	3	2	2	15	5
PER	16	6	8	1	5	36	12
ROS	0	1	3	0	2	6	2
SAG	13	5	13	8	6	45	15
TOM	0	0	0	1	0	1	0
TRF	0	0	1	0	2	3	1
Unknown	1	1	0	0	0	2	1
Total	72	69	68	51	50	310	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	1	0	1	2	1
AGE/AGT	13	8	0	14	2	37	11
ALE	1	1	0	2	2	6	2
APP	0	0	2	2	0	4	1
BCE/BCT	0	0	2	2	0	4	1
BGE/BGT	0	1	0	3	0	4	1
CBP	1	0	0	0	0	1	0
CBS	0	0	0	0	1	1	0
CGE/CGT	5	0	1	6	2	14	4
CHT	0	0	0	1	0	1	0
CLE	0	1	0	0	3	4	1
COG/COS	48	9	0	47	4	108	32
GIE/GIT	2	1	1	1	20	25	7
GPA	1	3	0	1	0	5	1
GRE/GRT	5	3	1	15	6	30	9
IDL	0	0	0	1	0	1	0
MIX	6	2	0	1	0	9	3
OTH	1	2	2	4	3	12	4
PCH	0	0	1	0	0	1	0
PEA	1	0	7	2	0	10	3
PGE/PGT	7	3	0	0	3	13	4
PIE/PIT	2	2	1	5	0	10	3
PLT	0	1	0	0	0	1	0
PNT	2	0	0	2	0	4	1
POT	0	0	0	1	0	1	0
PUM	2	1	1	0	2	6	2
RHU	1	0	0	0	0	1	0
RYC	0	0	1	0	0	1	0
SOY	0	0	0	1	0	1	0
SQW	1	0	1	0	0	2	1
SWC	1	0	1	0	0	2	1
TME	0	1	0	0	0	1	0
TOM	0	0	2	0	0	2	1
TRE	0	2	1	1	0	4	1
TRT	0	0	2	0	0	2	1
WHT	1	0	0	3	0	4	1
Unknown	5	1	0	1	1	8	2
Total	106	42	28	116	50	342	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)	26	32	33	18	20	129	42
SMG 3 (silt loam)	26	21	11	16	14	88	28
SMG 4 (sandy loam)	10	10	21	11	11	64	20
SMG 5 (sandy)	10	6	3	5	5	29	9
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	72	69	68	51	50	310	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Allard	3	2	0	1	0	0	3	1
Alton	5	0	2	0	2	0	4	1
Benson	4	0	1	0	0	0	1	0
Blasdell	3	8	6	2	6	3	25	7
Brockport	1	1	0	0	0	0	1	0
Canandaigua	3	1	0	0	0	0	1	0
Chenango	3	4	1	9	6	6	26	8
Churchville	2	6	0	0	0	0	6	2
Cosad	4	1	0	1	0	0	2	1
Danley	2	0	0	0	7	1	8	2
Darien	2	10	4	0	10	3	27	8
Derb	3	4	2	0	2	0	8	2
Dunkirk	3	0	1	1	0	0	2	1
Elnora	5	2	0	0	0	0	2	1
Erie	3	1	3	2	0	21	27	8
Farnham	4	7	1	1	11	0	20	6
Fremont	2	0	0	0	1	0	1	0
Halsey	4	0	0	0	1	0	1	0

