

Rao, R., M. Hunter, Q.M. Ketterings, and H. Krol (2007). Jefferson Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-5. 36 pages.

Soil Sample Survey

Jefferson County

Samples analyzed by CNAL (2002-2006)



Jefferson County (photo credit: Mike Hunter, CCE of Jefferson County).

Summary compiled by

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Cornell Nutrient Analysis Laboratory

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

&

Nutrient Management Spear Program

<http://nmsp.css.cornell.edu/>



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August 23, 2007

Correct Citation:

Rao, R., M. Hunter, Q.M. Ketterings, and H. Krol (2007). Soil sample survey of Jefferson County. Samples analyzed by the Cornell Nutrient Analysis Laboratory (2002-2006). CSS Extension Bulletin E07-5. 36 pages.

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1. County Introduction

Jefferson County is located in Northern New York at the east end of Lake Ontario. The County borders Lake Ontario to the West and the St. Lawrence River to the North. To the Northeast is St. Lawrence County; to the east, Lewis County; and the south, Oswego County. Topographically, Jefferson County can be divided into the St. Lawrence River Valley Thousand Islands Region, Lake Ontario lowlands, Tug Hill Region, Black River Valley, and the Theresa Lakes Region. The county encompasses 1,293 square miles, making it the ninth largest county in New York State.

In Jefferson County, winters are cold and summers are moderately warm. The total annual precipitation is 40 inches, of which nearly 20 inches falls during the growing season. The annual average snowfall is 112 inches. The average last spring freeze is May 8th and the first fall freeze is October 6th.

The bedrock in the county consists of large areas of limestone, sandstone, granite and shale covered by glacial till and lake sediments. There are over 85 different soil types found in the county, ranging from clayey to loamy soils on lowland plains and loamy to sandy soils on plains and terraces. Lowland plains are found near Lake Ontario and the St. Lawrence Valley. The upland areas near the Tug Hill Region and the Black River Valley are rolling to hilly.

Lake Ontario and the St. Lawrence River receive most of the drainage waters in the county. The Black River and Sandy Creek are also watersheds of significance, both draining into Lake Ontario. In the southeastern part of the county, the Mad River watershed empties into the Salmon River in Oswego County. In the northern part of the county, the Indian River and Oswegatchie River flow into St. Lawrence County.

Jefferson County is one of the leading agricultural counties in New York State with annual agricultural sales of \$99.5 million according to the 2002 Census of Agriculture. Dairy farming is the major agricultural industry in the county, and ranks fourth in the state for milk production. Jefferson County ranks third in the state for both number of milk cows and number of beef cows.

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In 2006, there were 325,800 acres in farms, 40% of the county's total 814,209 acres. Jefferson County ranks number 1 in the state for both hay acres harvested and total tons produced. Corn is also a major crop grown in Jefferson County with 36,800 acres of corn planted in 2005. Approximately 2/3 of the corn grown in the county is harvested for silage. Soybeans, wheat and other small grains are among other crops grown in the county.

