

*2007 Statewide
Survey of
Agricultural
Chemicals in
Wisconsin
Groundwater*

WISCONSIN GROUNDWATER QUALITY
AGRICULTURAL CHEMICALS IN WISCONSIN GROUNDWATER



APRIL 2008

Introduction

- Joint project with DATCP, NASS and DHS
- Previous statewide groundwater surveys in 1994, 1996, and 2001

Objectives

- Obtain a current picture of agricultural chemicals in Wisconsin's groundwater
- Relate groundwater quality to land use
- Compare levels of agricultural chemicals in groundwater in 2007 to previous statewide surveys

Study Design

- Sampled groundwater in Wisconsin using private water supply wells
- Collected 398 water samples
- Stratified random sampling design based on cultivated land categories

Cultivated Land Categories and Well Locations

● well sampled in 2001 and 2007

● well sampled in 2007

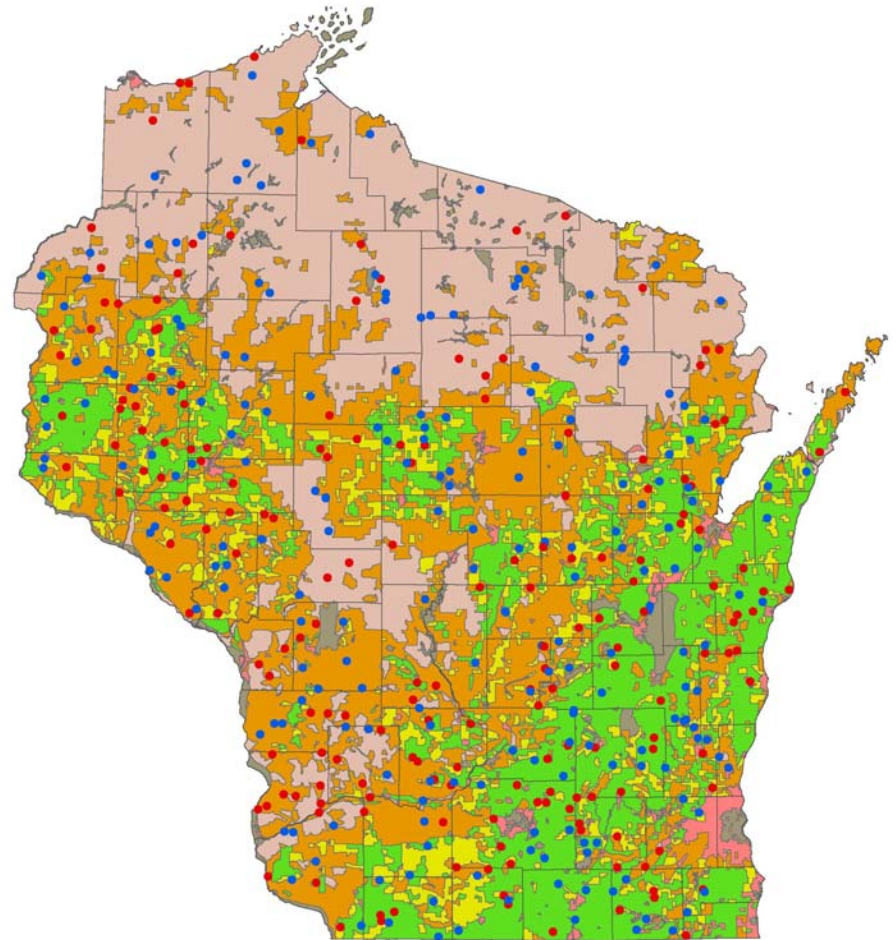
■ >75% cultivated

■ 51-75% cultivated

■ 15-50% cultivated

■ <15% cultivated

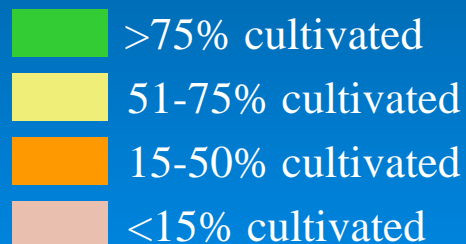
Sampling Locations for the 2007 Survey



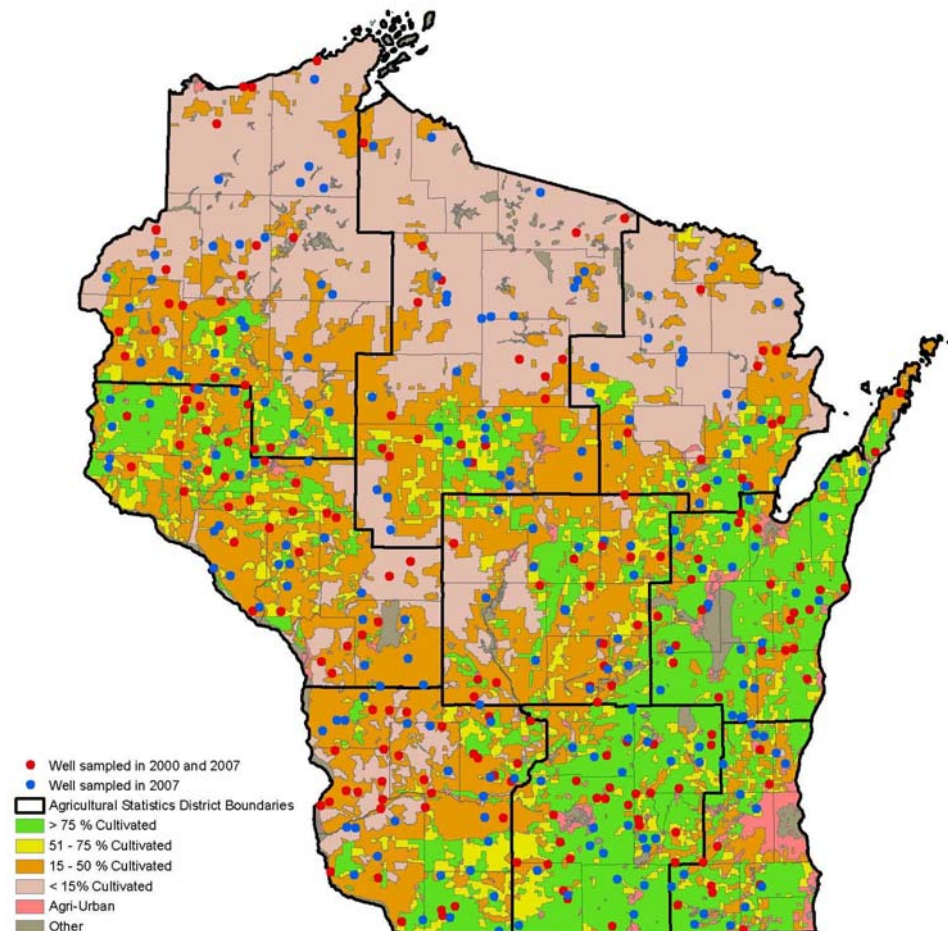
Cultivated Land Categories and Well Locations

● well sampled in 2001 and 2007

● well sampled in 2007



Sampling Locations for the 2007 Survey



Laboratory Sample Analysis

- Each sample analyzed for 32 compounds
 - 16 herbicide active ingredients
 - 14 herbicide metabolites
 - 1 insecticide active ingredient
