Managing Nutrients After a Drought

Wisconsin Crop Management Conference
Madison, WI
January 15, 2013

Carrie A.M. Laboski

DEPARTMENT OF SOIL SCIENCE
University of Wisconsin-Madison

UW Extension

Overview

- N
- P & K
- Fall 2012 soil sampling

Greatest likelihood of excess N

- 2012 corn crop was poor
- Manure applied since 2011
- 2011 crop was a forage legume
- If fall & winter precipitation is less than normal
- Not likely a problem if soybean was 2012 crop

Soil Nitrate Monitoring Network

http://uwlab.soils.wisc.edu/soilnitratemonitoring/

- Preplant Nitrate Test (PPNT)
  - 0-1’ + 1-2’ soil samples taken prior to planting corn
  - 50 lb N/a is considered background
  - N credit (lb N/a) = PPNT - 50

Contact & Location Information

University of Wisconsin-Madison
SOIL TESTING LABORATORIES

8452 Mineral Point Rd • Verona, WI 53593
P. 608-262-4364 • F. 608-833-1277
2611 Yellowstone Dr • Marshfield, WI 54449
P. 715-387-2523 • F. 715-387-1723

Soil Nitrate Monitoring Network

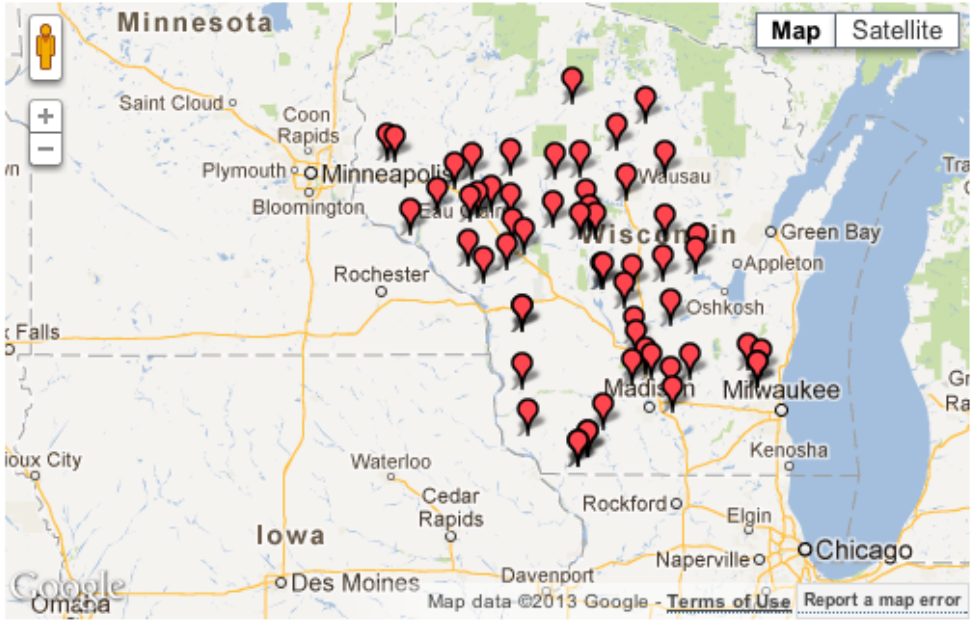
The soil nitrate monitoring network was set up to track fall and spring soil profile nitrate concentrations following the 2012 growing season.

Use the map and click the red map pins to discover the location information. Click the MapID in the pop-up box to see soil nitrate data for that location. To see data for up to two locations simultaneously, choose up to two locations in the select box (ctrl+click or cmd+click for two), and click the "Fetch Data" button below.

Approx. location

1. Arlington, Columbia cty
2. Sun Prairie, Dane cty
3. Waterloo, Dodge cty
4. Coloma, Adams cty
5. Grand Marsh, Adams cty
6. Marshfield, Wood cty
7. Neillsville, Clark cty
8. Owen, Clark cty
9. Dorchester, Clark cty
10. Hixton, Jackson cty
11. Black River Falls, Jackson ct
12. Melrose, Jackson cty
13. Merrill, Lincoln cty
14. Gleason, Lincoln cty
15. Abbotsford, Marathon cty
16. Mosinee, Marathon cty
17. Birnamwood, Marathon cty
18. Cary, Wood cty
19. Richfield , Wood cty
20. Hansen, Wood cty
21. Amherst, Portage cty

Fetch Data



Select one or two locations

"." = not applicable or no data provided.
* = 2012 precipitation from thaw to fall sampling.

Soil samples were collected by numerous UW-Extension and UW-Madison staff. This project was made possible by funding from the UW-Extension Ag and Natural Resources Program Area.