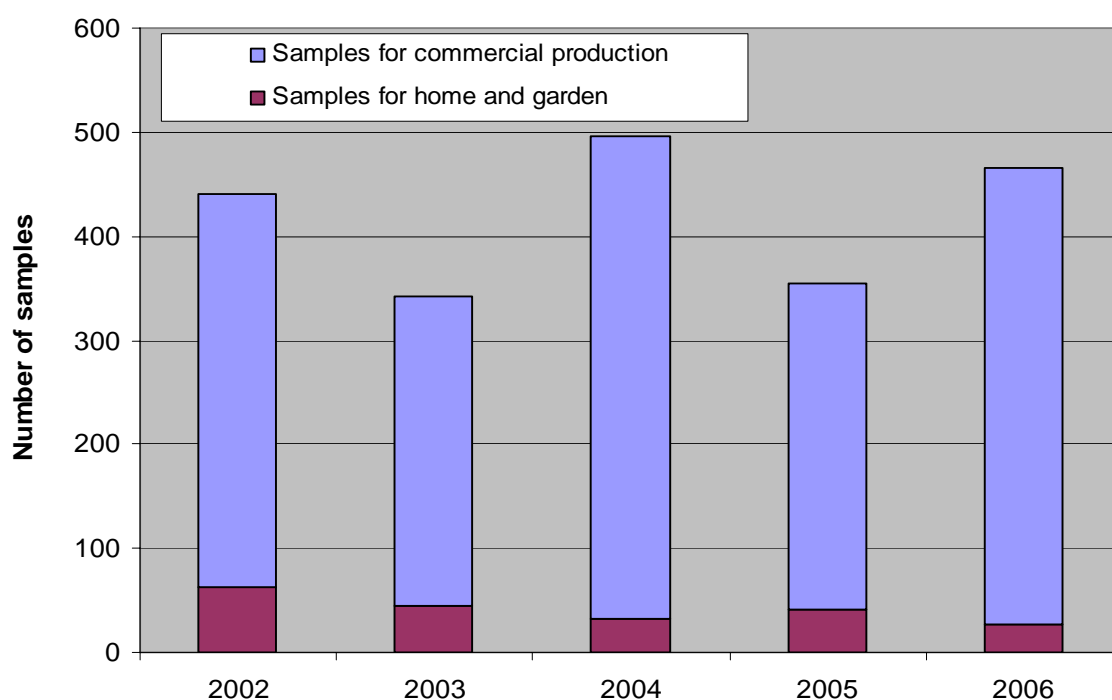
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Jefferson County (photo credit: Mike Hunter, CCE of Jefferson County).

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Jefferson County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) during 2002 and 2006. The total number of samples analyzed in these years amounted to 2099. Of these 1890 samples (90%) were submitted by commercial growers while 209 samples (10%) were submitted by homeowners. The number of samples has been fluctuating over the past years.



Homeowners		Commercial		Total
2002	63	2002	377	440
2003	45	2003	297	342
2004	32	2004	465	497
2005	42	2005	313	355
<u>2006</u>	<u>27</u>	<u>2006</u>	<u>437</u>	<u>464</u>
Total	209	Total	1890	2099

The majority (64%) of the homeowners that submitted soil samples to the Cornell Nutrient Analysis Laboratory during 1995-2001 requested recommendations for lawns or for home garden vegetable production. Commercial growers submitted samples mostly to grow corn silage or grain (46%), alfalfa or alfalfa/grass mixes (25%), and grass hay (12%), while a few growers were planning to grow clover, soybeans, oats or ryegrass.

Soils tested for home and garden in Jefferson County were classified as belonging to soil management group 4 (29%), group 2 (28%), group 3 (26%), or group 5 (17%). A description of the different management groups is given below. Of the samples submitted by commercial growers, 38% belonged to soil management group 3, 35% was from soil management group 4, 13% belonged to group 2 and 7% each were from group 1 or 6. Collamer was the most common soil type (23%) followed by Galway (12%), Nellis (7%), Rhinebeck (6%) and Farmington and Niagara (6% each).

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.

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to over 20% for the commercial samples with a median of 3.7 to 4.0% organic matter.

For homeowner samples, the median ranged from 3.2 to 4.7% organic matter. Fifty percent of the samples had 2 to 5% organic matter with 47% testing between 3 and 6% organic matter. Fifteen percent had more than 6.9% organic matter. Of the samples submitted by commercial growers, 77% had between 3 and 6% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 5.1 to 8.2 for home and garden samples while 65% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 7.9 and 81% 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 a pH of 4.8.

Soil test P levels of <1 lbs P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and anything higher is classified as very high. For homeowners, 25% tested low for phosphorus, 15% tested medium, 17% tested high and 43% tested very high. This meant that 60% tested high or very high in P. For commercial growers, 7% tested very high. In total 31% was low in P, 31% tested medium for P while another 31% of the submitted samples were classified as high in soil test P. This means that 38% tested high or very high in P. There were no clear trends in P levels over the 5 years.