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Hamlin	2	1	0	0	0	0	1	0
Hornell	2	2	0	0	0	0	2	1
Howard	3	0	0	0	2	0	2	1
Ilion	2	1	0	0	1	0	2	1
Ira	4	0	0	1	0	0	1	0
Kendaia	2	0	0	0	1	0	1	0
Langford	3	0	0	0	3	5	8	2
Lima	2	0	0	0	1	0	1	0
Manlius	3	0	0	0	1	0	1	0
Mardin	3	10	0	1	7	0	18	5
Marilla	3	3	1	0	6	0	10	3
Middlebury	3	0	1	0	3	0	4	1
Minoa	4	0	1	0	1	0	2	1
Newstead	4	2	0	0	0	0	2	1
Niagara	3	3	4	0	1	0	8	2
Odessa	2	1	3	2	0	5	11	3
Orpark	2	5	4	0	7	0	16	5
Ovid	2	0	0	0	1	0	1	0
Palmyra	3	2	0	0	0	0	2	1
Phelps	3	2	0	0	1	0	3	1
Philo	3	0	0	0	9	1	10	3
Raynham	3	0	0	1	3	0	4	1
Red Hook	4	1	0	0	2	0	3	1
Remsen	2	4	1	0	0	3	8	2
Rhinebeck	2	6	1	2	7	1	17	5
Schoharie	1	0	2	0	0	1	3	1
Schuyler	3	1	0	0	5	0	6	2
Scio	3	2	0	1	0	0	3	1
Swormville	1	2	0	0	1	0	3	1
Teel	2	1	0	0	0	0	1	0
Varysburg	2	0	0	0	1	0	1	0
Volusia	3	8	2	2	4	0	16	5
Wayland	2	1	0	0	0	0	1	0
Williamson	4	0	0	1	2	0	3	1
Unknown	-	1	1	0	0	0	2	1
Total	-	106	42	28	116	50	342	100

5. Organic Matter

5.1 Homeowner Samples

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

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	0	1	9	14	20	7	5	16	72
2003	0	8	9	9	14	5	5	19	69
2004	0	4	4	10	11	8	8	23	68
2005	0	1	3	10	7	9	9	12	51
2006	0	2	2	10	12	6	6	12	50
Total	0	16	27	53	64	35	33	82	310

	2002	2003	2004	2005	2006
Lowest:	1.4	1.4	1.3	1.9	1.4
Highest:	20.5	47.5	30.2	23.2	55.4
Mean:	5.5	6.0	6.6	6.1	8.5
Median:	4.6	4.4	5.5	5.3	4.9

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	0	1	13	19	28	10	7	22	100
2003	0	12	13	13	20	7	7	28	100
2004	0	6	6	15	16	12	12	34	100
2005	0	2	6	20	14	18	18	24	100
2006	0	4	4	20	24	12	12	24	100
Total	0	5	9	17	21	11	11	26	100

5.2 Commercial Samples

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

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	0	3	14	31	26	21	6	5	106
2003	0	1	4	6	18	4	4	5	42
2004	0	1	6	6	6	5	3	1	28
2005	0	0	16	45	39	15	1	0	116
2006	0	1	5	8	19	9	4	4	50
Total	0	6	45	96	108	54	18	15	342

	2002	2003	2004	2005	2006
Lowest:	1.6	1.8	1.7	2.2	1.9
Highest:	11.0	48.7	8.3	6.4	8.9
Mean:	4.3	6.1	4.3	3.9	4.6
Median:	4.1	4.5	4.3	3.9	4.5

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	3	13	29	25	20	6	5	100
2003	0	2	10	14	43	10	10	12	100
2004	0	4	21	21	21	18	11	4	100
2005	0	0	14	39	34	13	1	0	100
2006	0	2	10	16	38	18	8	8	100
Total	0	2	13	28	32	16	5	4	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	3	3	9	10	7	19	20	1	0	72
2003	1	0	6	6	8	6	25	14	3	0	69
2004	1	1	5	4	11	17	19	10	0	0	68
2005	0	1	2	2	3	6	21	15	1	0	51
2006	0	2	0	4	6	7	22	8	0	1	50
Total	2	7	16	25	38	43	106	67	5	1	310

	2002	2003	2004	2005	2006
Lowest:	4.7	4.4	4.4	4.8	4.7
Highest:	8.0	8.3	7.7	8.0	8.5
Mean:	-	-	-	-	-
Median:	7.0	7.1	6.8	7.2	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	4	4	13	14	10	26	28	1	0	100
2003	1	0	9	9	12	9	36	20	4	0	100
2004	1	1	7	6	16	25	28	15	0	0	100
2005	0	2	4	4	6	12	41	29	2	0	100
2006	0	4	0	8	12	14	44	16	0	2	100
Total	1	2	5	8	12	14	34	22	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	0	1	9	19	31	31	15	0	0	0	106
2003	0	1	7	16	7	6	2	2	1	0	42
2004	1	0	7	6	8	6	0	0	0	0	28
2005	1	0	8	25	29	36	12	5	0	0	116
2006	1	1	5	20	17	5	1	0	0	0	50
Total	3	3	36	86	92	84	30	7	1	0	342

