A Presentation of the

December 2, 2008

IOWA STATE UNIVERSITY
University Extension

UNIVERSITY OF MINNESOTA
EXTENSION

Is Turkey Manure an Asset or a Liability: Crop Production and Environmental Impacts of Utilization at Two Field Scales.

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Evaluation of

Losses of Nitrogen, Phosphorus, and Soil

Crops (Corn-Soybeans-Corn-Corn-Soybeans)

2006 2007 2008 2009 2010

Soil Fertility Sources-Fall of 2007

Turkey Litter

Fertilizer

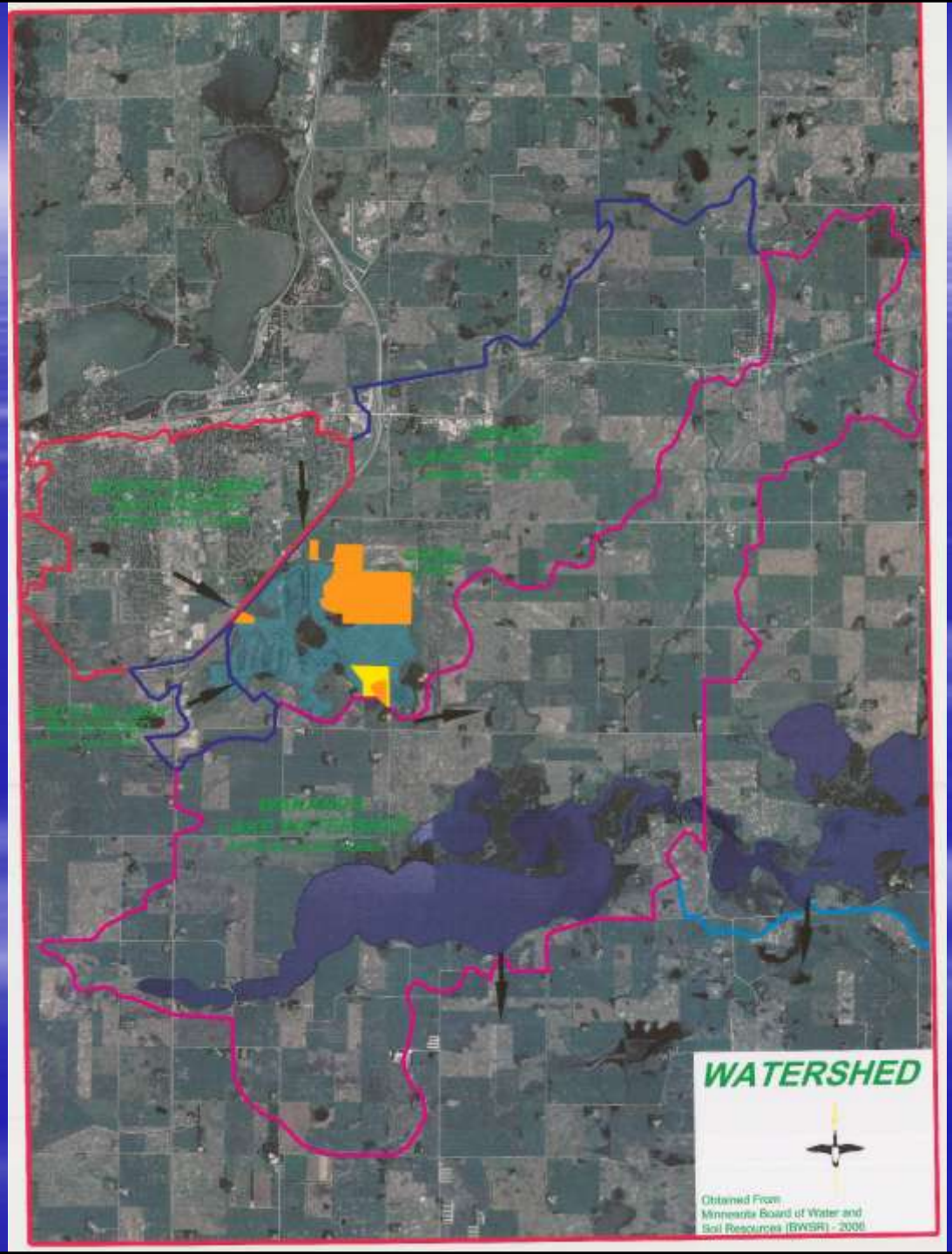
Unfertilized Control

Locations

Willmar

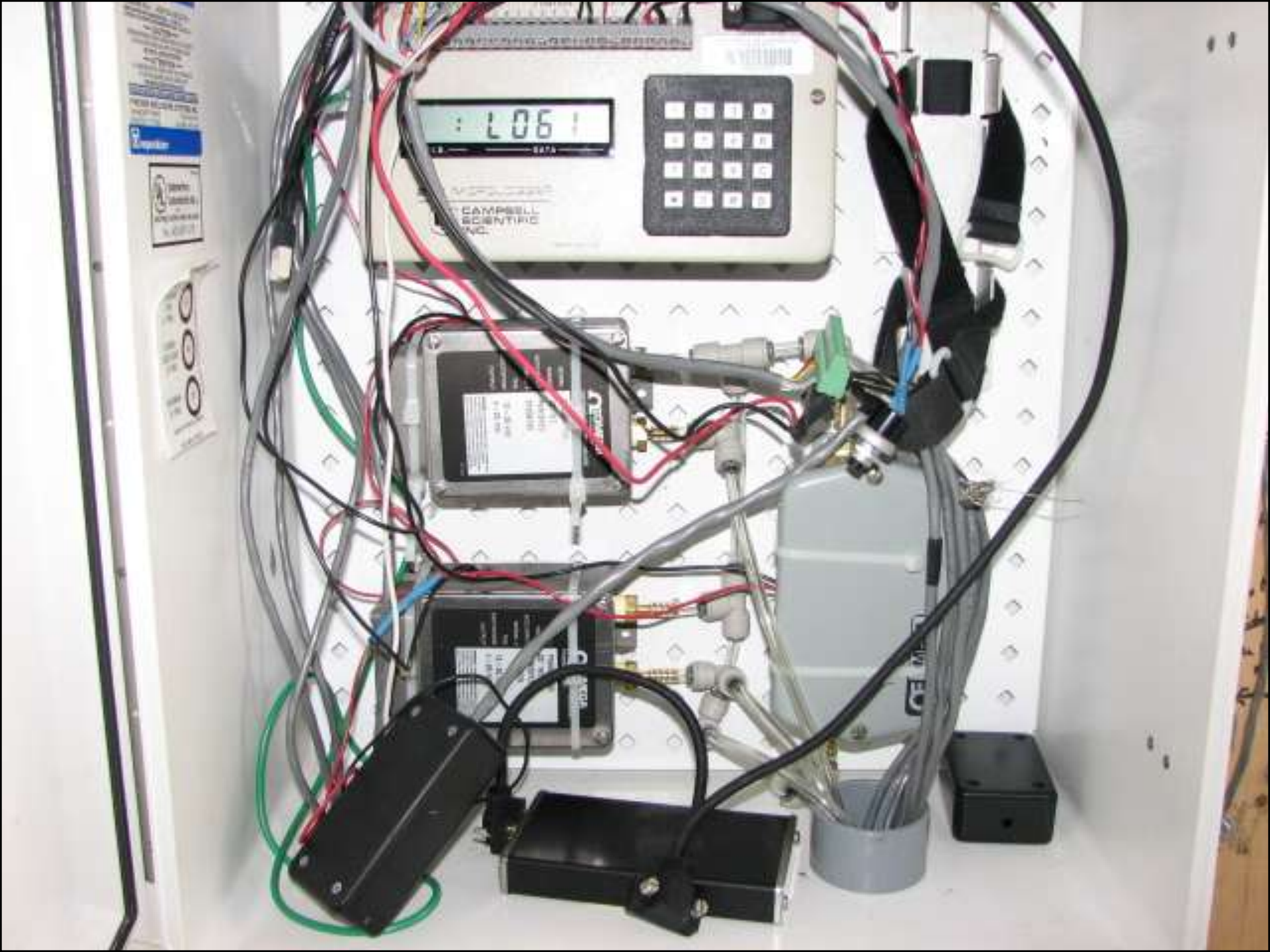
Morris

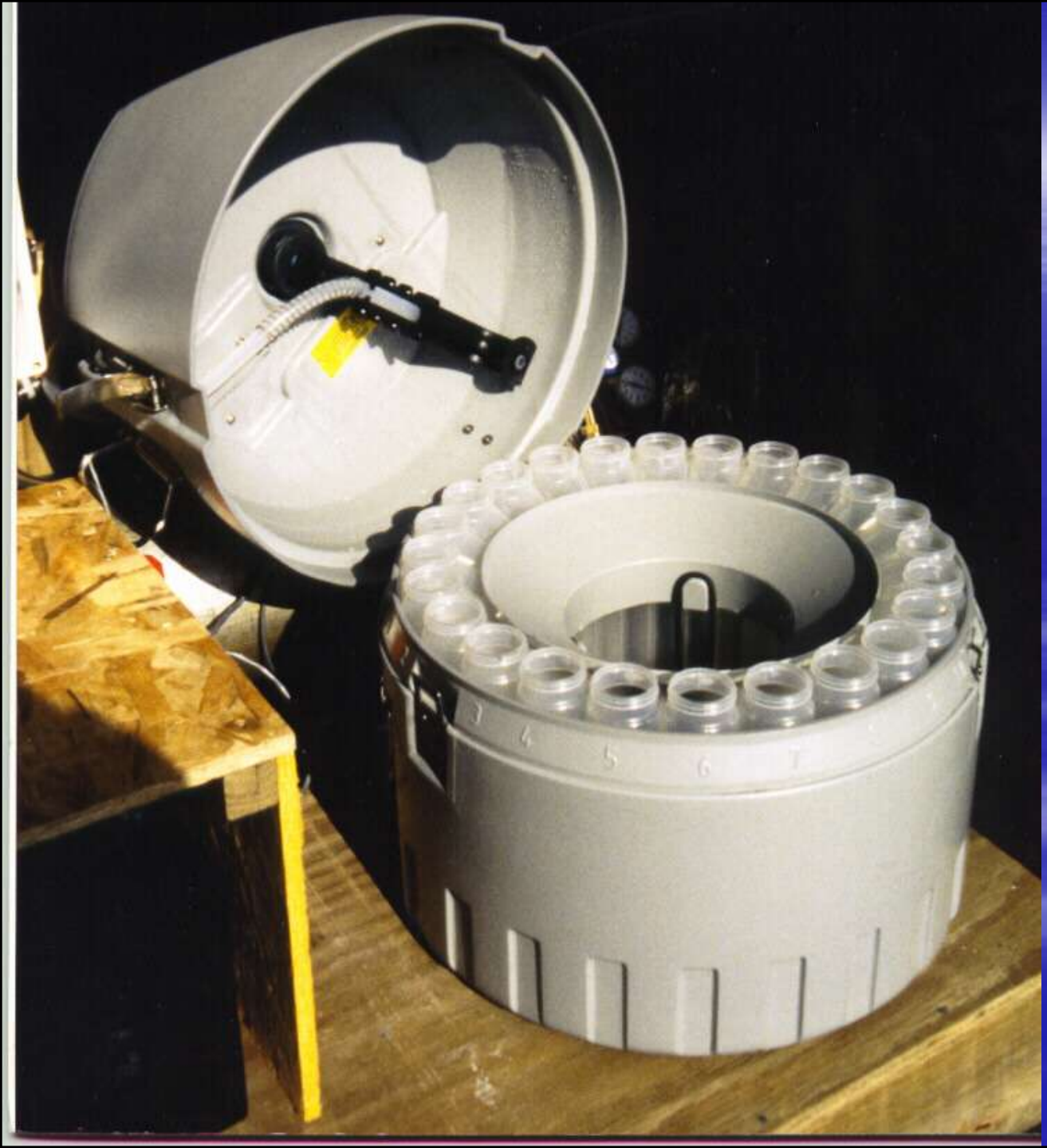