Classifications for potassium depend on soil management group. The fine textured soils (soil management group 1) have a greater K supplying capacity than the coarse textured sandy soils (soil management group 5). Classification for each of the management groups in the above table represent very low, low, medium, high and very high. So for example for soil management group 5 and 6, <60 lbs K/acre means the soil is very low in K, between 60 and 114 lbs K/acre is medium, 115-164 lbs K/acre is medium, 165-269 lbs K/acre is high and >269 lbs K/acre is classified as very high (see Table on page 8). Potassium classifications for Jefferson County soils varied from very low (1% of the homeowner soils and 2% of the commercial growers' soils) to very high (56% of the homeowner soils and 28% of the commercial growers' soils). For homeowners, 10% tested low in K, 15% tested medium, and 18% tested high for potassium. For commercial growers' soils, 14% tested low, 22% tested medium and 34% tested high in potassium.

Potassium soil test interpretations for New York.

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 magnesium if Morgan extractable Mg is less than 20 lbs Mg/acre. Low testing soils have 20-65 lbs Morgan Mg per acre. Soils with 66-100 lbs Mg/acre test medium for Mg. High testing soils have 101-199 lbs Mg/acre while soils with more than 200 lbs Mg/acre in the Morgan extraction are classified as very high in Mg. Magnesium levels ranged from 1 to more than 3000 lbs Mg/acre. Most soils tested very high or very high for Mg (95% for homeowner soils and 93% for commercial grower samples). In total 5% of the homeowner soils and 7% of the commercial growers' soil tested low or medium in Mg. Thus, Mg deficiency is not likely to occur in Jefferson County provided a desirable soil pH range is maintained.

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 for 97% were in the normal range for both sets of samples with only 3% testing excessive for Fe. Similarly, most soils (97-100%) tested normal for manganese. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. Less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lbs Zn per acre 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, the soil tests high in Zn. For the homeowner soils, 85% tested high for Zn while 11% tested medium. Of the commercial growers' samples, 5% tested low in Zn, 20% tested medium while 75% was high in Zn.

In the following sections, the summary tables for each of the soil fertility indicators described above are given. The appendix contains the crop codes used in section 3.

3. Cropping Systems

3.1 Homeowner Samples

Crops for which recommendations are requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
AIG	0	0	0	0	1	1	0
APR	0	0	1	1	0	2	1
ATF	19	1	0	0	0	20	10
BLU	0	1	0	0	0	1	0
FLA	1	0	0	0	2	3	1
GEN	0	0	0	0	0	0	0
GRA	0	0	3	9	0	12	6
LAW	17	16	5	4	5	47	22
MVG	16	15	20	21	16	88	42
Other	2	2	1	3	0	8	4
PER	4	3	0	0	0	7	3
PTO	0	1	0	0	0	1	0
ROD	0	2	0	0	0	2	1
ROS	0	1	0	1	0	2	1
RSP	0	2	0	0	0	2	1
SAG	4	0	1	3	2	10	5
STR	0	0	0	0	1	1	0
TRF	0	0	1	0	0	1	0
Unknown	0	1	0	0	0	1	0
Total	63	45	32	42	27	209	100

