Wisconsin Department of Agriculture, Trade and Consumer Protection
Agricultural Resource Management Division
Environmental Quality Unit

Targeted Sampling Summary Report, 2019

Background

Wisconsin's groundwater law, chapter 160, Wis. Stats., requires agencies to sample and monitor groundwater for substances related to facilities, activities and practices under their jurisdiction, that have a reasonable probability of entering the groundwater resources of the state, and to determine if preventive action limits or enforcement standards have been exceeded at points of standards application. The statute further specifies that agencies develop monitoring plans that include provisions for conducting four types of monitoring: problem assessment, regulatory, at-risk and management practice monitoring (§160.27; §160.05).

Purpose of Targeted Sampling

It is estimated that agriculture contributes $105-billion annually[1] to Wisconsin's economy. Growers use millions of pounds of pesticides, and millions of tons of fertilizers annually to grow a wide variety of crops. DATCP's Targeted Sampling Program (TSAMP) is one type of monitoring the agency performs to meet its statutory obligation to protect groundwater. The agency utilizes a targeted approach to select drinking water wells that are at risk of being impacted by agricultural chemicals. The program tests private wells located within or near agricultural areas for pesticides and nitrate-nitrogen (nitrate).

Program Approach and Selection Criteria

The potential for agricultural chemicals to influence groundwater at any particular location is dependent on conditions at each location. Criteria used to select study areas for TSAMP testing focus on those conditions that make groundwater prone to contamination. These criteria vary from year to year and between study areas. Criteria that have been used for study area selection are listed below.

- Areas susceptible to groundwater contamination due to geology (i.e. sandy soils with shallow groundwater, shallow depth to bedrock, or karst features).
- Areas where prior testing by others (county government, university, private owner, etc.) indicates elevated nitrate, pesticides or other unusual test results.
- Areas within or near an existing atrazine prohibition area (PA), or areas where other restrictions on pesticide use has occurred out of concern for groundwater protection.
- Areas with little variation in crop rotation (e.g. corn, cranberry, and ginseng grown year after year) increasing the likelihood of repetitive pesticide-use in the area.
- Areas where crops are grown that require extensive chemical or fertilizer inputs and/or irrigation.
- Areas where pesticides with characteristics of high mobility and resistance to degradation are used.

[1] https://datcp.wi.gov/Pages/Publications/WIAgStatistics.aspx

TSAMP planning was performed early in the year so that sample collection could occur during the summer months. Planning starts with staff and management agreeing on the number of samples to be collected for the coming year. Generally, 50-percent of the wells sampled each year are new to the program, and the remaining wells are repeat samples from a prior year. Repeat testing is performed at wells previously sampled five or more years ago. Using this approach water quality observations can be made for each area, and water quality trends over time can also be observed. Permission to sample is typically obtained in advance, but staff may also seek permission from other private wells owners while in the area based on observations made the day of sampling.

Another goal of TSAMP is to select wells that have known well construction information. Well construction information (well depth, casing depth, well age, geologic formation, or other construction characteristics) can then be viewed along with water quality observations. For example, for a given area, comparisons might be drawn between wells that are 80 to 100 feet deep, versus wells that are shallower. Likewise, wells that are cased to the bedrock surface may be compared to wells cased at greater depth into bedrock.

Samples are collected using standard sampling protocols and then hand delivered to the DATCP Bureau of Laboratory Services (BLS) for pesticide and nitrate analyses. Homeowners are provided a copy of their analytical results within 10-days receipt of the data from BLS. Staff provide assistance interpreting results and resolving water contamination issues that are found.

2019 Program Specifics

During annual program planning, staff coordinated testing with BLS for analysis of 100 samples for 2019. Approximately half of the samples were collected from wells in new areas (areas not sampled in prior years) and half were collected from wells tested in 2014. Between June and August, staff collected a total of 105 samples from agricultural areas in 11 counties. Forty-six samples were collected from locations that were previously sampled in 2014, while 59 were collected from locations sampled for the first time. Figure 1 shows private well locations sampled in 2019. Figure 2 shows all TSAMP wells sampled since 2010. Table 1 lists criteria used to select areas tested in 2019 and shows the number of samples collected from each area.

Analytical Testing and Groundwater Standards

BLS performed all groundwater analytical testing using GC/MS/MS and LC/MS/MS in accordance with ISO 17025 accreditation standards. All samples were tested for 105 pesticides and nitrate. A full listing of compounds analyzed is included in Appendix A along with established and proposed Preventive Action Limits (PALs) and Enforcement Standards (ESs) for each compound (ch. NR 140, Wis. Adm. Code).