Willmar Study


WATERSHED
Obtained From
Minnesota Board of Water and
Soil Resources (BWSR) - 2006

West Pump Station
East Pump Station
Control Pump Station
Fahlun
Kandiyohi County
Key to Features
N

Study Area


CAMPBELL
SCIENTIFIC
INC.



Automated Sampler

Unfertilized Control

Unfertilized Control

Willmar Storm Water Drainage Ditch

Lake Wakonda

Turkey Manure Analysis (lbs/ton), Fall of '07- Gorans Farm, Willmar, MN

Total N	**Ammon Nitrate**		**Inorg. N**	**Org. N**	**Avail N**	**P_20_5**	**K_20**
43	14	1.0	15	27	24	26	20

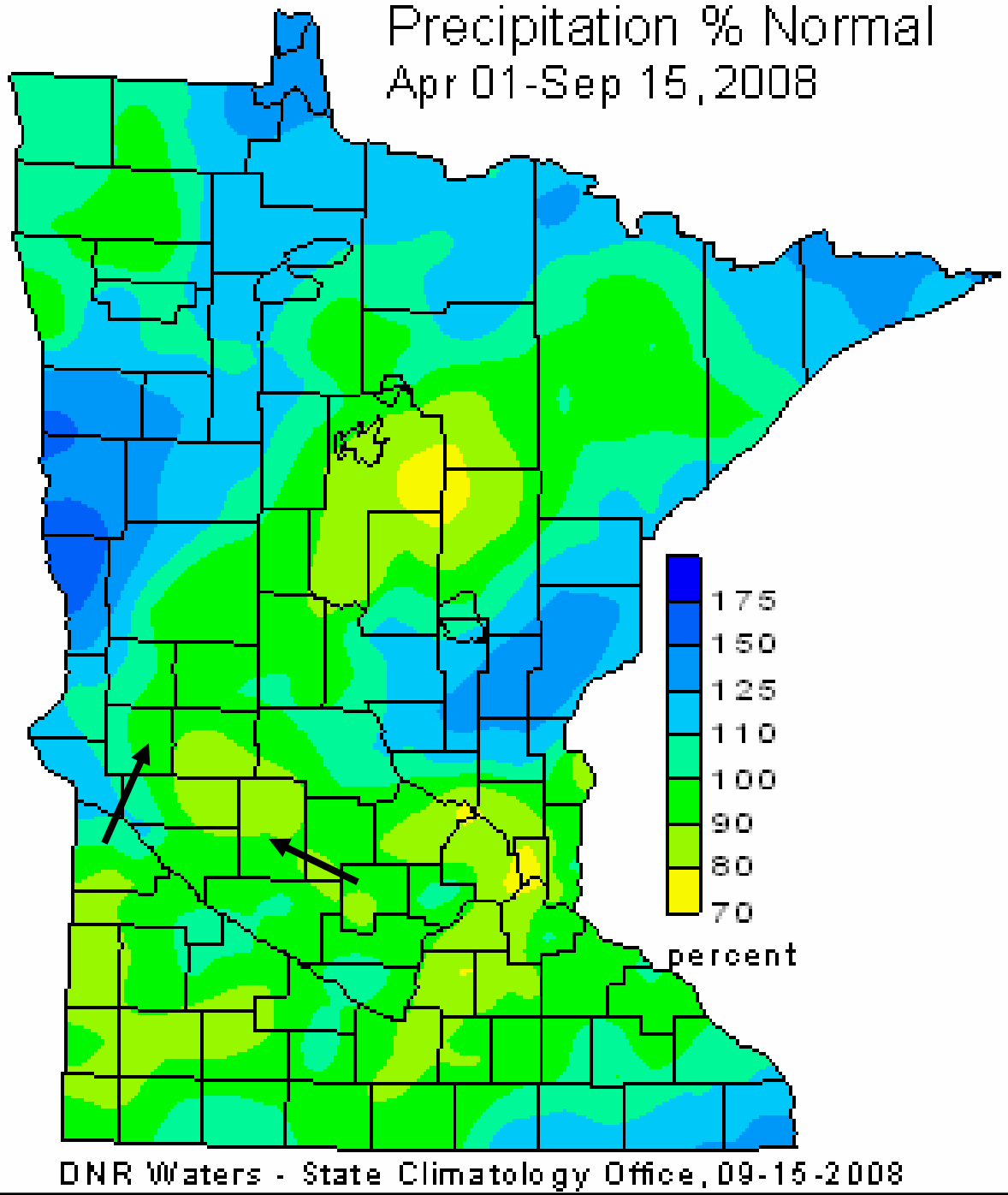
Turkey litter and anhydrous ammonia applied fall of 2007.