 - nitrate-N
- 2007 survey included 15 new herbicides and herbicide metabolites compared to previous surveys
- 16 of 32 compounds have a groundwater standard



2007 Survey Results

- Number of wells with detects
- Estimates of statewide proportion of detects
- Estimates of Mean Concentrations
- Geographic distribution of results



Results of the 2007 Survey for the Most Frequently Detected Compounds

(398 wells sampled)

Compound	Number of Wells with Detects	Concentration Range (ug/l)	Groundwater Enforcement Standard (ug/l)	Number of Wells above Standard
Any Pesticide	158			
Atrazine TCR	55	0.16-3.7	3.0	2
Alachlor ESA	100	0.14-8.4	20	
Metolachlor ESA	106	0.14-6.5		
Nitrate-N	234	0.52-81*	10*	47

* mg/l

Ag Chemicals Detected Most Frequently in the 2007 Survey

- nitrate-N
- metolachlor ESA*
- alachlor ESA
- atrazine and its metabolites

* this compound does not have a groundwater standard

Statewide Estimates of the Proportion of Detections for Selected Compounds

Compound	Proportion Estimate (%)	95% CI (%)
Any pesticide	33.5	28.6-38.3
Alachlor ESA	21.6	17.2-26.0
Metolachlor ESA	21.6	17.7-25.6
Atrazine TCR	11.7	8.5-14.8
Nitrate-N	56.0	50.3-61.7

Statewide Estimates of the Proportion of Detections that Exceeded an Enforcement Standard

Compound	Proportion Estimate (%)	95% CI (%)
Atrazine TCR>3ug/l	0.4	*
Nitrate-N>10 mg/l	9.0	6.5-11.6