Figure 1: 2019 TSAMP Well Locations

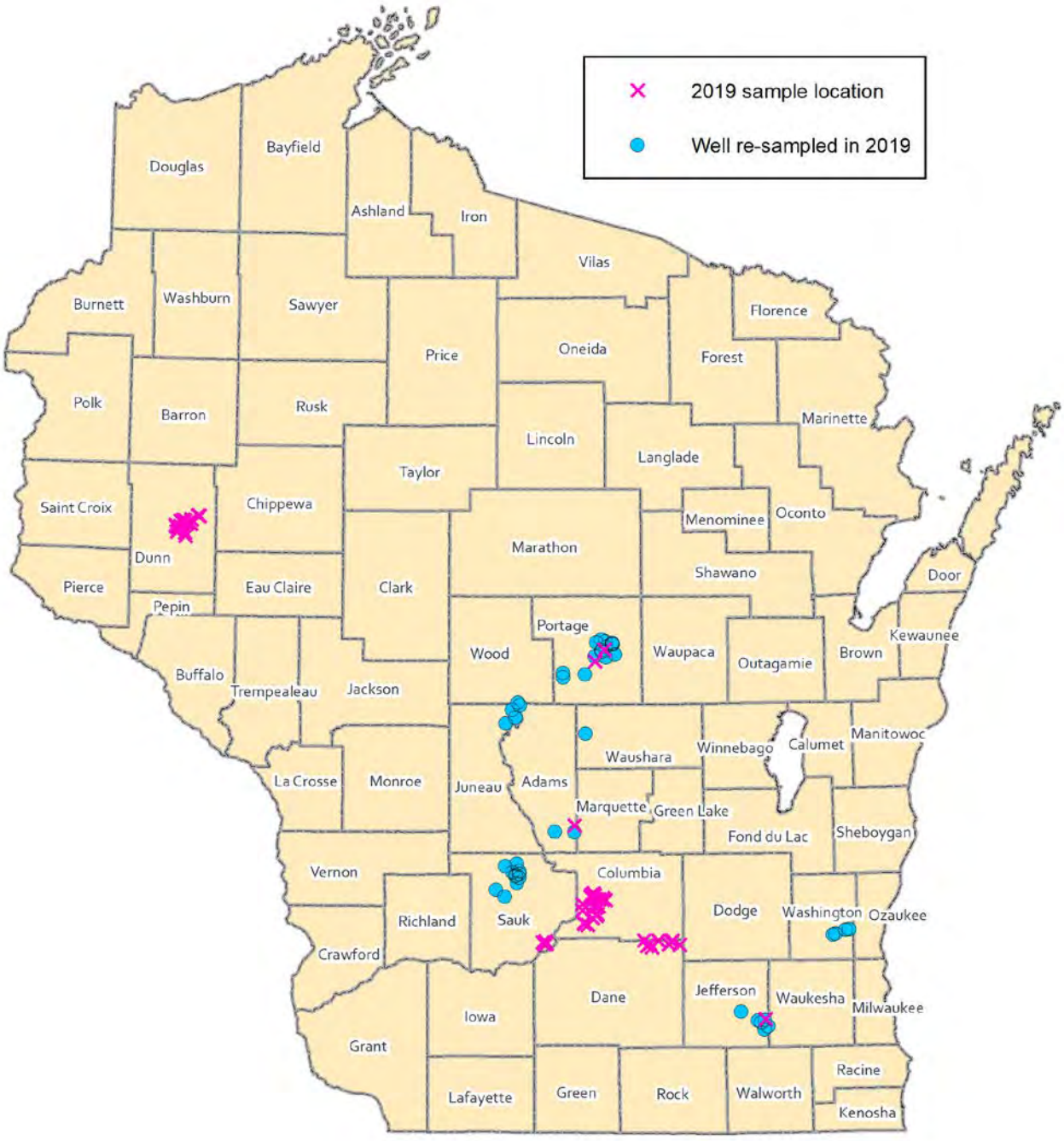


Figure 1 shows locations for all 105 TSAMP wells tested in 2019. Fifty-nine new locations were sampled (X), and 46 locations sampled in 2014 were resampled in 2019 (●).

Figure 2: TSAMP Well Locations since 2010

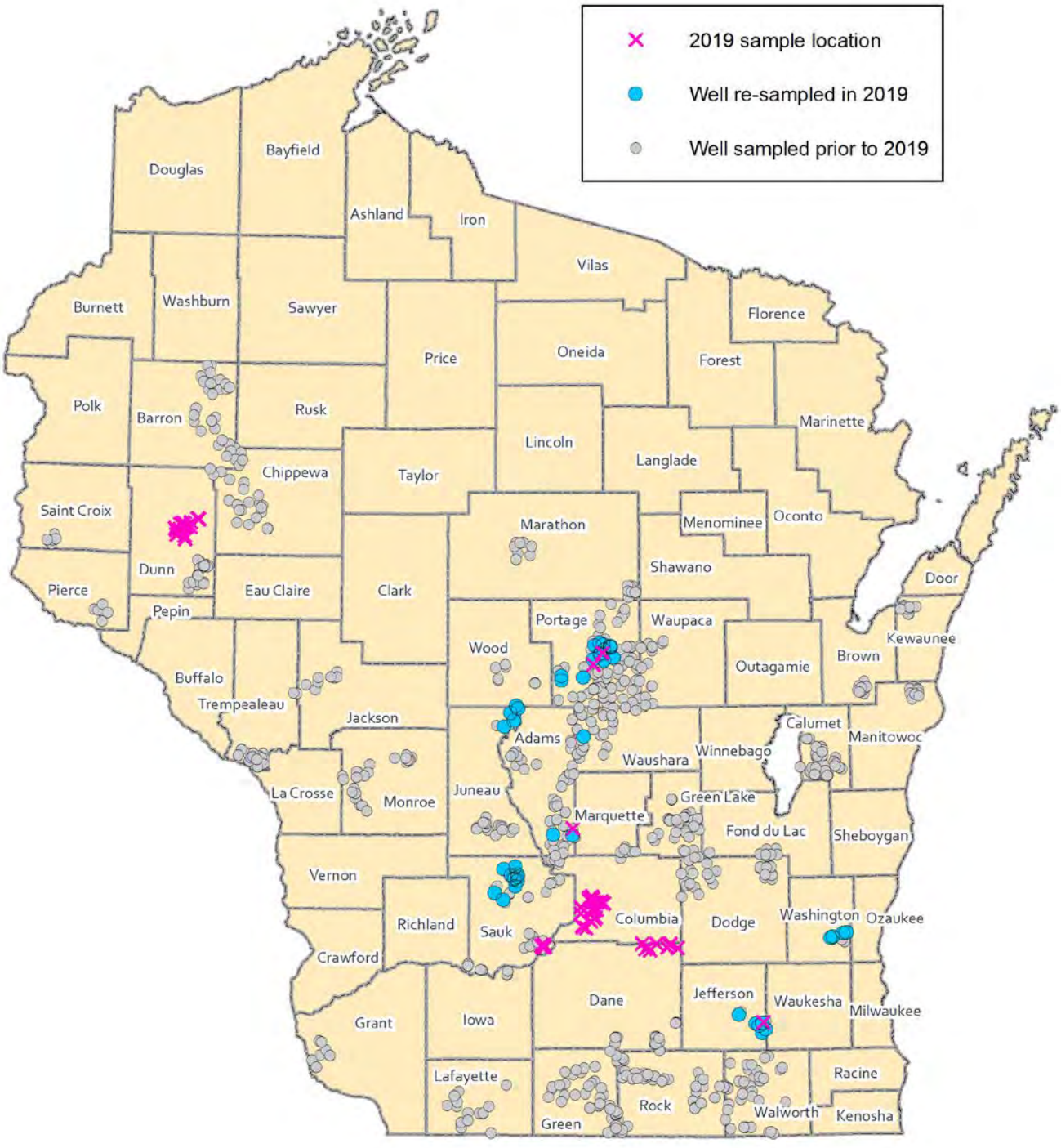


Figure 2 shows well locations sampled for the first time in 2019 (X) and wells sampled a second time in 2019 (●) after testing in 2014. Historic TSAMP locations from all samples collected since 2010 are shown as Grey dots (●); these areas also show where repeat sampling is likely to occur in future years.

Table 1: TSAMP Summary for 2019

Targeted Area	Counties	TSAMP Well Selection Criteria and Study Area Conditions	Number of Samples
Towns of Caledonia, Dekorra, and Lodi	Columbia	Area susceptible to GW contamination near existing pesticide prohibition area; some irrigation; limited variation in cropping patterns. New area in 2019.	25
Towns of Bristol and York	Dane	Proximity to existing pesticide prohibition area; limited variation in cropping patterns. New area in 2019.	9
Colfax and Menomonie	Dunn	Area susceptible to GW contamination; significant irrigation; limited variation in cropping patterns. New area in 2019.	17
Stevens Point, Amherst, Custer, Hancock, Nekoosa and Oxford	Portage, Waushara Adams, Juneau, Wood	Area susceptible to GW contamination; significant irrigation; limited variation in cropping patterns. Repeats of 2014 sampling, with a few new wells.	26
Reedsburg and Loganville	Northern Sauk	Limited variation in cropping patterns; proximity to existing pesticide prohibition area. Repeat of 2014.	11
Sauk City	Southern Sauk	Area susceptible to GW contamination; significant irrigation; limited variation in cropping patterns. New area in 2019.	6
Sullivan, Palmyra; and Jackson	Jefferson, Washington	Limited variation in cropping patterns. Repeats of wells sampled in 2014.	11

Results

A total of 105 groundwater samples were collected from private drinking water wells as a part of the TSAMP effort in 2019. All well owners were mailed a copy of their test results upon receipt of the data from BLS. A summary of all detections of nitrate and pesticides is shown in Table 2.

Nitrate

In 2019, nitrate nitrogen was quantified above the detection limit in 90-percent of samples collected. Nitrate exceeded the 10 mg/l ES in 56-percent of wells sampled. The percentage of wells with ES exceedances for 2019 is much greater than results from the 2017 statewide random sampling survey. In that survey, 8-percent of wells sampled exceeded the ES for nitrate (Wisconsin DATCP, 2017).