Turkey litter applied at 4.6 tons/acre resulting in (lbs/acre):

Avail N	P_20_5	K_2O	ZN	S
110	119	91	3	39

Soil Fertility Treatments Fall of 2007

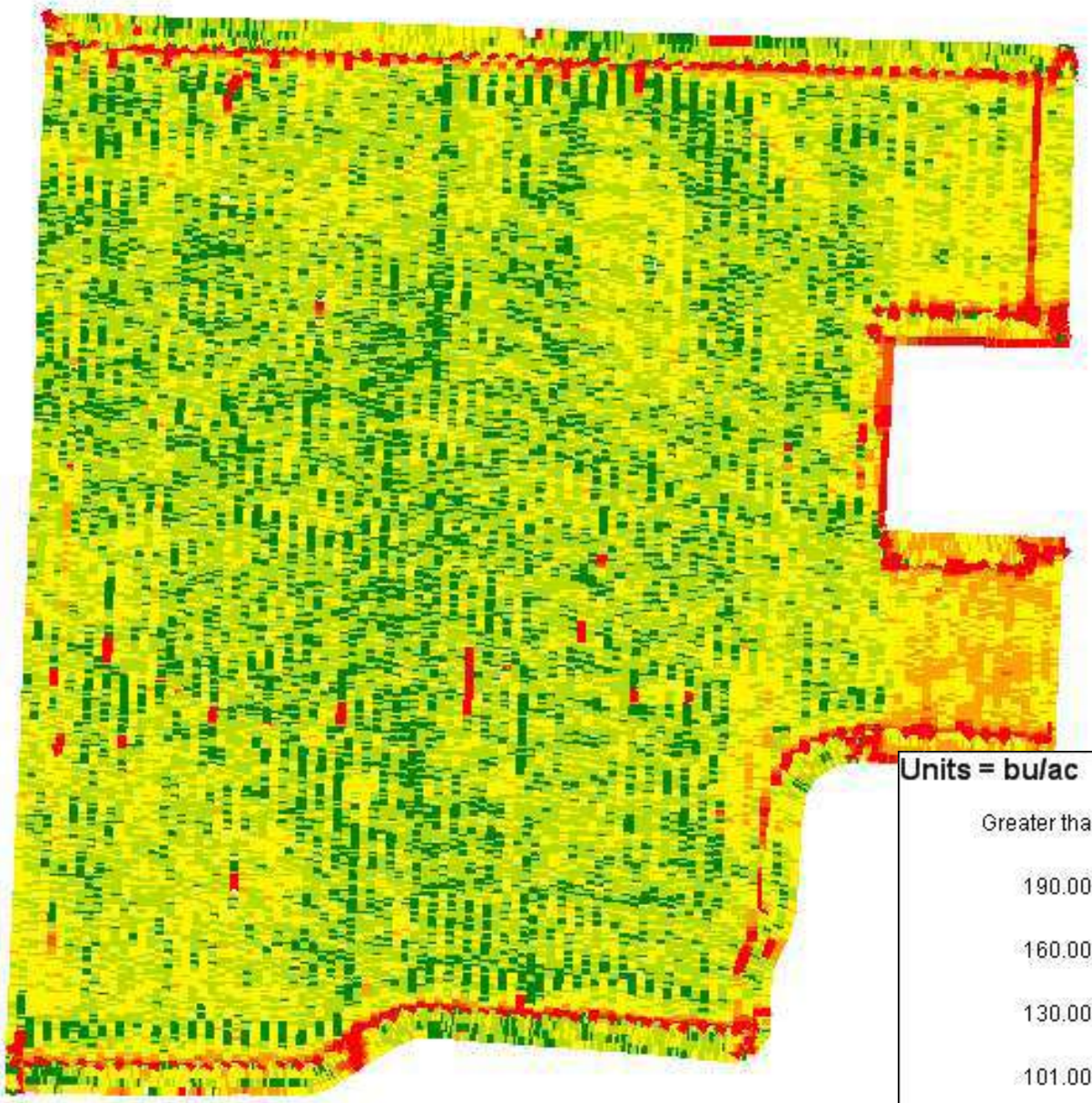
Field	**Date**
Turkey Litter (110 lbs available N/acre)	
Allan's 40	Sept. 22, 2007 Manure
M1B	Oct 11 2007 Manure
M2	Oct 11 2007 Manure
Anhydrous (110 lbs N/acre)	
M1A	Nov 5 2007 Anhydrous
M3	Nov 6 2007 Anhydrous