	2002	2003	2004	2005	2006
Lowest:	4.5	4.9	4.4	4.4	4.4
Highest:	7.4	8.3	6.9	7.7	7.1
Mean:	-	-	-	-	-
Median:	6.4	5.8	6.0	6.4	5.9

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	0	1	8	18	29	29	14	0	0	0	100
2003	0	2	17	38	17	14	5	5	2	0	100
2004	4	0	25	21	29	21	0	0	0	0	100
2005	1	0	7	22	25	31	10	4	0	0	100
2006	2	2	10	40	34	10	2	0	0	0	100
Total	1	1	11	25	27	25	9	2	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	13	11	20	7	5	6	3	1	6	72
2003	0	12	9	23	2	4	1	6	2	10	69
2004	0	9	12	20	4	7	2	5	0	9	68
2005	0	6	9	11	7	2	6	4	0	6	51
2006	0	9	4	18	6	3	0	2	3	5	50
Total	0	49	45	92	26	21	15	20	6	36	310

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	2	1
Highest:	918	1669	751	683	986
Mean:	70	102	86	85	102
Median:	21	20	20	39	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	18	15	28	10	7	8	4	1	8	100
2003	0	17	13	33	3	6	1	9	3	14	100
2004	0	13	18	29	6	10	3	7	0	13	100
2005	0	12	18	22	14	4	12	8	0	12	100
2006	0	18	8	36	12	6	0	4	6	10	100
Total	0	16	15	30	8	7	5	6	2	12	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	35	16	43	5	3	0	1	0	3	106
2003	0	15	14	7	3	1	0	0	0	2	42
2004	0	11	7	8	2	0	0	0	0	0	28
2005	0	47	23	43	3	0	0	0	0	0	116
2006	0	30	10	6	3	1	0	0	0	0	50
Total	0	138	70	107	16	5	0	1	0	5	342

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	597	1622	60	58	72
Mean:	27	69	10	10	9
Median:	9	5	4	5	3

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	15	41	5	3	0	1	0	3	100
2003	0	36	33	17	7	2	0	0	0	5	100
2004	0	39	25	29	7	0	0	0	0	0	100
2005	0	41	20	37	3	0	0	0	0	0	100
2006	0	60	20	12	6	2	0	0	0	0	100
Total	0	40	20	31	5	1	0	0	0	1	100

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

8. Potassium

8.1 Homeowner Samples

Potassium (lbs K/acre Morgan extraction) in homeowner samples (number):

Soil Management Group 2						
	Very Low	Low	Medium	High	Very High	Total
	<40	40-69	70-99	100-164	>164	
2002	0	0	2	7	17	26
2003	1	1	3	7	20	32
2004	1	0	4	5	23	33
2005	0	0	1	2	15	18
2006	0	1	4	4	11	20
Total (#)	2	2	14	25	86	129
Total (%)	2	2	11	19	67	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	0	1	3	5	17	26
2003	0	1	4	7	9	21
2004	0	0	1	2	8	11
2005	0	0	0	4	12	16
2006	0	0	2	4	8	14
Total (#)	0	2	10	22	54	88
Total (%)	0	2	11	25	61	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	0	2	0	4	4	10
2003	0	0	3	2	5	10
2004	0	4	4	2	11	21
2005	0	1	1	3	7	12
2006	0	0	2	5	4	11
Total (#)	0	7	10	16	31	64
Total (%)	0	11	16	25	48	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
2002	2	1	1	1	5	10
2003	0	2	0	1	3	6
2004	0	0	1	1	1	3
2005	0	1	0	3	1	5
2006	0	2	0	1	2	5
Total (#)	2	6	2	7	12	29
Total (%)	7	21	7	24	41	100

Rao, R., R. Tindell, Q.M. Ketterings, and H. Krol (2008). Erie Soil Sample Survey (2002-2006). CSS Extension Bulletin E08-1. 28 pages.