Forty-six private wells were sampled in 2014, and 44 of those wells were available for resampling in 2019. The remaining two wells were abandoned and replaced with new wells sometime after 2014 sampling for the following reasons. A well owner in Adams County drilled a new well because the old well went dry. Another well in Portage County was replaced by its owner due to elevated nitrate. In 2019, DATCP sampled all 44 wells available for resampling along with both replacement wells. Table 3 provides a summary of changes in nitrate concentrations observed for all 44 wells tested in both 2014 and 2019. Table 3 excludes both replacement well samples.

Table 2: Summary of compounds detected in 105 samples in 2019, relative to PAL and ES

Compound Detected	Range Detected*	Detections			NR 140 PAL / ES
		Total	>=PAL	>=ES	
NITROGEN (NO3+NO2 as N)	1.17 – 46.4 mg/l	94	92	46	2 / 10 mg/l
ATRAZINE	0.053 – 0.173 µg/l	23	**	**	**
DE-ETHYL ATRAZINE	0.055 – 0.421	59	**	**	**
DEISOPROPYL ATRAZINE	0.055 – 0.256	17	**	**	**
DIAMINO ATRAZINE	0.222 – 0.988	26	**	**	**
ATRAZINE (TCR)	0.055 – 1.58	64	31	0	0.3 / 3.0
ACETOCHLOR	ND	0	0	0	0.7 / 7
ACETOCHLOR ESA	0.062 – 1.68	24	***	***	***
ACETOCHLOR OA	0.383	1	0	0	46 / 230
ALACHLOR	ND	0	0	0	0.2 / 2
ALACHLOR ESA	0.061 – 4.96	59	2	0	4 / 20
BENTAZON	0.107 – 2.17	6	0	0	60 / 300
CHLORANTRANILIPROLE	0.088 – 0.715	5			Not Established
CLOPYRALID	0.186 – 68.6	2			Not Established
CLOTHIANIDIN	0.012 – 1.15	24	0	0	200 / 1000 P
DIMETHENAMID	0	0	0	0	5 / 50****
DIMETHENAMID ESA	0.054 – 8.01	5			Not Established
DIMETHENAMID OA	0.30	1			Not Established
FLUMETSULAM	0.056 – 0.206	3			Not Established
FOMESAFEN	0.193 – 0.41	2			Not Established
IMIDACLOPRID	0.032 – 1.0	11	11	7	0.02 / 0.2 P
METALAXYL	0.053 – 0.278	5			Not Established
METOLACHLOR	0.051 – 6.33	9	0	0	10 / 100
METOLACHLOR ESA	0.057 – 21.1	80	*****	*****	*****
METOLACHLOR OA	0.307 – 17.2	21	0	0	260 / 1300
METRIBUZIN	0.072 – 5.6	7	0	0	14 / 70
METRIBUZIN DA	0.138 – 0.725	3			Not Established
METRIBUZIN DADK	0.19 – 2.83	8			Not Established
NICOSULFURON	0.1	1			Not Established
PICLORAM	0.346 – 1.32	2	0	0	100 / 500
THIAMETHOXAM	0.013 – 1.29	11	0	0	10 / 100 P
TRICLOPYR	0.227 – 0.341	2			Not Established

* Units: Nitrate = mg/l (milligrams per liter, equivalent to parts per million), and
Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).

** The NR 140 PAL and ES for the sum of atrazine + three breakdown products (atrazine TCR) is 0.3 and 3 µg/l.

*** The NR 140 PAL and ES for the sum of acetochlor ESA + OA is 46 and 230 µg/l.

P Proposed NR 140 PAL and ES: not promulgated by administrative rule at time of reporting.

**** The NR 140 PAL and ES is listed for dimethenamid / dimethenamid-P.

***** The NR 140 PAL and ES for the sum of metolachlor ESA + OA is 260 and 1,300 µg/l.

Table 3: Number of samples showing an increase, no change, or a decrease in nitrate concentration

Observations for 44 wells sampled in both 2014 and 2019		
Increased Nitrate	**No Change**	**Decreased Nitrate**
21 had a higher NO3- result 11 increased 2 mg/l or more 7 increased 5 mg/l or more 2 increased 10 mg/l or more	**Five did not change** …all five were non-detect in both sample events	**18 had a lower NO3- result** 9 decreased 2 mg/l or more 2 decreased 5 mg/l or more 1 decreased 10 mg/l or more

More testing is needed for these 44 wells over time to further evaluate the above trends. A goal of the program is to resample these wells on a 5-year cycle to provide additional data for long-term trend analysis.

Nitrate occurrence data is further summarized in four tables below. Each table summarizes a specific subset of wells sampled, and presents the results relative to the nitrate PAL (2 mg/l) and ES (10 mg/l). Table 4A summarizes occurrence data for all 105 wells sampled in 2019. Table 4B provides nitrate occurrence data for the 59 newly sampled wells. Table 4C summarizes the nitrate data for 44 wells sampled a second time in 2019, while Table 4D provides the data for those same 44 wells sampled in 2014.

Table 4A: 2019 Nitrate summary--105 samples collected from all wells tested

Table 4A: Nitrate Occurrence Data--All 105 Wells Sampled in 2019			
16	wells sampled had from 0 to <=2 mg/L	15%	56% <= 10 ppm
19	wells sampled had from > 2 to <=5 mg/L	18%	
24	wells sampled had from > 5 to <=10 mg/L	23%	
31	wells sampled had from > 10 to <= 20 mg/L	30%	44% > 10 ppm
15	wells sampled exceeded > 20 mg/L	14%	

Table 4A shows that 15-percent of samples collected in 2019 detected nitrate less than or equal to 2 mg/l (the PAL). An additional 18-percent of samples detected nitrate at concentrations between 2 and 5 mg/l, and 23-percent of samples detected nitrate between 5 and 10 mg/l (the ES). Overall, 56-percent of wells tested in 2019 detected nitrate below the ES. The ES was exceeded in the remaining 44-percent of wells tested in 2019.

Table 4B provides a similar summary of the 59 wells sampled for the first time in 2019. Similar results were observed for this dataset; 54-percent of samples detected nitrate at concentrations less than or equal to the ES while 46-percent exceeded the ES.

Table 4B: 2019 Nitrate summary—Results from 59 new well locations sampled in 2019

Table 4B: Nitrate Occurrence--59 Wells Sampled First Time in 2019			
6	wells sampled had from 0 to <=2 mg/L	10%	54% <= 10 ppm
9	wells sampled had from > 2 to <=5 mg/L	15%	
16	wells sampled had from > 5 to <=10 mg/L	27%	
22	wells sampled had from > 10 to <= 20 mg/L	37%	46% > 10 ppm
6	wells sampled exceeded 20 mg/L	10%	

Observations over time can also be made by comparing 2014 and 2019 results. Tables 4C and 4D (below) summarize nitrate occurrence data for all 46 locations sampled first in 2014 and again five years later in 2019. As stated above, two of the 46 wells sampled in 2014 were abandoned and replaced with new wells. The 2019 results shown include the results from the 44 resampled wells, plus replacement wells at two of the resampled properties.