Notes: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations are requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE/ABT	8	71	89	1	4	173	9
AGE/AGT	97	0	0	57	86	240	13
AIG	1	0	0	0	0	1	0
ALE/ALT	8	2	19	7	29	65	3
APP	0	0	0	0	1	1	0
BCE	0	0	1	0	0	1	0
BGE/BGT	0	1	4	0	0	5	0
BLB	0	0	0	0	0	0	0
BNS	0	0	1	0	0	1	0
BSP	3	0	1	2	4	10	1
BSS	0	0	0	1	0	1	0
BUK	0	0	0	2	0	2	0
BWI	0	0	0	0	1	1	0
BWS	0	0	0	0	0	0	0
CGE/CGT	7	17	1	14	26	65	3
CHC	1	0	0	1	0	2	0
CHT	0	0	0	0	1	1	0
CLE/CLT	0	4	4	14	7	29	2
COG/COS	166	137	228	144	197	872	46
CSE	0	0	0	0	1	1	0
GIE/GIT	13	34	0	2	1	50	3
GPA	1	0	0	0	1	2	0
GRE/GRT	34	0	72	27	36	169	9
IDL	0	1	0	0	14	15	1
LAW	0	0	1	0	0	1	0
MIX	1	1	1	3	0	6	0
MML	0	0	0	1	0	1	0
OAS	14	3	17	13	7	54	3
OAT	1	1	0	1	2	5	0
OTH	2	3	1	4	2	12	1
PGE/PGT	0	0	0	0	0	0	0
PIE/PIT	0	0	0	0	0	0	0
PLE/PLT	0	0	0	0	0	0	0
PNT	2	1	1	0	3	7	0
POT	0	0	0	0	0	0	0
PUM	1	0	0	1	0	2	0
RSS	0	0	1	0	0	1	0

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Current year crop	2002	2003	2004	2005	2006	Total	%
RYC	0	0	2	0	0	2	0
RYS	2	1	4	1	4	12	1
SOD	0	0	2	0	0	2	0
SOF	0	0	8	0	0	8	0
SOG	1	0	0	0	0	1	0
SOY	13	7	0	13	6	39	2
SQW	0	0	0	1	0	1	0
SSH	0	0	0	1	0	1	0
SWC	0	0	2	2	1	5	0
TRE/TRT	0	0	0	0	0	0	0
WHT	0	0	2	0	0	2	0
Unknown	1	13	3	0	3	20	1
Total	377	297	465	313	437	1889	100

Notes: 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)	18	8	8	18	8	60	28
SMG 3 (silt loam)	11	19	9	10	5	54	26
SMG 4 (sandy loam)	20	12	8	8	12	60	29
SMG 5 (sandy)	14	6	7	6	2	35	17
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	63	45	32	42	27	209	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Adams	5	0	2	17	3	2	24	1
Allis	3	1	0	0	1	0	2	0
Alton	5	0	0	13	0	5	18	1
Amenia	4	4	5	8	1	11	29	2
Angola	2	2	0	0	0	0	2	0
Arkport	4	0	2	0	4	0	6	0
Benson	4	1	5	5	1	1	13	1
Bice	5	3	0	0	5	0	8	0
Blasdell	3	8	2	4	1	3	18	1
Bombay	4	5	2	2	4	5	18	1
Canandaigua	3	2	1	0	0	1	4	0
Chaumont	1	1	6	14	9	11	41	2
Claverack	4	2	1	0	1	4	8	0
Collamer	3	84	31	135	70	113	433	23
Covington	1	1	1	1	0	4	7	0
Croghan	5	1	0	1	3	1	6	0
Danley	2	6	1	0	0	1	8	0
Darien	2	0	0	0	1	0	1	0
Deerfield	5	1	3	0	3	1	8	0
Dunkirk	3	0	0	1	1	2	4	0
Elmridge	5	1	1	5	3	3	13	1
Elmwood	4	2	0	0	0	0	2	0
Empeyville	4	0	0	1	0	0	1	0
Farmington	3	21	26	16	16	19	98	5
Fredon	4	0	2	0	0	1	3	0
Galen	4	0	3	5	2	4	14	1
Galoo	4	1	0	1	0	1	3	0
Galway	4	36	59	38	41	53	227	12
Groton	4	9	8	7	4	11	39	2
Guffin	1	1	0	2	1	0	4	0
Gulf	4	1	0	0	1	0	2	0
Halsey	4	1	0	0	0	0	1	0
Hamlin	2	0	0	2	0	0	2	0
Hudson	2	13	6	9	23	34	85	4
Hinckley	5	0	0	1	2	0	3	0
Insula	4	0	0	1	0	0	1	0
Ira	4	0	0	1	2	0	3	0