* not enough data points to calculate a confidence interval

Percentage of Detects by Strata for Selected Compounds

Strata Description	Percentage of Detects			
	Atrazine TCR	Alachlor ESA	Metolachlor ESA	Nitrate-N > 10 mg/l
> 75% cultivated	17	36	46	21
51-75% cultivated	20	28	22	10
15-50% cultivated	13	20	18	8.6
<15% cultivated	5.1	12	10	1.7

Estimates of Mean Concentration of Detects for Selected Compounds

Compound	Concentration Estimate (ug/l)	95% CI (ug/l)
Atrazine TCR	0.67	0.12-1.21
Atrazine parent	0.22	0.13-0.32
Alachlor ESA	1.00	0.53-1.48
Metolachlor ESA	0.47	0.29-0.65
Nitrate-N*	5.64	4.83-6.46

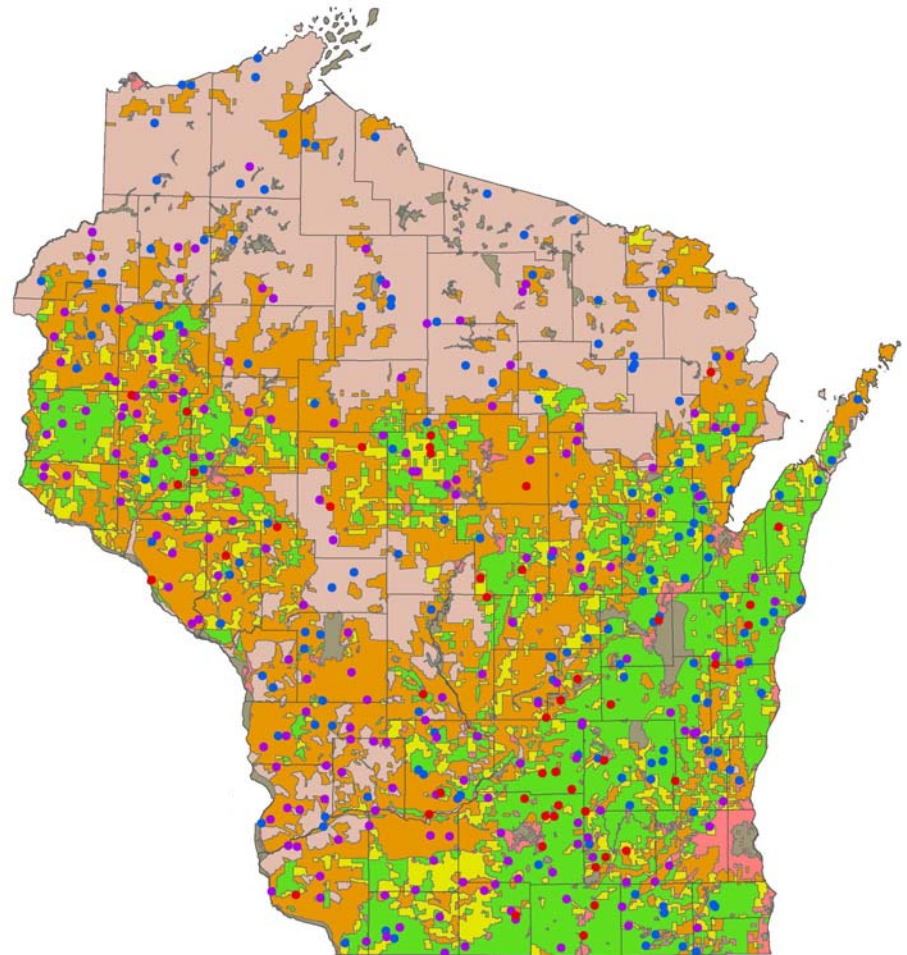
* nitrate-N values are in mg/l

Nitrate-N Results from the 2007 Survey

- No Nitrate-N detected
- Nitrate-N detected < 10 mg/l
- Nitrate-N detected > 10 mg/l

- >75% cultivated
- 51-75% cultivated
- 15-50% cultivated
- <15% cultivated

Nitrate-Nitrogen Results from the 2007 Survey




“New” Pesticides Detected in the 2007 Survey

- bentazon* (Basagran) (2 wells)
- 2,4-D* (2 wells)
- clopyralid (Curtail) (1 well)
- dimethanamid ESA (Frontier) (1 well)

* these compounds have a groundwater standard

How do we use the results?

- Prioritize ARM Division program activities
 - Assess need for groundwater protection actions
 - Prioritize compounds for groundwater standards development
 - Provide information to the public and other agencies
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http://www.datcp.state.wi.us/arm/agriculture/land-water/envIRON_quality/pdf/ARMPub180.pdf

Jeff.Postle@Wisconsin.gov

(608) 224-4503