Tables 4C and 4D: Nitrate Occurrence Comparison—Results for 46 locations in 2019 vs 2014

Table 4C: Nitrate Occurrence--46 wells in 2019			
10	wells sampled ranged from 0 to <=2 mg/L	22%	59% <= 10 ppm
9	wells sampled ranged from >2 to <=5 mg/L	20%	
8	wells sampled ranged from >5 to <=10 mg/L	17%	
10	wells sampled ranged from >10 to <= 20 mg/L	22%	42% > 10 ppm
9	wells sampled exceeded 20 mg/L	20%	
Table 4D: Nitrate Occurrence--46 wells in 2014			
10	wells sampled ranged from 0 to <=2 mg/L	22%	61% <= 10 ppm
10	wells sampled ranged from >2 to <=5 mg/L	22%	
8	wells sampled ranged from >5 to <=10 mg/L	17%	
8	wells sampled ranged from >10 to <= 20 mg/L	17%	39% > 10 ppm
10	wells sampled exceeded 20 mg/L	22%	

As shown, the number of wells with nitrate concentrations ranging from non-detect to the PAL (2 mg/l) remained the same (22 percent). The number of wells with nitrate detections between the PAL and the ES (10 mg/l) decreased. However, the number of wells with concentrations exceeding the ES, increased from 39-percent to 42-persent. These results suggest that nitrate concentrations have increased in this set of wells from 2014 to 2019.

Results for 2019 samples collected from replacement wells were also compared to 2014 results. The Portage County residence where the well was replaced due to elevated nitrate, decreased from 40.5 mg/l (old well BL731) to 11.7 mg/l in the sample collected from the new well (YN429). The Adams County well that was replaced because it went dry yielded similar results; 10.1 mg/l nitrate (old well PX941) in the 2014 sample, versus 9.17 mg/l nitrate for the new well (YU773) tested in 2019. Neither owner was able to provide information about the depth of the old wells.

Pesticides

Detections: One or more pesticide compounds were detected in 92 of 105 samples collected in 2019 (88-percent). A total of 28 different pesticides or pesticide metabolites were detected in one or more samples collected in 2019 (see Table 2). The frequency of detection (n) of the four most frequently detected pesticide compounds is shown below.

- metolachlor ESA (n=80)
- alachlor ESA (n=59)
- de-ethyl atrazine (n=59)
- diamino-atrazine (n=26)

These compounds are metabolites of metolachlor, alachlor and atrazine, active ingredients in herbicides used on corn or other crops historically grown in the State. The four most frequently detected parent compounds are shown below.

- clothianidin (n=24)
- atrazine (n=23)
- imidacloprid (n=11)
- thiamethoxam (n=11)

Clothianidin, imidacloprid, and thiamethoxam are neonicotinoid insecticides, active ingredients used widely in vegetable production areas and as seed treatments for corn and other grains grown statewide.

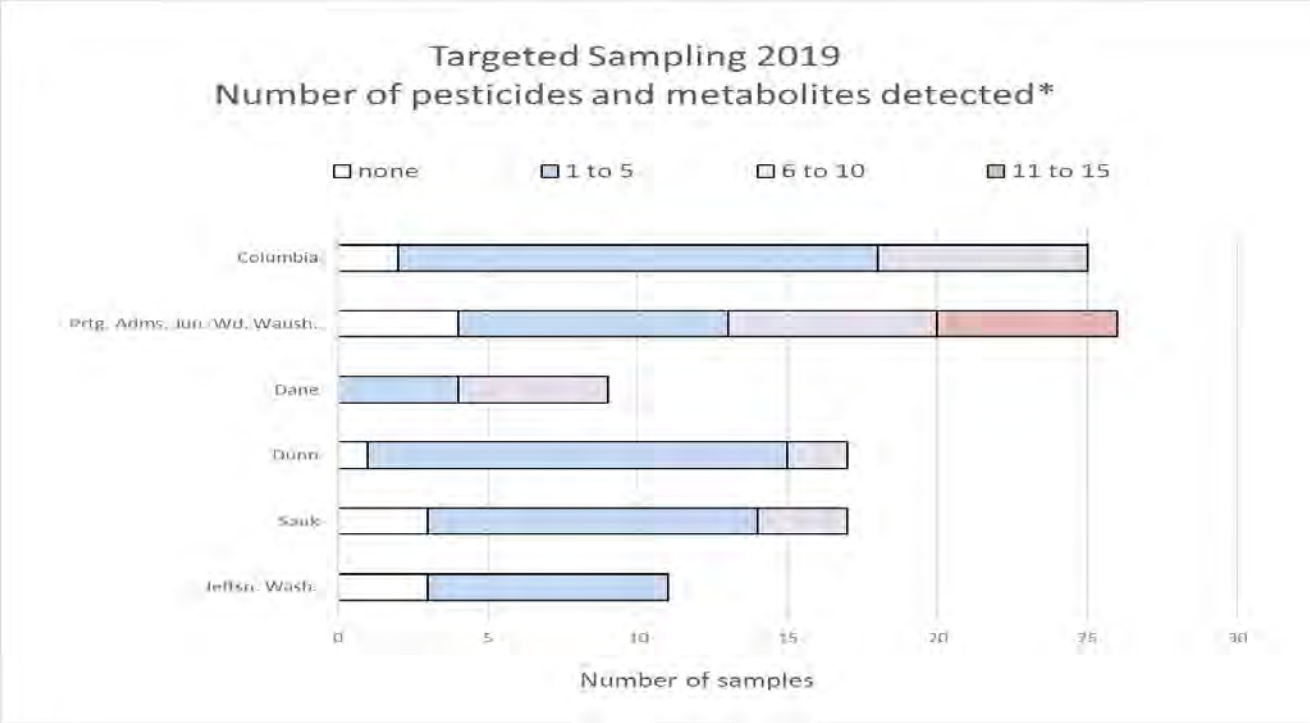
Standards Comparison: Pesticides detected in 2019 samples were compared to existing groundwater quality standards listed in Wis. Admin. Code Ch. NR 140, and results are summarized in Table 2. The right column of Table 2 shows the Preventive Action Limit (PAL) and Enforcement Standard (ES) for compounds with established standards; no standards have been established for 11 pesticide compounds detected in 2019. No pesticide compounds were detected above their respective ESs. However, atrazine TCR (the sum of atrazine and its metabolites) and alachlor ESA were detected at concentrations exceeding their respective PALs. Atrazine TCR exceeded the PAL (0.3 µg/l) in 31 samples. The highest atrazine TCR concentration was 1.58 µg/l, a little more than half the ES (3.0 µg/l). Alachlor ESA was detected above the PAL (4.0 µg/l) in two samples.

Proposed Standards: In 2019 DNR proposed groundwater quality standards for an additional 11 pesticide compounds on the NR 140 Cycle 10 list. Proposed PAL and ES standards for these compounds have not been promulgated, but they are shown in the right column of Table 2. Three compounds with proposed standards were detected in 2019 TSAMP samples. These include clothianidin, imidacloprid and thiamethoxam. Imidacloprid was detected in 11 samples. It exceeded the proposed 0.02 µg/l PAL in all 11 samples, and the proposed 0.2 µg/l ES in 7 of these samples. Clothianidin and thiamethoxam were detected in 24 and 11 samples respectively, and the detected concentrations for these compounds are below proposed standards.