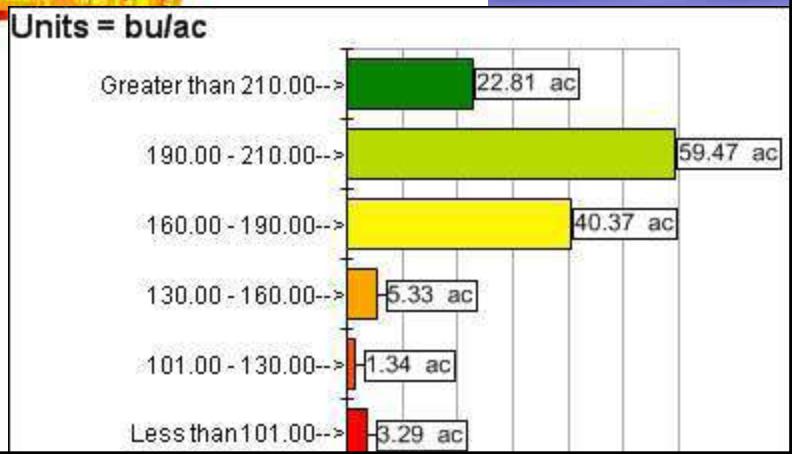


Precipitation in Study Area

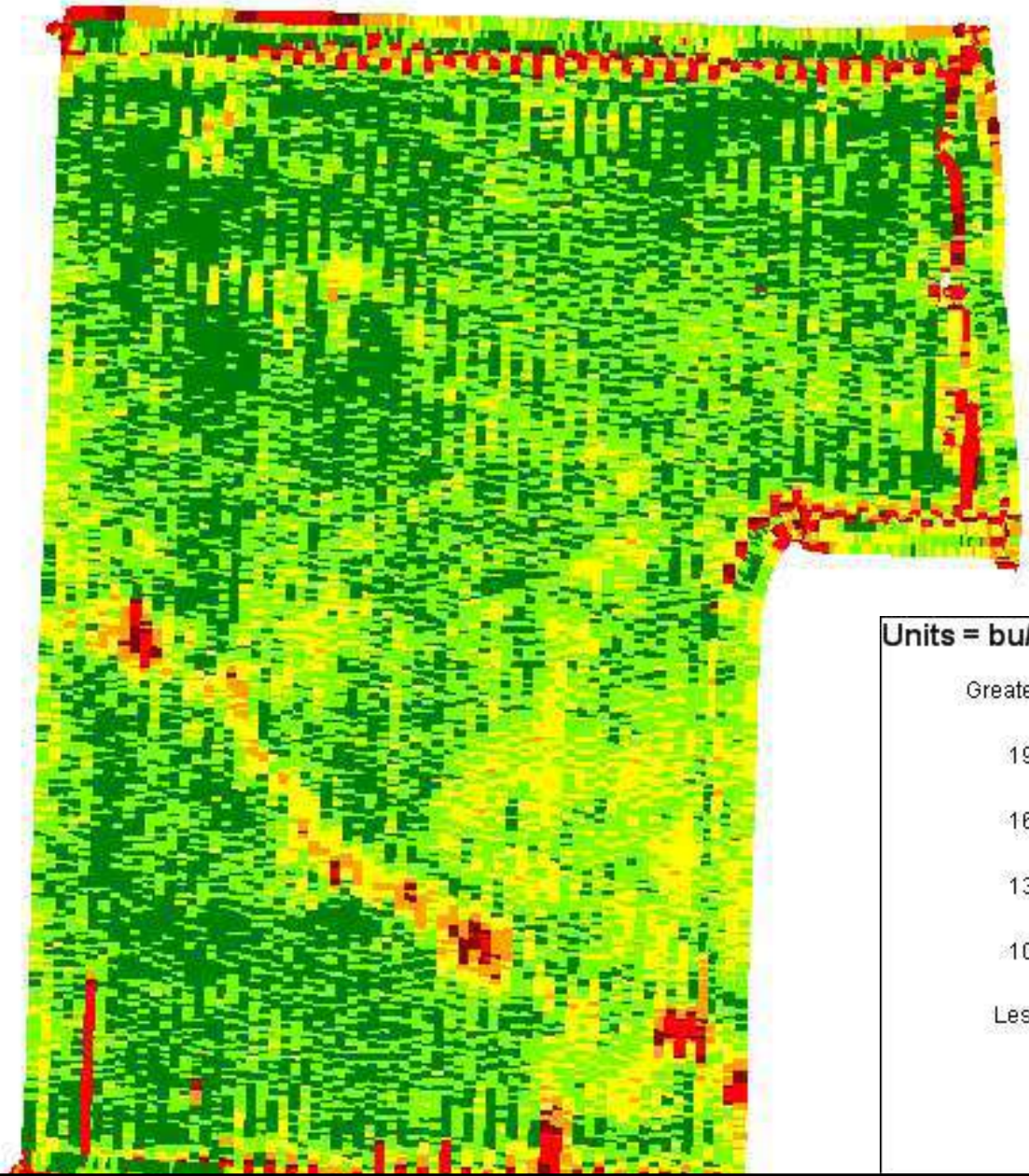
Crop Response

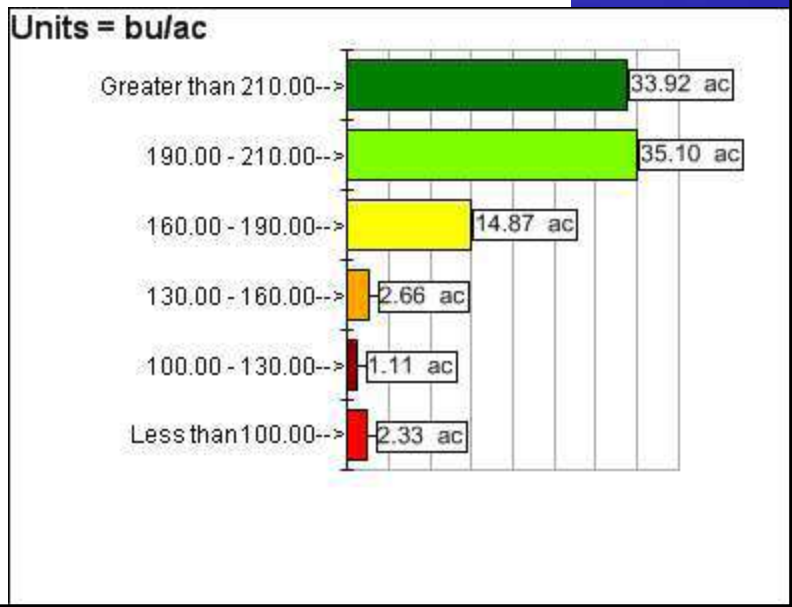
Corn yields; fertilizer and control fields, 2008