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	2	4	6	17	43	72
2003	1	4	10	17	37	69
2004	1	4	10	10	43	68
2005	0	3	2	10	36	51
2006	0	3	8	14	25	50
Grand Total	4	18	36	68	184	310

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	3	6	8	24	60	100
2003	1	6	14	25	54	100
2004	1	6	15	15	63	100
2005	0	6	4	20	71	100
2006	0	6	16	28	50	100
Grand Total	1	6	12	22	59	100

	2002	2003	2004	2005	2006
Lowest:	51	38	38	84	52
Highest:	7983	9039	2010	1133	9130
Mean:	421	460	351	364	622
Median:	231	239	229	253	213

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	2	0	1	3
2003	0	0	0	0	2	2
2004	0	0	0	0	0	0
2005	0	0	1	0	0	1
2006	0	0	0	1	0	1
Total (#)	0	0	3	1	3	7
Total (%)	0	0	43	14	43	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	3	2	13	20	38
2003	0	1	0	3	9	13
2004	0	1	0	1	2	4
2005	0	1	7	14	15	37
2006	0	0	3	5	5	13
Total (#)	0	6	12	36	51	105
Total (%)	0	6	11	34	49	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	7	20	23	51
2003	0	0	10	7	4	21
2004	0	0	2	12	6	20
2005	0	0	19	14	26	59
2006	0	2	18	8	8	36
Total (#)	0	3	56	61	67	187
Total (%)	0	2	30	33	36	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	4	2	5	11
2003	0	2	0	0	1	3
2004	0	0	2	1	1	4
2005	0	2	1	3	11	17
2006	0	0	0	0	0	0
Total (#)	0	4	7	6	18	35
Total (%)	0	11	20	17	51	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	1	0	2
2003	0	0	0	0	2	2
2004	0	0	0	0	0	0
2005	0	0	0	1	1	2
2006	0	0	0	0	0	0
Total (#)	0	1	0	2	3	6
Total (%)	0	17	0	33	50	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., R. Tindell, Q.M. Ketterings, and H. Krol (2008). Erie Soil Sample Survey (2002-2006). CSS Extension Bulletin E08-1. 28 pages.

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	0	5	15	36	49	1	106
2003	0	3	10	10	18	1	42
2004	0	1	4	14	9	0	28
2005	0	3	28	32	53	0	116
2006	0	2	21	14	13	0	50
Grand Total	0	14	78	106	142	2	342

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	0	5	14	34	46	1	100
2003	0	7	24	24	43	2	100
2004	0	4	14	50	32	0	100
2005	0	3	24	28	46	0	100
2006	0	4	42	28	26	0	100
Grand Total	0	4	23	31	42	1	100

	2002	2003	2004	2005	2006
Lowest:	58	63	64	63	70
Highest:	2557	12714	364	583	401
Mean:	282	609	188	207	155
Median:	181	174	181	167	116

9. Magnesium

9.1 Homeowner Samples

Magnesium (lbs Mg/acre Morgan extraction) in homeowner samples (numbers):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	5	66	72
2003	0	0	0	4	65	69
2004	0	0	0	7	61	68
2005	0	0	1	1	49	51
2006	0	0	1	0	49	50
Total	0	0	3	17	290	310

	2002	2003	2004	2005	2006
Lowest:	82	135	119	80	66
Highest:	3218	6541	1983	2047	9137
Mean:	577	735	638	678	962
Median:	515	530	539	612	655

Magnesium in homeowner samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	7	92	100
2003	0	0	0	6	94	100
2004	0	0	0	10	90	100
2005	0	0	2	2	96	100
2006	0	0	2	0	98	100
Total	0	0	1	5	94	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	0	3	4	99	106
2003	1	0	1	4	36	42
2004	0	0	3	5	20	28
2005	0	0	2	7	107	116
2006	0	1	0	7	42	50
Total	1	1	9	27	304	342