In 2019 the highest concentration observed for any pesticide was clopyralid, which was detected at 68.6 µg/l in a Columbia County well. Clopyralid is an herbicide used to control weeds in grasses, alfalfa, beans and wheat. It has no established ES or PAL, but the detected concentration is significantly less than the EPA Human Health Benchmark (HHBP) for chronic exposures in drinking water, set at 960 µg/l (https://iaspub.epa.gov/apex/pesticides/f?p=122:5:::NO:RP:P5_HHBP_ID:2564).

Numbers of pesticides detected: Chart 1 shows the number of samples collected from each study area in 2019, and the number of parent pesticide and pesticide metabolites (pesticides) detected in these samples.

Chart 1: Number of pesticides and pesticide metabolites detected in areas sampled in 2019



*Atrazine TCR was not counted to avoid double counting of atrazine compounds present.

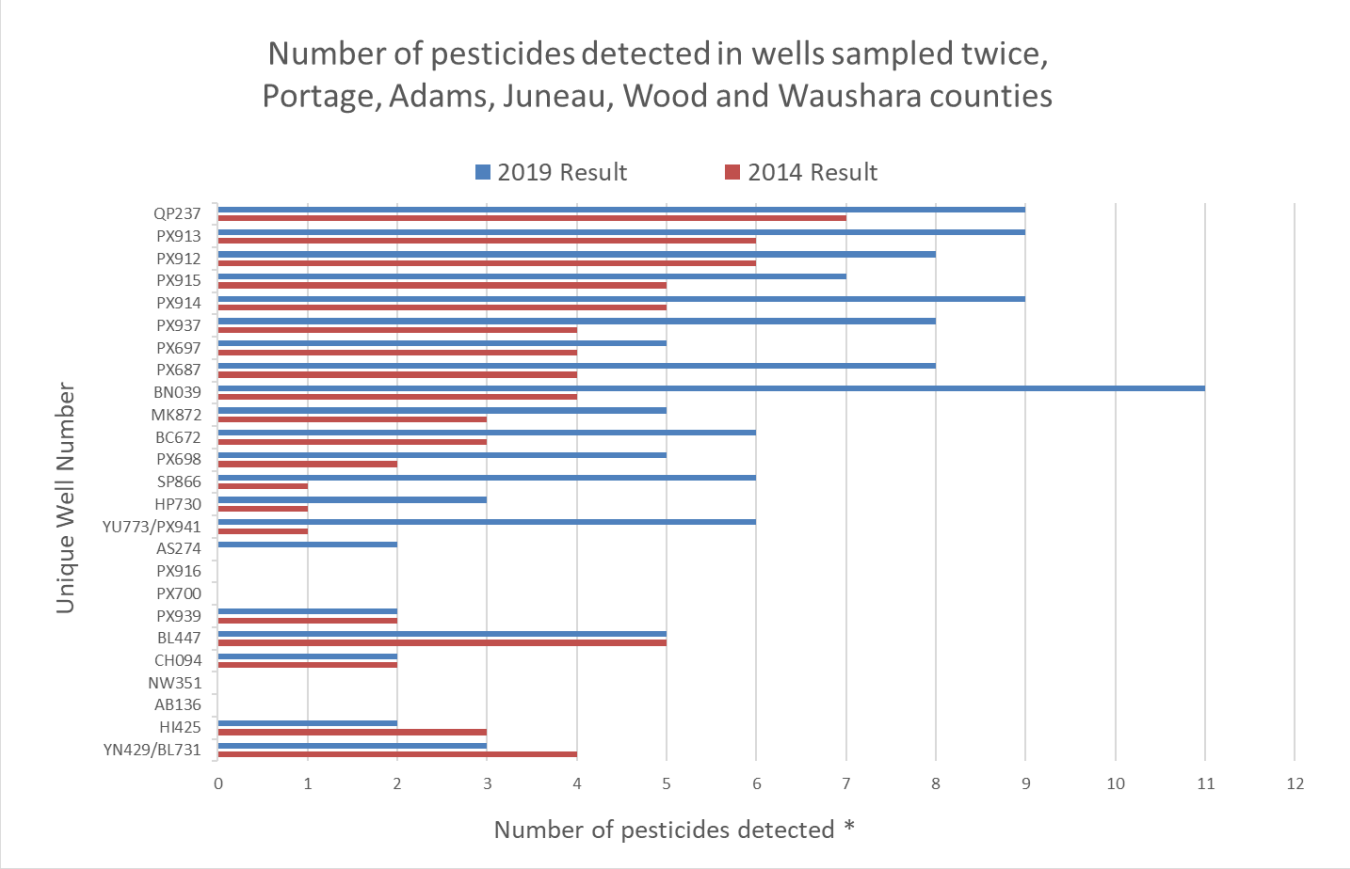
As shown in Chart 1, the number of pesticides detected in samples from each area is as follows:

- Out of 25 samples collected for Columbia County, no pesticides were detected in two samples, between one and five pesticides were detected in 16 samples, and between six and ten pesticides were detected in seven samples.
- Out of 26 samples collected for the Central Sands counties of Portage, Adams, Juneau, Wood and Waushara, no pesticides were detected in four samples, between one and five pesticides were detected in nine samples, between six and ten pesticides were detected in seven samples, and between 11 and 15 pesticides were detected in six samples.
- Out of 9 samples collected for Dane County, between one and five pesticides were detected in four samples, and between six and ten pesticides were detected in 5 samples.
- Out of 17 samples collected for Dunn County, no pesticides were detected in one sample, between one and five pesticides were detected in 14 samples, and between six and ten pesticides were detected in two samples.
- Out of 17 samples collected for Sauk County, no pesticides were detected in three samples between one and five pesticides were detected in 11 samples, and between six and ten pesticides were detected in 3 samples.
- Out of 11 samples collected for Jefferson and Washington counties, no pesticides were detected in three samples, and between one and five pesticides were detected in eight samples.

The number of pesticides detected in samples collected from the same well in 2014 and 2019 were also

evaluated. Chart 2 shows the number of pesticides (including metabolites) detected in samples collected from 25 residential wells within the central sands counties of Portage, Adams, Juneau, Wood and Waushara.

Chart 2: Number of pesticides detected in wells tested in both 2014 and 2019 in central sands counties.