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Junius	5	2	1	1	1	0	5	0
Kars	4	1	2	3	3	6	15	1
Kingsbury	1	5	9	17	5	2	38	2
Lagross	3	13	0	3	3	0	19	1
Lowville	4	7	4	1	2	1	15	1
Madalin	1	0	0	0	0	4	4	0
Madrid	4	17	12	12	19	12	72	4
Manlius	3	5	0	0	1	0	6	0
Massena	4	8	1	2	0	0	11	1
Minoa	4	2	1	1	0	2	6	0
Nassau	4	2	0	0	3	2	7	0
Naumburg	5	0	0	1	3	1	5	0
Nellis	4	23	18	48	11	30	130	7
Newstead	4	2	3	1	1	5	12	1
Niagara	3	26	9	22	6	22	85	5
Phelps	3	5	6	1	3	7	22	1
Pinckney	3	0	0	0	1	0	1	0
Pittsfield	4	4	0	1	0	0	5	0
Plainfield	5	4	3	0	4	2	13	1
Pootatuck	4	0	0	3	0	0	3	0
Pyrities	4	0	0	0	1	0	1	0
Rhinebeck	2	28	15	12	21	38	114	6
Ruse	4	0	2	0	0	0	2	0
Shaker	2	0	2	0	0	2	4	0
Sodus	4	1	0	4	1	0	6	0
Teel	2	0	12	6	7	0	25	1
Venango	3	0	1	0	1	0	2	0
Vergennes	1	5	6	15	7	3	36	2
Wareham	5	0	0	2	0	0	2	0
Wayland	2	0	2	2	0	0	4	0
Williamson	4	2	0	0	1	1	4	0
Wilpoint	1	0	1	6	2	2	11	1
Windsor	5	6	7	10	3	3	29	2
Unknown	-	1	13	1	0	1	16	1
Total	-	377	297	485	313	437	1889	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	17	13	8	7	8	3	7	63
2003	0	4	11	9	8	5	2	6	45
2004	0	3	3	5	7	8	6	0	32
2005	1	2	7	5	9	5	2	11	42
2006	0	2	2	5	6	3	1	8	27
Total	1	28	36	32	37	29	14	32	209

	2002	2003	2004	2005	2006
Lowest:	1.1	1.1	1.3	0.5	1.0
Highest:	17.1	13.8	6.9	17.4	45.7
Mean:	4.0	4.4	4.4	5.5	6.9
Median:	3.2	3.9	4.7	4.5	4.5

Organic matter 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	27	21	13	11	13	5	11	100
2003	0	9	24	20	18	11	4	13	100
2004	0	9	9	16	22	25	19	0	100
2005	2	5	17	12	21	12	5	26	100
2006	0	7	7	19	22	11	4	30	100
Total	0	13	17	15	18	14	7	15	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	2	8	41	124	112	55	16	19	337
2003	0	4	45	96	85	42	18	7	297
2004	0	4	69	210	95	52	21	14	465
2005	1	6	34	115	105	35	8	9	313
2006	0	11	70	194	97	45	14	6	437
Total	3	33	259	739	494	229	77	55	1889

	2002	2003	2004	2005	2006
Lowest:	0.1	1.0	1.5	0.8	1.1
Highest:	19.2	17.7	10.1	21.8	11.7
Mean:	4.3	4.2	4.0	4.1	3.8
Median:	4.0	4.0	3.7	4.0	3.7

Organic matter 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	2	11	33	30	15	4	5	100
2003	0	1	15	32	29	14	6	2	100
2004	0	1	15	45	20	11	5	3	100
2005	0	2	11	37	34	11	3	3	100
2006	0	3	16	44	22	10	3	1	100
Total	0	2	14	39	26	12	4	3	100

6. pH

6.1 Homeowner Samples

pH of homeowner samples (numbers):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	0	1	3	6	12	22	15	4	0	63
2003	0	0	2	1	5	10	16	10	1	0	45
2004	0	0	2	6	3	4	7	9	1	0	32
2005	0	0	1	5	9	10	13	4	0	0	42
2006	0	0	0	3	3	6	11	4	0	0	27
Total	0	0	6	18	26	42	69	42	6	0	209