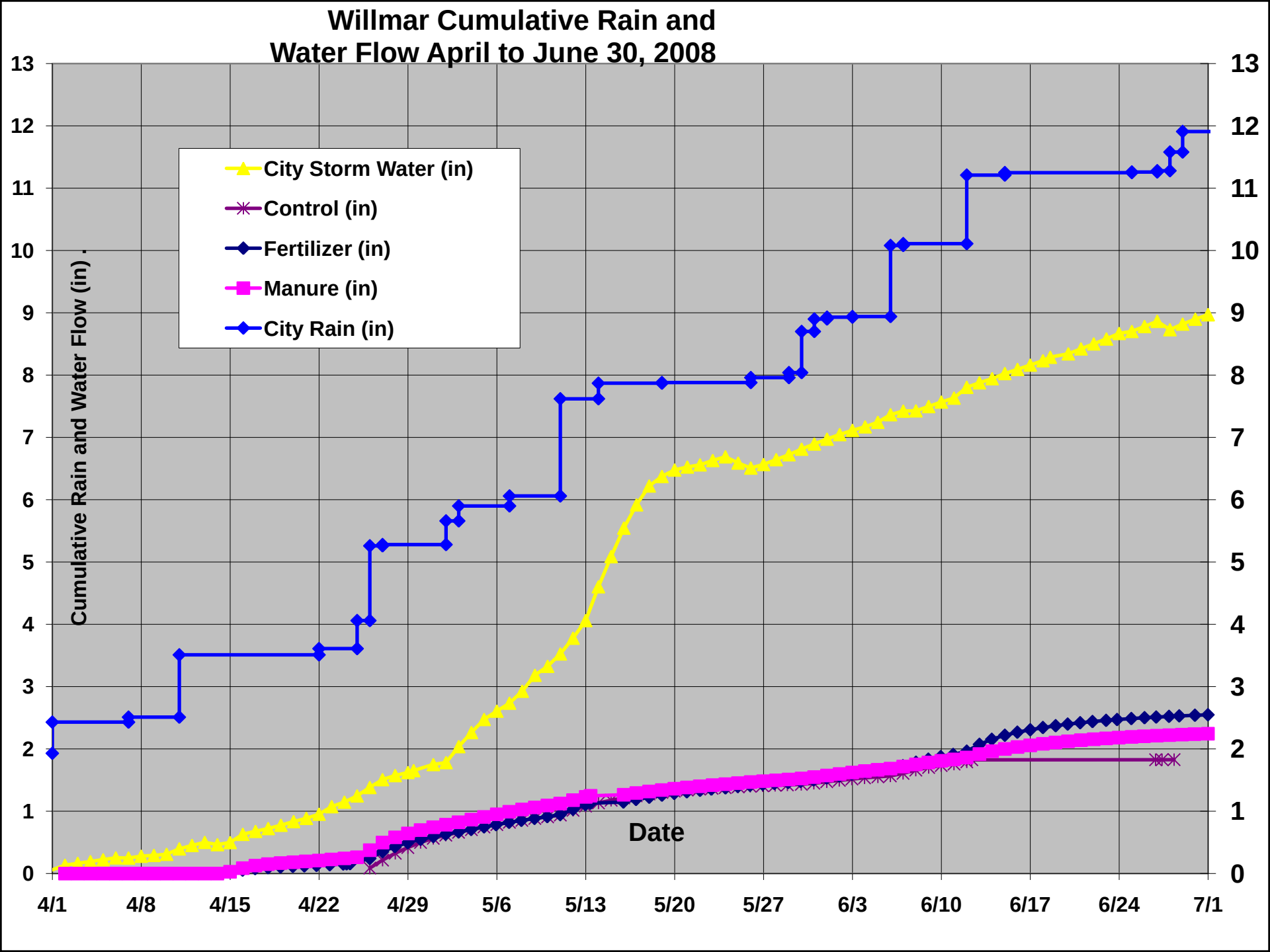


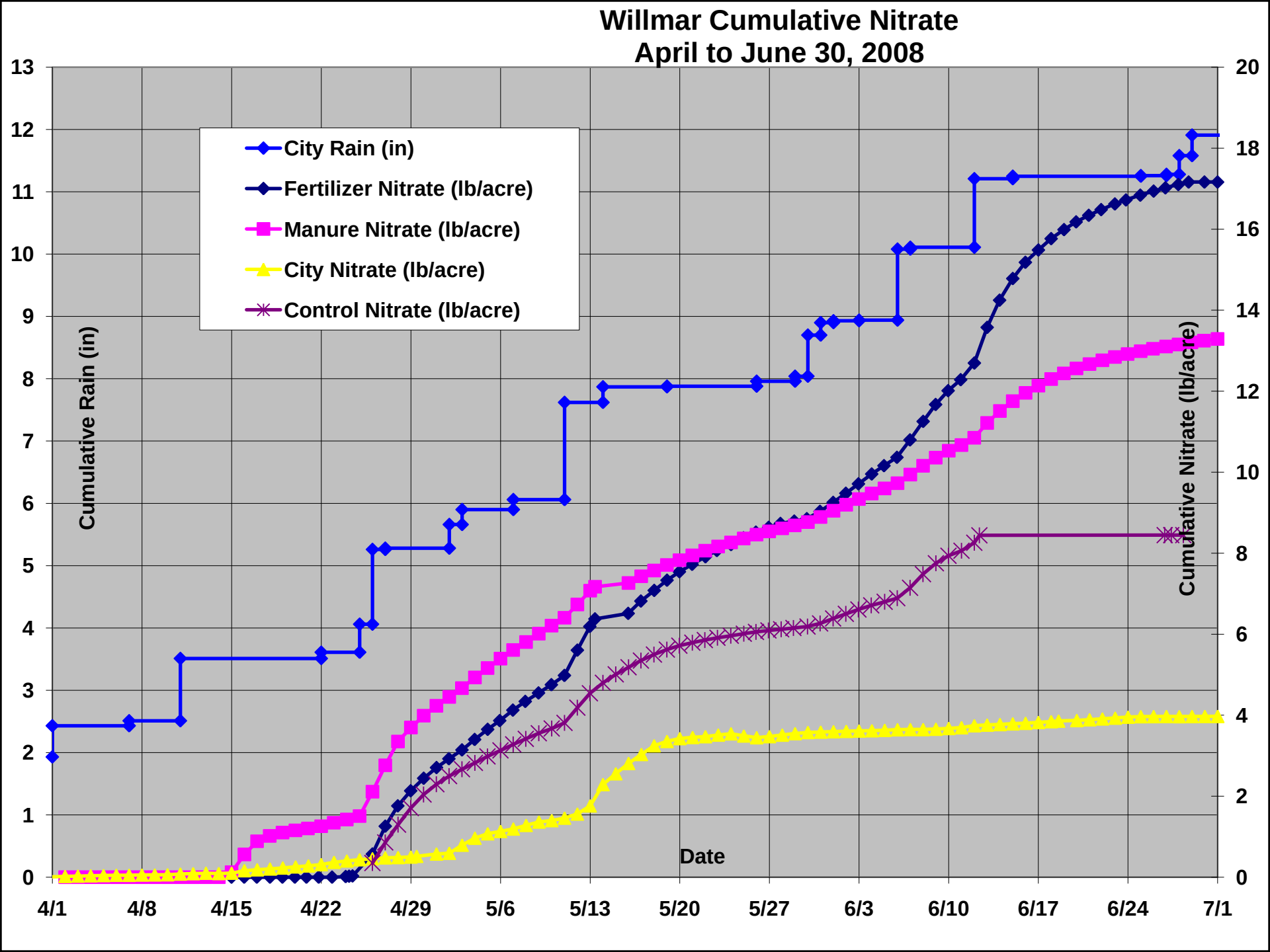
Corn yields; manure fields, 2008

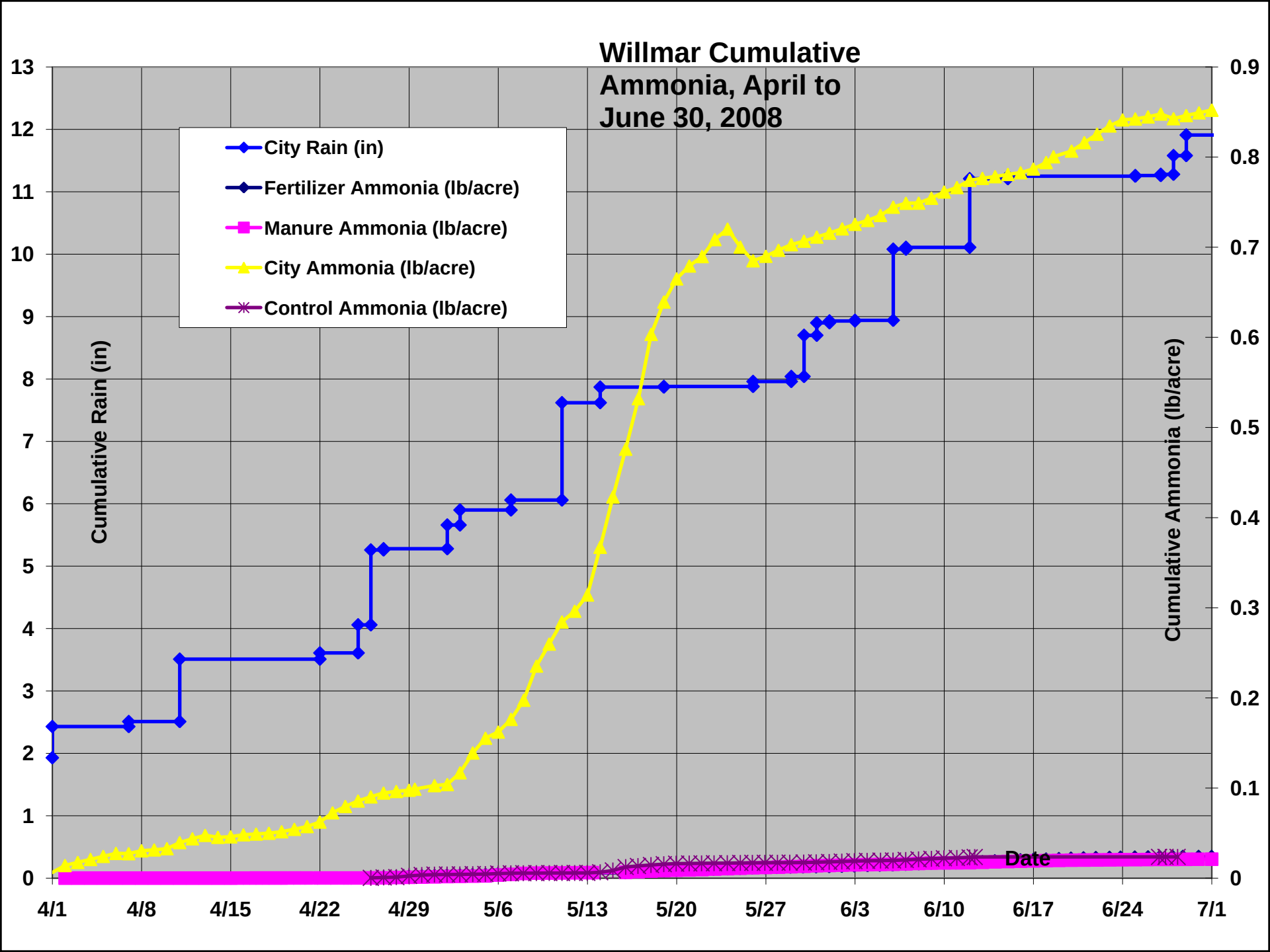


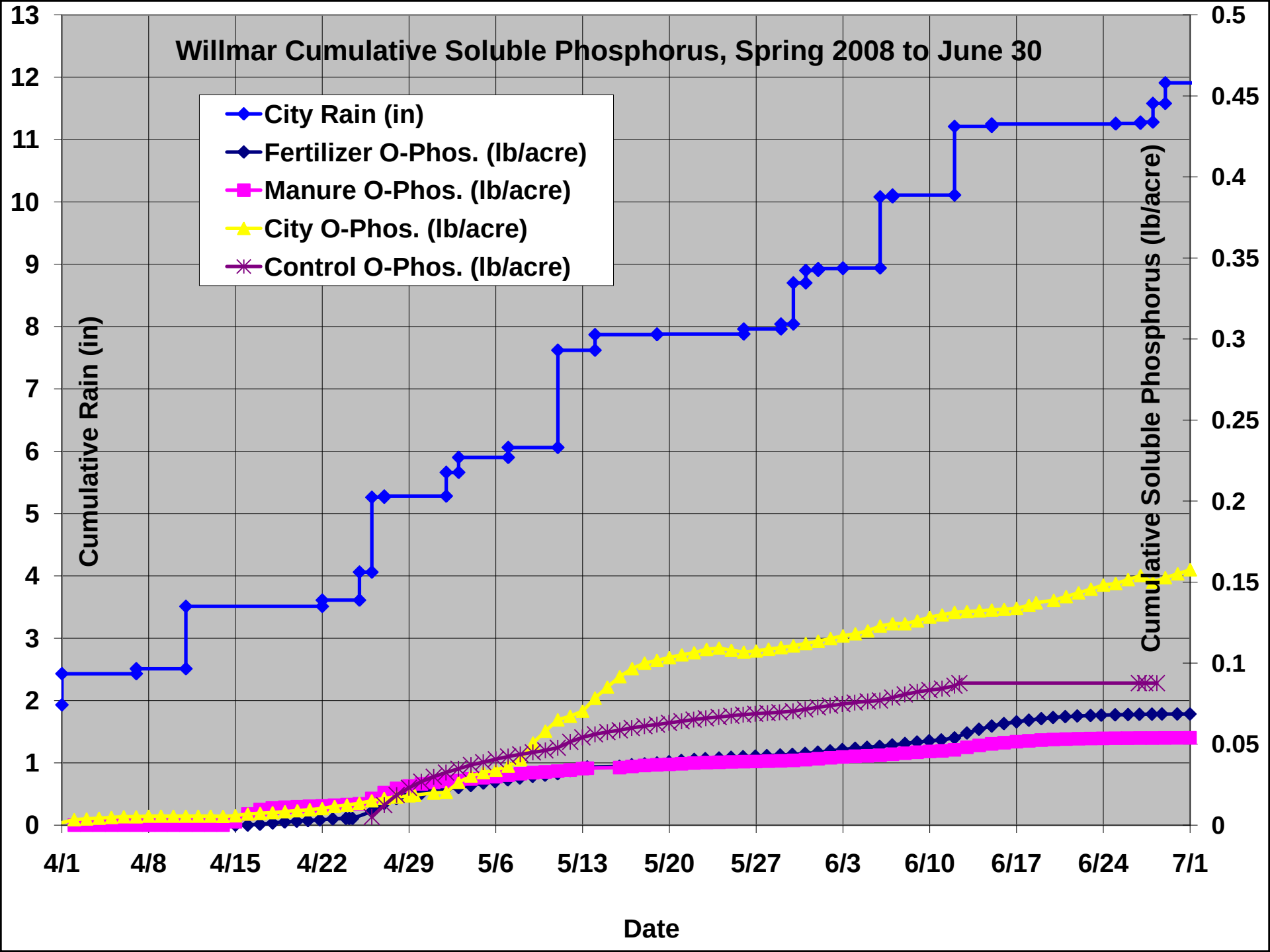


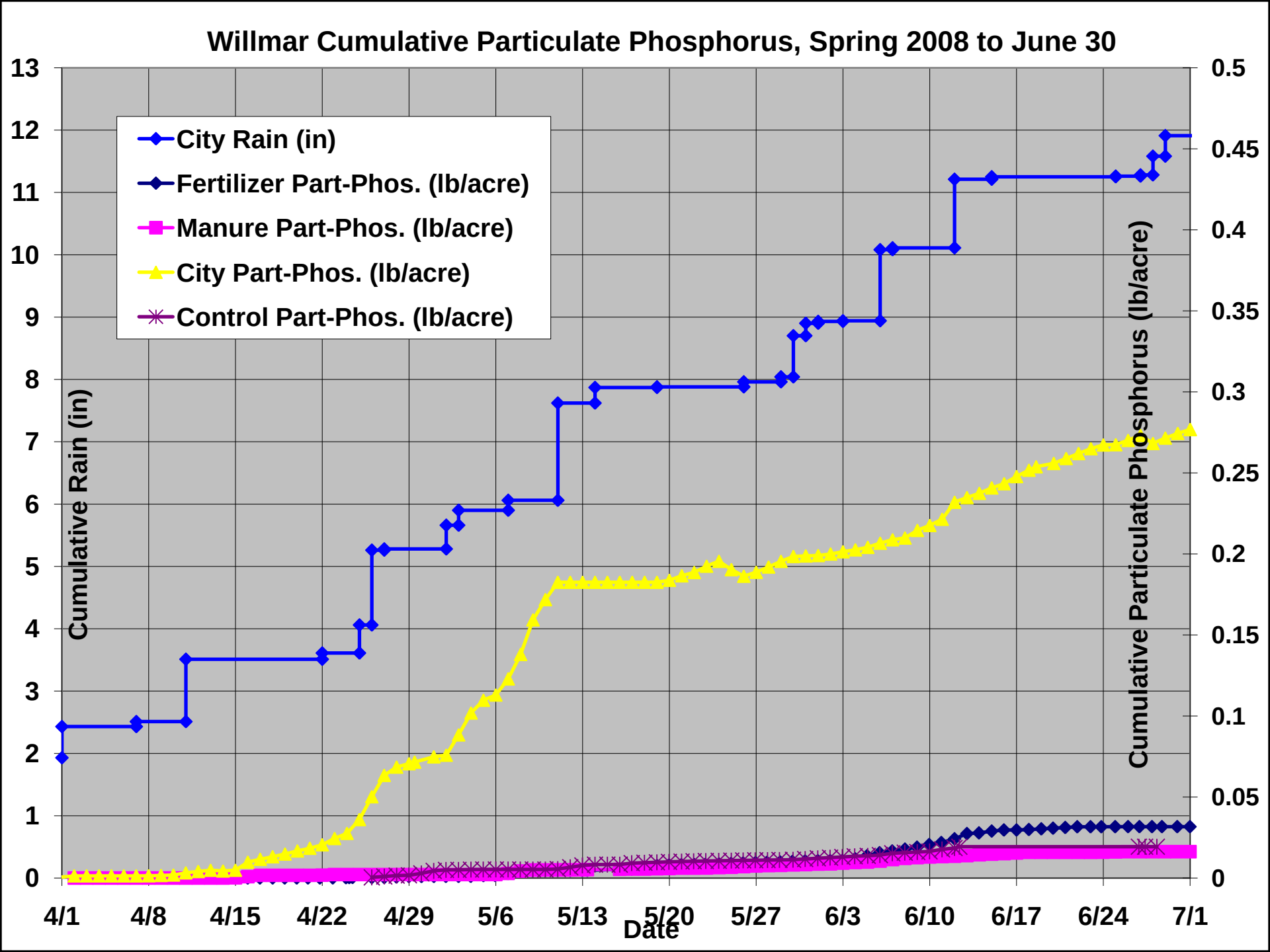
Water Quality

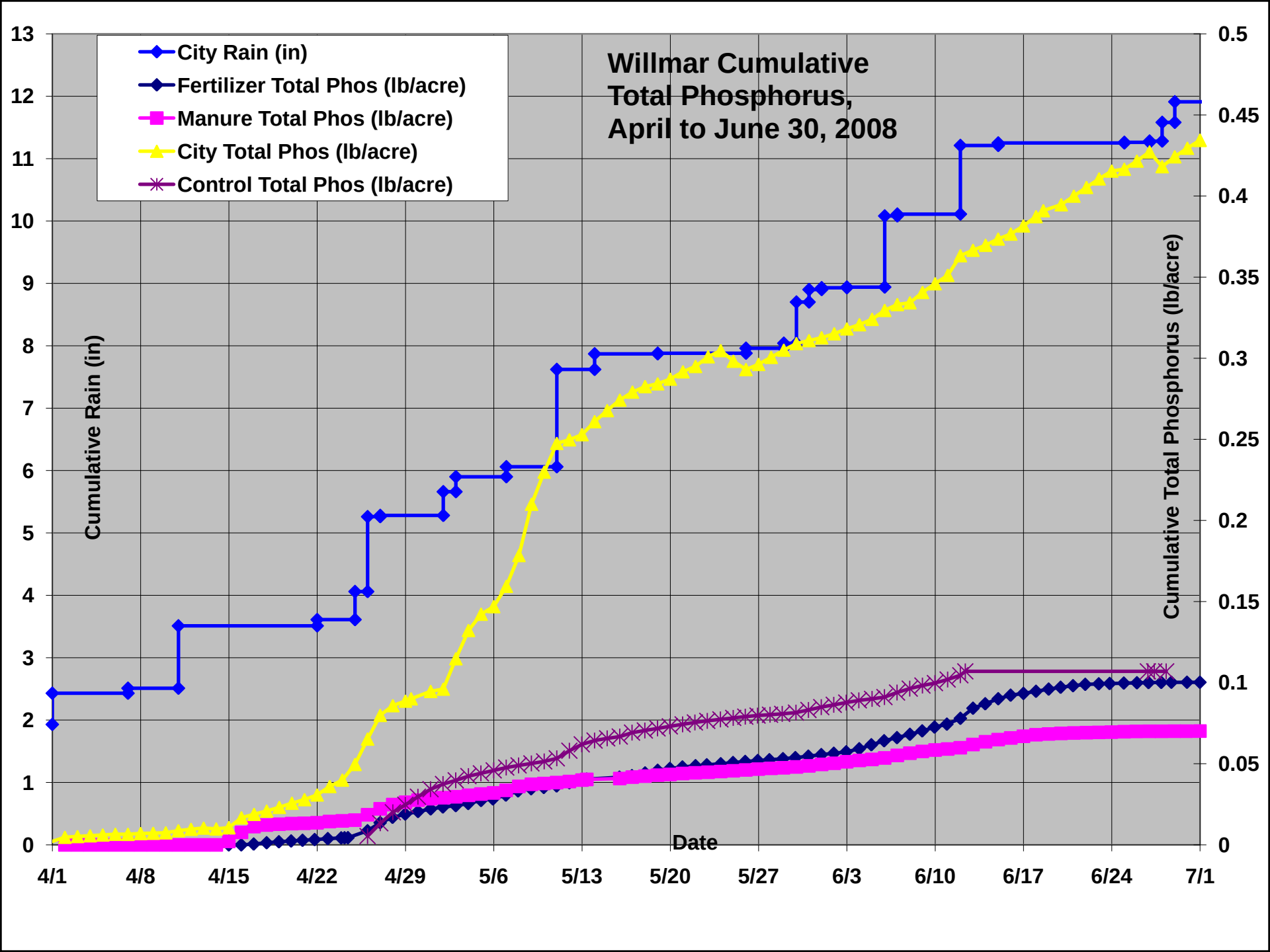