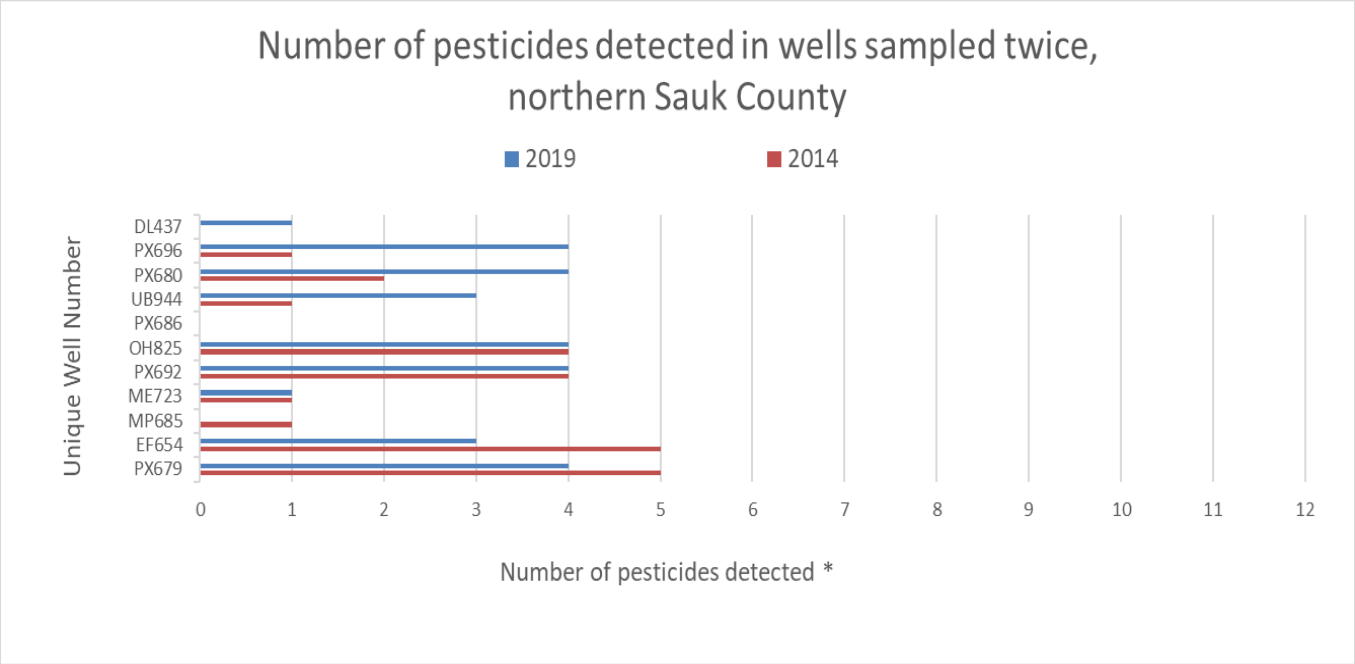
*Numbers include only pesticides and pesticide metabolites that were analyzed in both years.

Chart 2 shows that 16 of 25 wells in central sands counties detected more pesticides in 2019 samples compared to 2014 samples. The same number of pesticides were detected in samples collected from seven wells for each year, including four samples that detected no pesticides. Two wells had more pesticides detected in 2014 than in 2019. Chart 2 includes 2019 results from two replacement wells (YU773/PX941 and well YN429/BL731) installed after 2014 samples were collected.

Chart 3 (below) shows a similar comparison of 2014 and 2019 data for samples collected in northern Sauk County. Overall there were fewer pesticides detected in these samples compared to residential well samples for the central sands counties. Of the 11 wells sampled twice, four showed an increase in the number of pesticides detected in 2019, four had the same number of pesticides detected in each year (one having no pesticides detected in either year), and samples at three wells had fewer pesticides detected in 2019 than in 2014. Note that six wells in southern Sauk County are not shown in the chart because they were sampled for the first time in 2019.

It is important to note that some analytical methods used by BLS were modified between 2014 and 2019. Several new compounds were added while others were removed from the analyte list, and compound reporting levels changed for some compounds. The data in Charts 2 and 3 were partially

Chart 3: Number of pesticides detected in wells tested in both 2014 and 2019 in northern Sauk County.



*Numbers include only pesticides and pesticide metabolites that were analyzed in both years.

adjusted to account for some, but not all of these differences. For this evaluation the data was adjusted to show only detections for compounds analyzed in both years. The data was not adjusted to account for changes in reporting levels. Although reporting level changes may have occurred, it did not influence the number of detections observed at all sites.

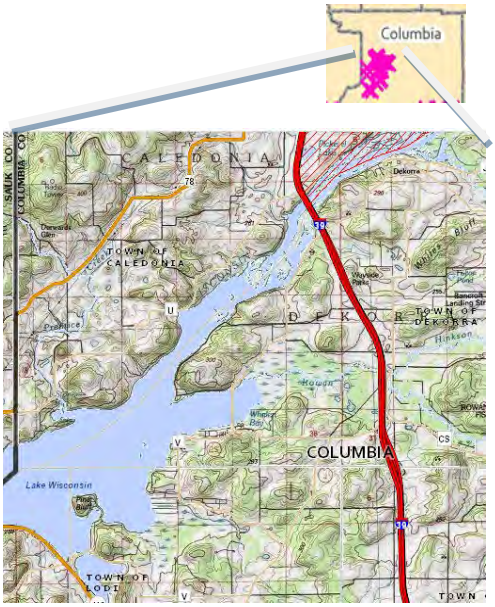
The occurrence of nitrate and pesticides in groundwater is influenced by the environmental setting (soil types, geology, depth to groundwater, and precipitation) and land management practices used (crop and cultivation types, agrichemicals used and irrigation practices) near each location sampled. Conditions at each site will effect contaminant migration rates. The extent to which these conditions may have contributed to contaminants reaching groundwater at each well location is beyond the scope of this report.

Data Summaries for 2019 TSAMP Study Areas

A detailed summary of findings is included below for residential well samples collected from six areas in 2019. The areas include:

1. Columbia County;
2. Dane County;
3. Dunn County;
4. Five counties within the Central Sands Region (Portage, Adams, Juneau, Wood and Waushara)
5. Sauk County, and
6. Jefferson and Washington counties.

1. *Summary: Columbia County*



In 2019, DATCP collected first time samples from 25 residential wells in Columbia County. The study area and well locations are shown on the figures to the right. Samples collected north of the Wisconsin River (10) were from an area bound by Highway 78 to the north, the River to the south, the county line to the west, and I-39 to the east. Samples collected south of the river (15) included homes with Lodi and Poynette addresses.

Crops observed in this study area include mainly corn, soybeans, forage crops and some wheat. Some irrigation exists on fields south of the river, but most fields are not irrigated. Soils in these areas are predominantly sandy. Well records show static water depths vary greatly with topography and location. Well water is drawn from sand and gravel deposits and underlying sandstone bedrock.

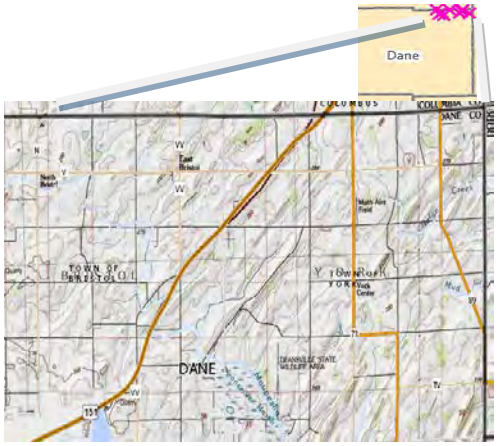
Columbia County Results (25)