	2002	2003	2004	2005	2006
Lowest:	5.1	5.2	5.4	5.2	5.7
Highest:	8.2	8.0	8.0	7.8	7.8
Mean:	-	-	-	-	-
Median:	7.3	7.1	7.1	6.8	7.0

pH homeowner of samples (% of total number of samples):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	0	2	5	10	19	35	24	6	0	100
2003	0	0	4	2	11	22	36	22	2	0	100
2004	0	0	6	19	9	13	22	28	3	0	100
2005	0	0	2	12	21	24	31	10	0	0	100
2006	0	0	0	11	11	22	41	15	0	0	100
Total	0	0	3	9	12	20	33	20	3	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	12	62	91	125	65	20	0	0	377
2003	0	0	2	26	93	74	67	35	0	0	297
2004	0	0	6	57	136	171	87	8	0	0	465
2005	0	1	10	35	77	106	68	16	0	0	313
2006	0	0	4	50	134	147	90	12	0	0	437
Total	1	2	34	230	531	623	377	91	0	0	1889

	2002	2003	2004	2005	2006
Lowest:	4.4	5.3	5.3	4.7	5.0
Highest:	7.8	7.9	7.6	7.7	7.7
Mean:	-	-	-	-	-
Median:	6.5	6.6	6.6	6.6	6.5

pH of commercial samples (% of total number of samples):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	0	3	16	24	33	17	5	0	0	100
2003	0	0	1	9	31	25	23	12	0	0	100
2004	0	0	1	12	29	37	19	2	0	0	100
2005	0	0	3	11	25	34	22	5	0	0	100
2006	0	0	1	11	31	34	21	3	0	0	100
Total	0	0	2	12	28	33	20	5	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	25	11	7	4	4	1	4	1	6	63
2003	0	10	3	13	3	6	4	2	2	2	45
2004	0	3	5	6	2	4	2	4	4	2	32
2005	0	11	8	3	3	3	0	4	1	9	42
2006	0	3	5	7	0	1	4	1	0	6	27
Total	0	52	32	36	12	18	11	15	8	25	209

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

	2002	2003	2004	2005	2006
Lowest:	1	1	2	1	1
Highest:	533	298	465	826	2129
Mean:	58	53	82	132	199
Median:	6	28	62	15	27

Phosphorus 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	40	17	11	6	6	2	6	2	10	100
2003	0	22	7	29	7	13	9	4	4	4	100
2004	0	9	16	19	6	13	6	13	13	6	100
2005	0	26	19	7	7	7	0	10	2	21	100
2006	0	11	19	26	0	4	15	4	0	22	100
Total	0	25	15	17	6	9	5	7	4	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	159	102	97	10	6	2	0	0	1	377
2003	0	98	72	104	15	8	0	0	0	0	297
2004	0	112	142	174	18	8	5	2	1	1	465
2005	0	88	118	81	17	3	1	2	0	3	313
2006	0	120	156	136	17	4	1	2	0	1	437
Total	0	577	590	594	77	29	9	6	1	6	1889

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	674	77	267	312	328
Mean:	11	13	14	14	12
Median:	5	6	8	6	6