Data item	First location information	Second location information
Map ID	2	3
Town	Sun Prairie	Waterloo
County	Dane	Dodge
Soil series	Ringwood	Pella
Surface texture	silt loam	silty clay loam
2012 corn crop yield	96 bu/a	184 bu/a
Total fertilizer N rate applied	200 lb N/a	205 lb N/a
Type of manure applied	None	None
Rate of manure applied	.	.
Units for manure application	.	.
Precipitation 2012 season*	21.3	21.3
Irrigation 2012	.	.
Fall sampling date	11/13/12	11/13/12
0-1' lb N/a	17	148
1-2' lb N/a	128	74
2-3' lb N/a	40	20
0-2' lb N/a	144	221
0-3' lb N/a	184	242
Spring sampling date	.	
Precip between fall & spring	.	
0-1' lb N/a	.	
1-2' lb N/a	.	
2-3' lb N/a	.	

Spring samples will be collected

"." = not applicable or no data provided.
* = 2012 precipitation from thaw to fall sampling.

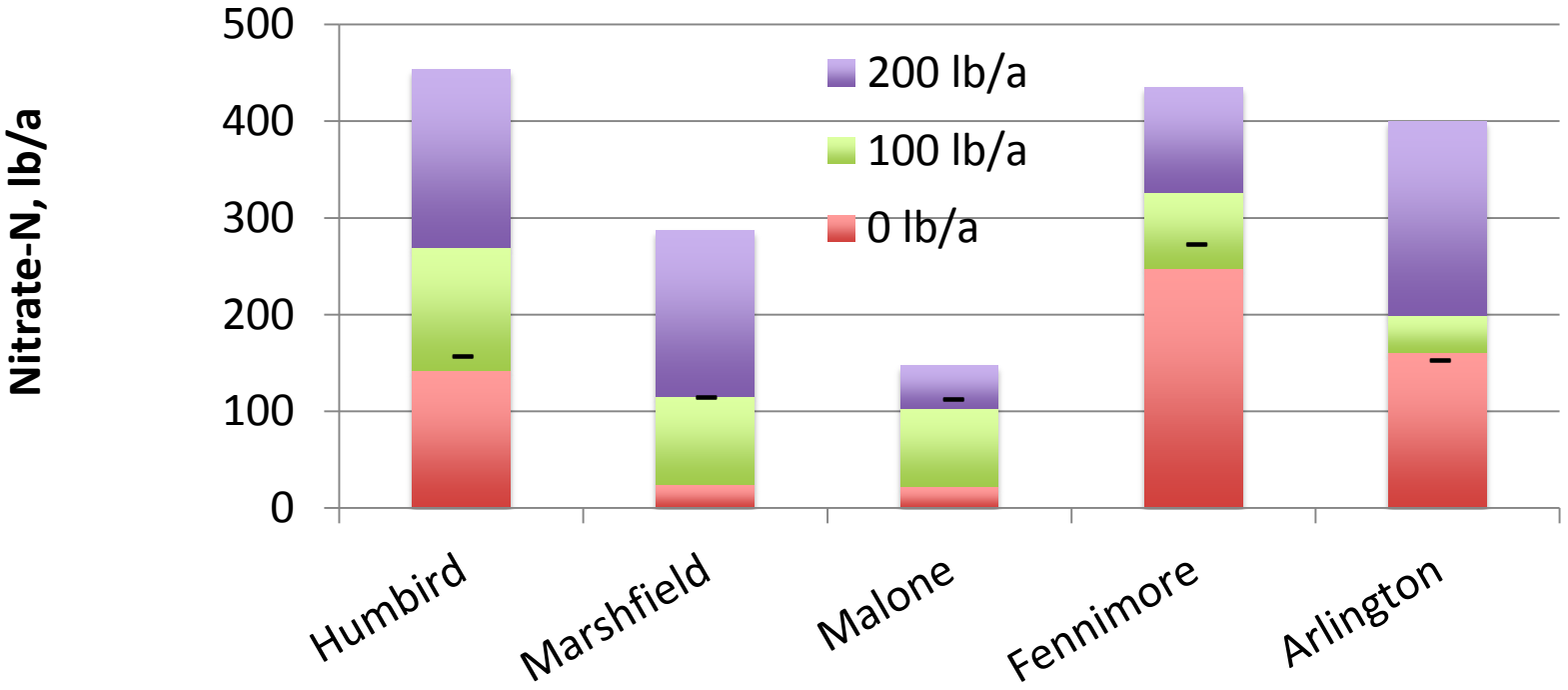
Soil samples were collected by numerous UW-Extension and UW-Madison staff. This project was made possible by funding from the UW-Extension Ag and Natural Resources Program Area.