WUWN	City	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ACETOCHLOR ESA	ACETOCHLOR OA	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	CLOPYRALID	CLOTHIANIDIN	METOLACHLOR	METOLACHL-ESA	METOLACHL-OA	NICOSULFURON	PICLORAM	THIAMETHOXAM	TRICLOPYR	NITRATE
VM077	Merrimac	COLUMBIA	Mar-06	320	7	40	180	Sandstone	6/4/2019	0	0	0.409	0	0.374	0	0	0	0.437	0	0	0	0	0	8.5
WA805	Merrimac	COLUMBIA							6/4/2019	0	0	0.353	0	0	0	0	0	0.36	0	0	0	0	0	11.4
EI576	Portage	COLUMBIA	Dec-93	145		142	54	Snd & Grvl	6/4/2019	0	0	0.34	0.091	0.686	0	0	0	0.709	0	0	0	0	0	2.83
WA804	Portage	COLUMBIA							6/4/2019	0	0	0.078	0	0	0	0	0	1.82	0	0	0	0	0	5.06
WA806	Portage	COLUMBIA							6/4/2019	0	0	0	0	0	0	0	0	0.156	0	0	0	0	0	2.84
WA807	Portage	COLUMBIA							6/4/2019	0	0	0	0	0.149	0	0	0	0.272	0	0	0	0	0	3.77
WA808	Portage	COLUMBIA							6/4/2019	0	0	2.37	0.112	1.118	0	0	0	0.055	0	0	0	0	0	7.23
WA809	Portage	COLUMBIA							6/4/2019	0.105	0	0	0	0.055	0	0.04	0	0.715	0	0	0	0	0	3.95
WP943	Portage	COLUMBIA	Jun-10	102	9	41	21	Sandstone	6/4/2019	0.194	0	0.176	0.101	0.362	0	0.027	0	0.987	0	0	0	0	0	4
WU215	Portage	COLUMBIA	May-12	80		76	23	Snd & Grvl	6/4/2019	0.204	0	2.93	0	0.494	0	0	0	4.95	0	0	0	0	0	23.7
MB532	Lodi	COLUMBIA	Sep-97	158	108	108	8	Sandstone	6/11/2019	0	0	4.34	0	0.675	0	0	0	0.445	0	0	0	0	0	15.1
WA810	Lodi	COLUMBIA							6/11/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0.341	9.14
WA822	Lodi	COLUMBIA							6/11/2019	0.089	0	0.198	0.059	0.119	0	0	0	4.34	0.406	0	0	0	0	30.6
WA823	Lodi	COLUMBIA							6/11/2019	0	0	0.147	0	0	0	0.04	2.09	2.27	0.475	0.1	1.32	0.013	0	12.8
WA811	Poynette	COLUMBIA							6/11/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.44
WA812	Poynette	COLUMBIA							6/11/2019	0	0	0	0	0.076	68.6	0.019	0	0.794	0	0	0	0	0	26.5
WA813	Poynette	COLUMBIA							6/11/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WA814	Poynette	COLUMBIA							6/11/2019	0	0	0	0	0	0	0	0	0.269	0	0	0	0	0	4.77
WA815	Poynette	COLUMBIA							6/11/2019	0.071	0	0.144	0	1.027	0	0	0	2.77	0	0	0	0	0	15.9
WA816	Poynette	COLUMBIA							6/11/2019	0	0	0	0	0.566	0	0.053	0	4.54	0	0	0	0	0	11.8
WA817	Poynette	COLUMBIA							6/11/2019	0	0	0.216	0	0.721	0	0	0	0	0	0	0	0	0	4.23
WA818	Poynette	COLUMBIA							6/11/2019	0.074	0	0	0	0	0	0.058	0	0.332	0	0	0	0	0	7.2
WA819	Poynette	COLUMBIA							6/11/2019	0.58	0	0.099	0.09	1.58	0	0	0	1.01	0	0	0	0	0	12.5
WA820	Poynette	COLUMBIA							6/11/2019	0	0	0.152	0	0	0	0	0	0	0	0	0	0	0	6.68
WA821	Poynette	COLUMBIA							6/11/2019	0	0	2.78	0.101	0.447	0	0	0	0	0	0	0	0	0	7.48

Notes: WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

- Nitrate was detected in 24 of the 25 samples at concentrations ranging from non-detect to 30.6 mg/l. The average concentration for 25 samples is 9.9 mg/l. It exceeded the 10 mg/l ES in nine samples (36-percent).
- Pesticides were detected in 23 of the 25 samples. Fourteen pesticide compounds were detected. The most frequently detected pesticides include metolachlor-ESA (19), alachlor-ESA (15), and atrazine TCR (15). Atrazine-TCR exceeded the 0.3 µg/l PAL in 10 samples. Alachlor-ESA exceeded the 4 µg/l PAL in one sample.
- Insecticide detections included clothianidin (6) and thiamethoxam (1). Neither exceeded proposed PALs.
- Clopyralid was detected in one sample at 68.6 µg/l. Wisconsin does not have a groundwater standard for clopyralid; regardless, the concentration is below the human health benchmark (HHBP) established by EPA for chronic exposures to clopyralid in drinking water (980 µg/l).

2. *Summary: Dane County*



In 2019, DATCP collected first time samples from 9 residential wells in Dane County. The study area and well locations are shown on the figure to the right. Samples were collected from an area north and east of Sun Prairie within the northwest corner of the county.

Crops observed in this area include mainly corn, soybeans and forage. No irrigation was observed. Soils are mainly loam soils with silty, sandy and clay designations. Three well logs from the area show static water depths ranging from 19 to 60 feet with casings extending into bedrock at depths of 72 to 112 feet.

Dane County Results (9)

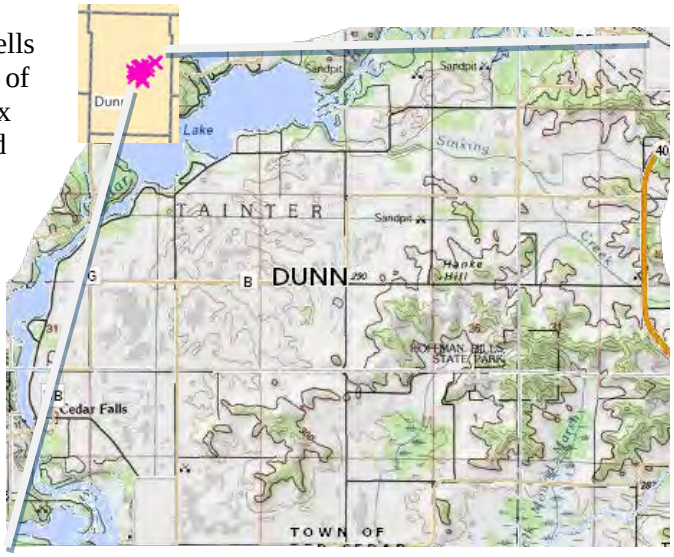
WUWN	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ACETOCHLOR ESA	ACETOCHLOR OA	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	CLOTHIANIDIN	FLUMETSULAM	METOLACHL-ESA	NITRATE
TS208	DANE	Jul-04	154	112	114	33	Sandstone	7/9/2019	0	0	0.216	0	0	0	0	0	5.56
WA825	DANE							7/9/2019	0.106	0	0.512	0.06	0.164	0.012	0.056	0.717	11.4
WA826	DANE							7/9/2019	0	0	0	0	0.497	0	0	0.37	10.9
WA830	DANE							7/9/2019	0	0	0	0	0	0	0	0.404	4.51
WA831	DANE							7/9/2019	0	0	1.19	0	0	0	0	0.29	0
WG668	DANE	Jul-06	120	80	80	60	Carbonate	7/9/2019	0.105	0	1.42	0.058	1.169	0	0	1.93	11.8
GX011	DANE							7/9/2019	0.099	0	2.57	0	0.644	0	0	1.62	11.8
HT369	DANE	Nov-01	117	72	72	19	Sandstone	7/9/2019	0.093	0	2.15	0.053	0.865	0	0	1.22	10.8
WA827	DANE							7/9/2019	0.062	0	4.96	0.098	0.621	0	0	0.611	10.2

Notes: WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

- Nitrate was detected in eight of nine samples collected at concentrations that ranged from non-detect to 11.8 mg/l. The average concentration for all nine samples is 8.55 mg/l. Nitrate exceeded the 10 mg/l ES in six of the nine samples (66.6-percent).
- Pesticides were detected in all 9 samples. Eight pesticide or pesticide metabolites were detected. The most frequently detected pesticides include metolachlor-ESA (8), alachlor-ESA (7) and atrazine TCR (6). No pesticides exceeded an ES. Alachlor-ESA exceeded the PAL (4 µg/l) in one sample.
- The insecticide clothianidin was detected in one sample at a concentration below the proposed 200 µg/l PAL.