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	42	27	26	3	2	1	0	0	0	100
2003	0	33	24	35	5	3	0	0	0	0	100
2004	0	24	31	38	4	2	1	0	0	0	100
2005	0	28	38	26	5	1	0	1	0	1	100
2006	0	28	36	31	4	1	0	0	0	0	100
Total	0	31	31	31	4	2	0	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	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	4	14	18
2003	0	1	1	1	5	8
2004	0	0	0	2	6	8
2005	0	0	0	3	15	18
2006	0	0	2	1	5	8
Total (#)	0	1	3	11	45	60
Total (%)	0	2	5	18	75	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	4	0	7	11
2003	0	2	0	3	14	19
2004	0	2	1	2	4	9
2005	0	0	1	3	6	10
2006	0	0	0	1	4	5
Total (#)	0	4	6	9	35	54
Total (%)	0	7	11	17	65	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	3	6	5	6	20
2003	0	2	1	1	2	6
2004	0	0	1	1	6	8
2005	0	1	0	0	7	8
2006	0	0	2	3	7	12
Total (#)	0	6	10	10	28	54
Total (%)	0	11	19	19	52	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	4	6	3	1	14
2003	0	3	4	1	4	12
2004	0	0	2	3	2	7
2005	2	3	0	1	0	6
2006	0	0	1	0	1	2
Total (#)	2	10	13	8	8	41
Total (%)	5	24	32	20	20	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., M. Hunter, Q.M. Ketterings, and H. Krol (2007). Jefferson Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-5. 36 pages.

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	0	7	16	12	28	63
2003	0	8	6	6	25	45
2004	0	2	4	8	18	32
2005	2	4	1	7	28	42
2006	0	0	5	5	17	27
Grand Total	2	21	32	38	116	209

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	0	11	25	19	44	100
2003	0	18	13	13	56	100
2004	0	6	13	25	56	100
2005	5	10	2	17	67	100
2006	0	0	19	19	63	100
Grand Total	1	10	15	18	56	100

	2002	2003	2004	2005	2006
Lowest:	62	59	72	52	73
Highest:	2282	757	2757	2612	7106
Mean:	289	237	448	447	643
Median:	192	217	291	281	248

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	1	1	6	5	13
2003	0	0	3	5	15	23
2004	0	0	2	15	38	55
2005	0	1	2	8	13	24
2006	0	0	3	11	12	26
Total (#)	0	2	11	45	83	141
Total (%)	0	1	8	32	59	10
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	14	17	16	49
2003	0	1	5	18	14	38
2004	0	2	6	13	10	31
2005	0	1	7	25	19	52
2006	0	0	3	35	37	75
Total (#)	0	2	11	45	83	245
Total (%)	0	4	22	90	166	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	5	19	35	64	41	165
2003	2	9	22	19	24	76
2004	1	25	34	69	53	182
2005	0	2	27	49	26	104
2006	0	11	37	76	43	167
Total (#)	9	66	155	277	187	694
Total (%)	1	9	22	40	27	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	4	33	35	24	35	131
2003	5	36	33	29	27	130
2004	4	31	42	36	31	144
2005	1	11	23	45	23	103
2006	2	30	41	45	32	150
Total (#)	16	141	174	179	148	658
Total (%)	2	21	26	27	22	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	5	8	1	2	2	18
2003	1	10	1	4	1	17
2004	1	11	16	15	9	52
2005	2	5	9	8	6	30
2006	0	8	7	1	2	18
Total (#)	9	42	34	30	20	135
Total (%)	7	31	25	22	15	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	15	63	86	113	99	1	377
2003	8	56	64	75	81	13	297
2004	6	69	100	148	141	1	465
2005	3	20	68	135	87	0	313
2006	2	49	91	168	126	1	437
Grand Total	34	257	409	639	534	16	1889

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	4	17	23	30	26	0	100
2003	3	19	22	25	27	4	100
2004	1	15	22	32	30	0	100
2005	1	6	22	43	28	0	100
2006	1	11	21	38	29	0	100
Grand Total	2	14	22	34	28	1	100

	2002	2003	2004	2005	2006
Lowest:	9	14	40	52	34
Highest:	4026	1034	1760	866	594
Mean:	186	179	195	180	172
Median:	135	146	151	159	149

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	5	18	40	63
2003	0	0	2	5	38	45
2004	0	0	0	4	28	32
2005	0	4	0	3	35	42
2006	0	0	0	2	25	27
Total	0	4	7	32	166	209

	2002	2003	2004	2005	2006
Lowest:	79	68	110	27	102
Highest:	1979	1565	1189	1530	2773
Mean:	401	423	458	563	601
Median:	308	348	389	456	452