Willmar Cumulative Rain and
Water Flow April to June 30, 2008
City Storm Water (in)
Control (in)
Fertilizer (in)
Manure (in)
City Rain (in)
Cumulative Rain and Water Flow (in)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1

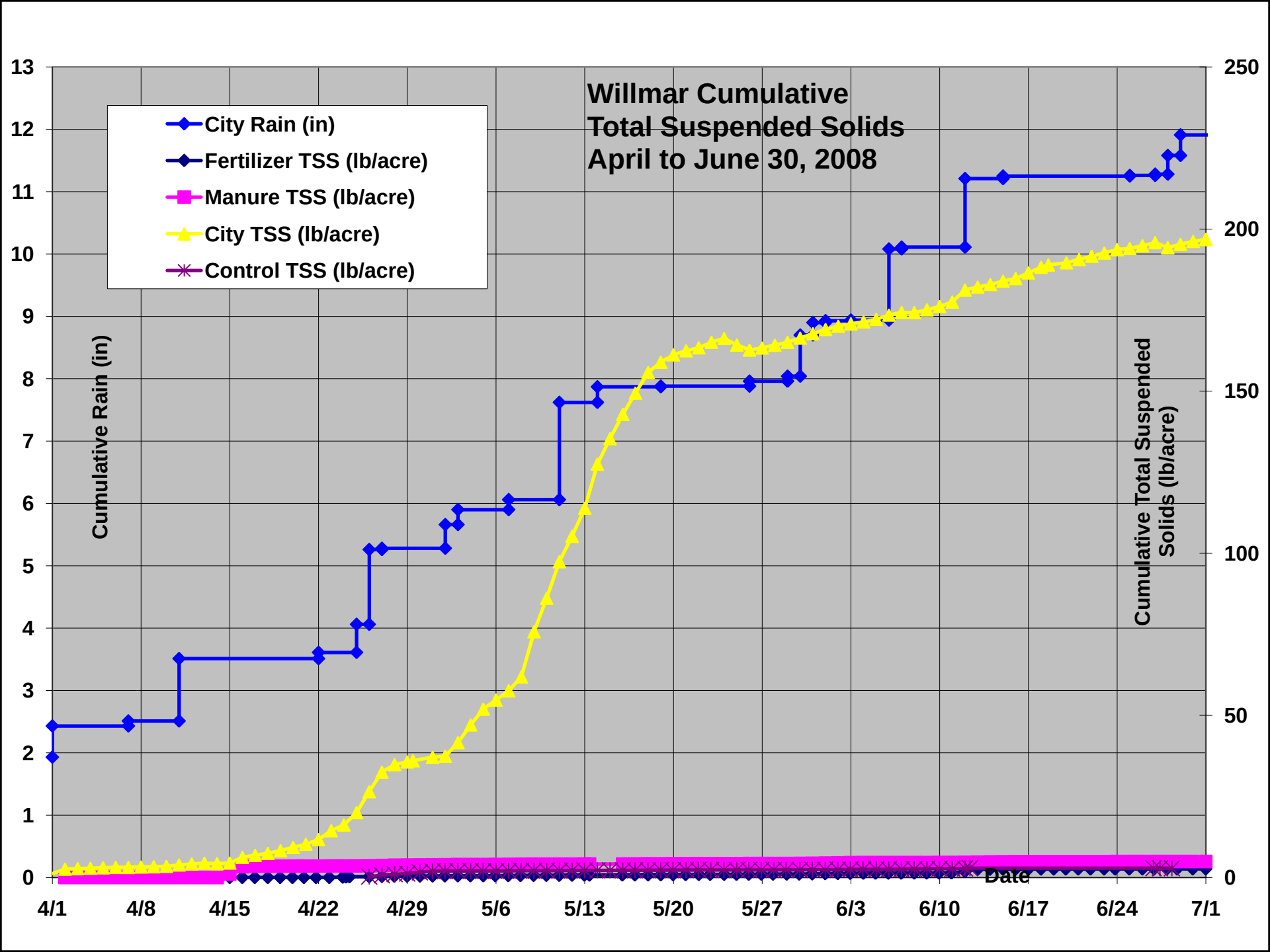

Willmar Cumulative Nitrate
April to June 30, 2008
City Rain (in)
Fertilizer Nitrate (lb/acre)
Manure Nitrate (lb/acre)
City Nitrate (lb/acre)
Control Nitrate (lb/acre)
Cumulative Rain (in)
Cumulative Nitrate (lb/acre)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
2
4
6
8
10
12
14
16
18
20
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1