Location ID	1	45	46	39
Town	Arlington	Arlington	Lewiston	Portage
County	Columbia	Columbia	Columbia	Columbia
Soil Series	Plano	Plano	Yahara	Ossian
Surface texture	silt loam	silt loam	fine sandy loam	silt loam
2012 Corn Crop Yield, bu/a	133	168	135	150
Total Fertilizer N applied, lb N/a	209	166	144	96
Type of manure applied	None	None	None	beef pack
Rate of Manure applied	.	.	.	20 T/a
Precipitation season	19.5	21.5	21.5	20.5
Irrigation	.	.	.	.
Sampling Date	11/13/12	11/14/12	11/14/12	11/1/12
0-1' lb N/a	83	23	29	170
1-2' lb N/a	86	26	28	35
2-3' lb N/a	5	.	.	.
0-2' lb N/a	169	50	56	204
0-3' lb N/a	174	.	.	.

Location ID	30	31	47	2	3
Town	Cottage Grove	Cottage Grove	Roxbury	Sun Prairie	Waterloo
County	Dane	Dane	Dane	Dane	Dodge
Soil Series	Plano	Salter	Seaton	Ringwood	Pella
Surface texture	silt loam	silt loam	silt loam	silt loam	silty clay loam
2012 Corn Crop Yield, bu/a	198	135	4 T DM/a	96	184
Total Fertilizer N applied, lb N/a	140	170	163	200	205
Type of manure applied	None	None	None	None	None
Rate of Manure applied	.	.	.	.	.
Precipitation season	19	19	11.6	21.3	21.3
Irrigation	.	.	.	.	.
Sampling Date	11/18/12	11/18/12	11/18/12	11/13/12	11/13/12
0-1' lb N/a	58	48	66	17	148
1-2' lb N/a	64	56	53	128	74
2-3' lb N/a	.	.	.	40	20
0-2' lb N/a	122	104	118	144	221
0-3' lb N/a	.	.	.	184	242

1988-89 Experience with Corn

Profile nitrate concentration in fall 1988 for 3 different preplant N rates applied to corn



Small yield responses to N at Marshfield & Malone (50-100 lb N/a)

1988-89 Experience with Corn

Spring 1989 preplant profile nitrate concentration and corn yield response to N

County	PPNT	Yield response
	lb N/a	
Clark	222	no
Wood	236	no
Monroe	98	no
Fond du Lac	164	yes ↓
Columbia	406	no
Grant	266	no
Dane	192	no

Adjusting Corn N Rates

1. Take a PPNT and subtract N credits from top end of MRTN range
2. Use the low end of the MRTN range
3. Estimate a N credit by:

   (total N in 2012 – actual grain yield) ÷ 2

Take Credit for Unused P & K

$$\text{Credits} = \text{2012 fertilizer applied} - \left[\frac{\text{yield achieved}}{\text{expected yield}} \times \text{2012 fertilizer applied} \right]$$

Example K_2O credit

- Expected 2012 corn yield used to determine fertilizer rates was 200 bu/a
- K fertilizer application rate was 250 lb K_2O/a
- Actual corn yield was 120 bu/a

$$K_2O \text{ credit} = 250 - \left[\frac{120}{200} \times 250 \right] = 100 \text{ lb } K_2O/a$$

Fall Soil Sampling

- Sampling very dry soil may provide erroneous soil test results for several reasons:
  - Difficult to sample to the desired depth consistently
  - Soil core does not stay intact
    - Particularly very dry surface soil
    - Some soil lost between taking the probe out of the ground and placing the sample in the bucket
  - Soil test P and K may be lower
    - Smaller differences for P
    - Larger differences for K
  - pH may be slightly lower because of salt build up with lack of rain

How soon after rain can I sample?

- Once rainfall has occurred, soils will begin to re-equilibrate and the effects of dry conditions on soil test P, K and pH will diminish
- Difficult to predict exact amount of rain needed
  - Depends on how dry the soil was, soil mineralogy, and likely other site specific conditions
- If soil is moist enough to push a probe into the ground to the desired sampling depth consistently, it is likely that the soil has re-equilibrated
- Given all of the above, soil test results, especially K, might be off

Summary

- Consider taking a PPNT in spring if growing corn and corn was the 2012 crop
- If 2012 yield levels were substantially different than expected at planting, consider taking P & K credits
- If fall 2012 soil test results seem really off, consider sampling
  - in spring to make adjustments for 2013
  - Or next fall to better plan for 2014

Thank You !

- Thanks to everyone who collected soil samples!!

Carrie Laboski
Extension Soil Fertility/
Nutrient Management Specialist
608-263-2795
laboski@wisc.edu
http://www.NPKetc.info
http://www.soils.wisc.edu/extension/