Magnesium 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	8	29	63	100
2003	0	0	4	11	84	100
2004	0	0	0	13	88	100
2005	0	10	0	7	83	100
2006	0	0	0	7	93	100
Total	0	2	3	15	79	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	2	15	18	110	232	377
2003	0	5	15	105	172	297
2004	0	11	20	127	307	465
2005	0	5	12	91	205	313
2006	2	9	14	116	296	437
Total	4	45	79	549	1212	1889

	2002	2003	2004	2005	2006
Lowest:	3	29	28	54	1
Highest:	3124	1751	1569	1740	1839
Mean:	330	330	333	328	387
Median:	237	223	249	240	254

Magnesium 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	4	5	29	62	100
2003	0	2	5	35	58	100
2004	0	2	4	27	66	100
2005	0	2	4	29	65	100
2006	1	2	3	26	68	100
Total	0	2	4	29	64	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	63	0	63
2003	43	2	45
2004	31	1	32
2005	40	2	42
2006	25	2	27
Total	202	7	209

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	100	0	100
	96	4	100
	97	3	100
	95	5	100
	93	7	100
	97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	3
Highest:	48	97	54	57	68
Mean:	13	12	10	14	13
Median:	8	6	6	8	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	372	5	377
2003	294	3	297
2004	445	20	465
2005	301	12	313
2006	429	8	437
Total	1841	48	1889

Percentages:

0-49	>49	Total
Normal	Excessive	
99	1	100
99	1	100
96	4	100
96	4	100
98	2	100
97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	70	92	125	128	1015
Mean:	10	9	13	13	14
Median:	6	6	8	8	7

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	62	1	63
2003	45	0	45
2004	31	1	32
2005	40	2	42
2006	24	3	27
Total	202	7	209

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	98	2	100
	100	0	100
	97	3	100
	95	5	100
	89	11	100
	97	3	100

	2002	2003	2004	2005	2006
Lowest:	8	4	11	2	15
Highest:	103	84	104	210	159
Mean:	21	33	40	40	46
Median:	28	32	33	33	35

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	337	0	337	100	0	100
2003	296	1	297	100	0	100
2004	465	0	465	100	0	100
2005	307	6	313	98	2	100
2006	437	0	437	100	0	100
Total	1882	7	1889	100	0	100

	2002	2003	2004	2005	2006
Lowest:	1	4	4	5	2
Highest:	65	102	96	224	76
Mean:	23	23	27	31	26
Median:	22	20	25	26	24

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	4	16	43	63
2003	0	3	42	45
2004	0	0	32	32
2005	1	2	39	42
2006	3	2	22	27
Total	8	23	178	209

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
6	25	68	100
0	7	93	100
0	0	100	100
2	5	93	100
11	7	81	100
4	11	85	100

	2002	2003	2004	2005	2006
Lowest:	0.2	0.6	1.1	0.1	0.1
Highest:	135.5	89.3	96.8	127.1	66.3
Mean:	9.7	8.8	12.3	16.5	11.6
Median:	2.3	4.1	6.2	6.3	3.5

12.2 Commercial Samples

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

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	10	50	317	377
2003	18	70	209	297
2004	15	112	338	465
2005	17	64	232	313
2006	35	80	322	437
Total	95	376	1418	1889

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
3	13	84	100
6	24	70	100
3	24	73	100
5	20	74	100
8	18	74	100
5	20	75	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.2	0.1	0.1	0.1
Highest:	22.5	13.5	68.0	26.2	23.8
Mean:	2.0	1.8	2.8	1.8	1.8
Median:	1.7	1.4	1.4	1.5	1.5

Appendix: Cornell Crop Codes

Crop codes are used in the Cornell Nutrient Analyses 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
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
	Small grains
MIL	Millet
OAS	Oats 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

Crop Code	Crop Description
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

Rao, R., M. Hunter, Q.M. Ketterings, and H. Krol (2007). Jefferson Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-5. 36 pages.



Jefferson County (photo credit: Mike Hunter, CCE of Jefferson County).