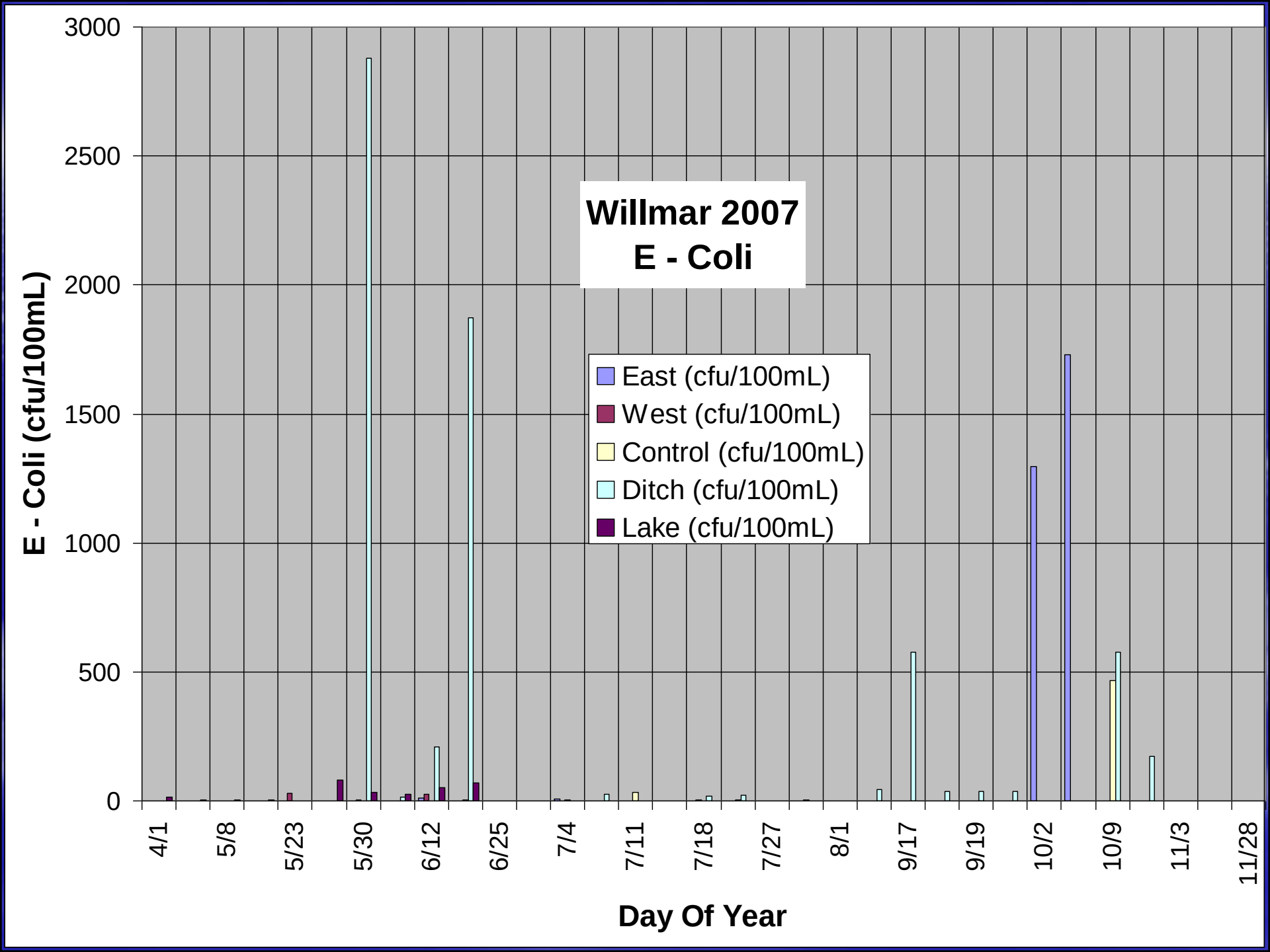

Willmar Cumulative Ammonia, April to June 30, 2008
City Rain (in)
Fertilizer Ammonia (lb/acre)
Manure Ammonia (lb/acre)
City Ammonia (lb/acre)
Control Ammonia (lb/acre)
Cumulative Rain (in)
Cumulative Ammonia (lb/acre)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1


Willmar Cumulative Soluble Phosphorus, Spring 2008 to June 30
City Rain (in)
Fertilizer O-Phos. (lb/acre)
Manure O-Phos. (lb/acre)
City O-Phos. (lb/acre)
Control O-Phos. (lb/acre)
Cumulative Rain (in)
Cumulative Soluble Phosphorus (lb/acre)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1


Willmar Cumulative Particulate Phosphorus, Spring 2008 to June 30
City Rain (in)
Fertilizer Part-Phos. (lb/acre)
Manure Part-Phos. (lb/acre)
City Part-Phos. (lb/acre)
Control Part-Phos. (lb/acre)
Cumulative Rain (in)
Cumulative Particulate Phosphorus (lb/acre)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1


Willmar Cumulative Total Phosphorus, April to June 30, 2008
City Rain (in)
Fertilizer Total Phos (lb/acre)
Manure Total Phos (lb/acre)
City Total Phos (lb/acre)
Control Total Phos (lb/acre)
Cumulative Rain (in)
Cumulative Total Phosphorus (lb/acre)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1


Willmar Cumulative
Total Suspended Solids
April to June 30, 2008
City Rain (in)
Fertilizer TSS (lb/acre)
Manure TSS (lb/acre)
City TSS (lb/acre)
Control TSS (lb/acre)
Cumulative Rain (in)
Cumulative Total Suspended Solids (lb/acre)
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0
50
100
150
200
250
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1


Willmar 2007
E - Coli
East (cfu/100mL)
West (cfu/100mL)
Control (cfu/100mL)
Ditch (cfu/100mL)
Lake (cfu/100mL)
E - Coli (cfu/100mL)
3000
2500
2000
1500
1000
500
0
4/1
5/8
5/23
5/30
6/12
6/25
7/4
7/11
7/18
7/27
8/1
9/17
9/19
10/2
10/9
11/3
11/28
Day Of Year

Summary

- Three farm fields with different soil fertility sources were established in the fall of 2007 (fertilizer, turkey manure, and an unamended control). Fields were instrumented to measure drainage water and water samples taken for contaminant determination.
- In addition, a drainage ditch that carries 60% of the storm water runoff from the city of Willmar was also monitored.

Summary

- During the growing season in 2008 there was four times more water lost in storm water than from farm fields.
- There was two to four times more nitrate lost from the farm fields than in storm water.
- Fertilizer N resulted in more nitrate loss than turkey manure.
- There was very little ammonium N lost from farm fields but a high amount from storm water.

Summary

- The total P loss was over four times higher from storm water compared to the fields.
- Sediment loss was also much higher in storm water than from the farm fields.
- City of Willmar had higher E Coli. concentrations (with the exception of shortly after manure application in the fall of 2007

Questions?