	2002	2003	2004	2005	2006
Lowest:	81	23	67	82	65
Highest:	1605	5931	741	875	566
Mean:	424	523	337	353	339
Median:	405	319	318	339	345

Magnesium in commercial samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	3	4	93	100
2003	2	0	2	10	86	100
2004	0	0	11	18	71	100
2005	0	0	2	6	92	100
2006	0	2	0	14	84	100
Total	0	0	3	8	89	100

10. Iron

10.1 Homeowner Samples

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

Total number of samples:			Percentages:			
	0-49	>49	Total	0-49	>49	Total
	Normal	Excessive		Normal	Excessive	
2002	64	8	72	89	11	100
2003	62	7	69	90	10	100
2004	57	11	68	84	16	100
2005	49	2	51	86	4	100
2006	45	5	50	90	10	100
Total	277	33	310	89	11	100

	2002	2003	2004	2005	2006
Lowest:	2	1	2	2	2
Highest:	326	204	144	80	163
Mean:	23	22	29	15	21
Median:	9	12	19	11	10

10.2 Commercial Samples

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

Total number of samples:			Percentages:			
	0-49	>49	Total	0-49	>49	Total
	Normal	Excessive		Normal	Excessive	
2002	93	13	106	88	12	100
2003	29	13	42	69	31	100
2004	20	8	28	71	29	100
2005	95	21	116	82	18	100
2006	36	14	50	72	28	100
Total	273	69	342	80	20	100

	2002	2003	2004	2005	2006
Lowest:	2	4	7	2	5
Highest:	100	116	555	326	689
Mean:	20	34	66	30	57
Median:	13	31	24	8	27

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	67	5	72	93	7	100
2003	62	7	69	90	10	100
2004	60	8	68	88	12	100
2005	49	2	51	96	4	100
2006	41	9	50	82	18	100
Total	279	31	310	90	10	100

	2002	2003	2004	2005	2006
Lowest:	9	6	17	11	14
Highest:	157	256	357	138	330
Mean:	44	51	65	57	67
Median:	37	36	52	52	43

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	101	5	106	95	5	100
2003	35	7	42	83	17	100
2004	25	3	28	89	11	100
2005	115	1	116	99	1	100
2006	50	0	50	100	0	100
Total	326	16	342	95	5	100

	2002	2003	2004	2005	2006
Lowest:	7	10	18	11	17
Highest:	172	467	304	113	86
Mean:	40	67	54	31	43
Median:	33	48	38	27	41

12. Zinc

12.1 Homeowner Samples

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

Total number of samples:					Percentages:				
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total	
	Low	Medium	High		Low	Medium	High		
2002	0	1	71	72	0	1	99	100	
2003	0	3	66	69	0	4	96	100	
2004	0	2	66	68	0	3	97	100	
2005	0	2	49	51	0	4	96	100	
2006	1	2	47	50	2	4	94	100	
Total	1	10	299	310	0	3	96	100	

	2002	2003	2004	2005	2006
Lowest:	0.9	0.6	0.6	0.7	0.2
Highest:	221.3	218.2	83.8	61.9	240.0
Mean:	16.5	11.1	10.5	11.2	13.6
Median:	6.6	4.4	4.5	5.6	4.5

12.2 Commercial Samples

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

Total number of samples:					Percentages:				
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total	
	Low	Medium	High		Low	Medium	High		
2002	2	12	92	106	2	11	87	100	
2003	0	3	39	42	0	7	93	100	
2004	1	5	22	28	4	18	79	100	
2005	21	32	63	116	18	28	54	100	
2006	0	7	43	50	0	14	86	100	
Total	24	59	259	342	7	17	76	100	

	2002	2003	2004	2005	2006
Lowest:	0.3	0.7	0.4	0.1	0.7
Highest:	41.6	18.0	10.0	7.9	9.2
Mean:	3.8	3.6	2.4	1.3	2.1
Median:	2.3	2.7	1.9	1.1	1.6

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
Corn	
COG	Corn grain
COS	Corn silage

Crop Code	Crop Description
	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
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Green

Crop Code	Crop Description
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	Tree fruits
TRT	Christmas trees, Topdressing