3. *Summary: Dunn County*

In 2019, DATCP collected samples from 17 residential wells in Dunn County. These wells are in agricultural areas east of the Red Cedar River (Tainter Lake) extending from Colfax (northeast) to Menomonie (southwest). The study area and well locations are shown on the figure to the right



Crops observed at the time of sampling were mainly corn and bean crops with some forage and cover crops. Numerous fields are under irrigation. Soils are generally sandy loams, silt loams and loamy sands that formed on the river terrace that extends to higher elevations to the east. Groundwater flow direction is west to southwesterly, towards the Red Cedar River (WGNHS, 1988). Well records found for six wells indicate the static water table present from 10 to 45 feet. Records indicate water is drawn from sand at depths between 40 and 88 feet below ground surface (bgs).

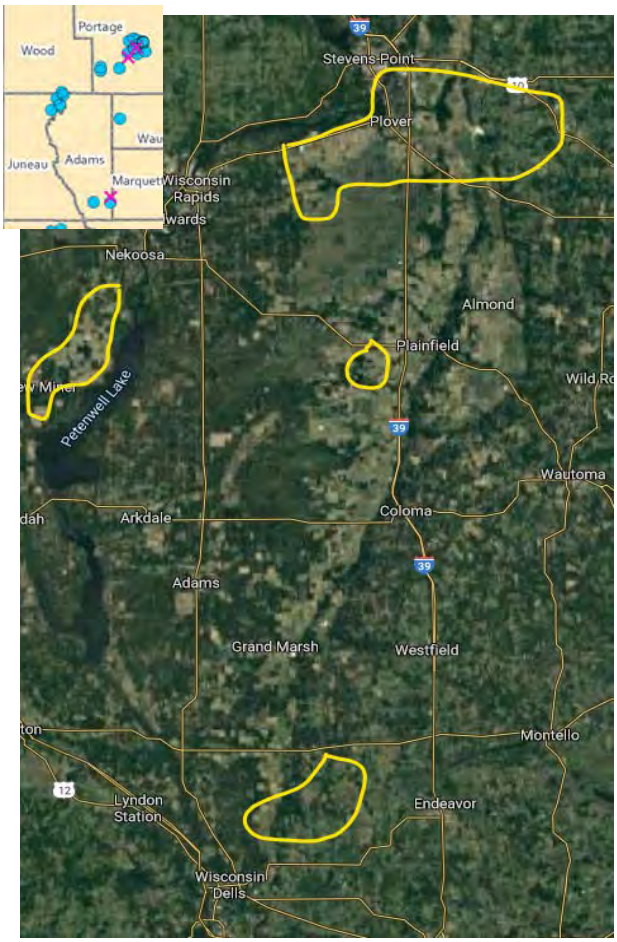
Dunn County Results (17)

WUWN	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ACETOCHLOR ESA	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	CLOTHIANIDIN	DIMETHEN-ESA	FOMESAFEN	METOLACHLOR	METOLACHL-ESA	METOLACHL-OA	NITRATE
TE076	DUNN	Sep-05	63		58	35	Sand	7/23/2019	0	0.989	0	0.168	0	0	0	0	5	0	18.5
TH680	DUNN	Jul-06	66		61	40	Sand	7/23/2019	0	0.725	0.173	0.668	0	0	0	0	8.01	0	15.9
UK973	DUNN	Nov-07	40		37	10	Sand	7/23/2019	0	0	0	0	0	0	0	0	0.157	0	8.74
WA828	DUNN							7/23/2019	0	0	0	0	0	0	0	0	1.31	0	7.5
WA829	DUNN							7/23/2019	0	0	0.111	0.635	0.148	0	0	0	5.99	1.42	14.2
WA832	DUNN							7/30/2019	0.476	0	0	0.101	0	0	0	0	1.87	0.307	13.5
WA839	DUNN							7/30/2019	0.072	0.354	0	0	0	0	0	0	1.18	0	0
YS345	DUNN	May-17	88		84	45	Sand	7/23/2019	0.076	0	0	0.082	0	0	0	0	12.7	0.795	19.2
YS381	DUNN	Oct-17	57		53	30	Sand	7/23/2019	0	0	0	0	0	0	0	0	0.068	0	8.89
RZ274	DUNN	Dec-02	76		73	32	Sand	7/30/2019	0	0	0	0	0	0	0	0	0	0	0
WA833	DUNN							7/30/2019	0	0	0	0	0	0	0	0	0.057	0	0
WA834	DUNN							7/30/2019	0	0	0	0	0	0	0	0	1.93	0	19.2
WA835	DUNN							7/30/2019	0.146	3.8	0	0.104	0	0	0	0	5.07	0	15.5
WA836	DUNN							7/30/2019	0	0.094	0	0.069	0	0	0	0	11.7	1.28	30.5
WA837	DUNN							7/30/2019	0.224	0.375	0	0.079	0	0	0.193	0	13.6	1.28	14.2
WA838	DUNN							7/30/2019	0.103	0	0	0.121	0	0	0	0.051	0.359	0	3.7
WA840	DUNN							7/30/2019	0.617	1.39	0	0.092	0	0.054	0	0	0.409	0	8.63

Notes: WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

- Nitrate was detected in 14 of 17 samples at concentrations that ranged from non-detect (in three samples) to 30.5 mg/l. The average concentration for the 17 samples is 14.2 mg/l. Nitrate exceeded the 10 mg/l ES in nine of the 17 samples (53-percent).
- Pesticides were detected in 14 of 17 samples. Ten pesticides or pesticide metabolites were detected. The most frequently detected pesticides include metolachlor-ESA (16), atrazine TCR (10), alachlor-ESA (7) and acetochlor-ESA (7).
- No pesticides exceeded an ES. Atrazine-TCR exceeded the PAL (0.3 µg/l) in two samples.
- One insecticide, clothianidin was detected in one sample below the proposed 200 µg/l PAL.

4. *Summary: Portage, Waushara, Adams, Juneau and Wood Counties*



In 2019, DATCP collected samples from 27 residential wells in the Central Sands (CS) vegetable growing region of Portage, Adams and Waushara Counties, and on a sandy terrace on the west bank of Petenwell Lake (Wisconsin River) in Juneau and Wood Counties. The entire area is known for deep sandy soils with low organic matter content, abundant shallow groundwater and mostly level topography. Most agricultural fields are irrigated. Crops grown include high value vegetable crops for processing (potatoes, sweet corn, snap beans, etc.) with rotations to corn or other crops. Groundwater flow is generally toward the Wisconsin River, but shallow groundwater flow directions may trend toward local drainage ditches and smaller streams that flow to the Wisconsin River. Wells sampled are located within the approximate boundaries shown on the figure to the right.

A summary of results for wells sampled in Portage County is listed below, and tabulated results are shown on page 17. A summary and tabulation of results for wells in Waushara, Adams, Juneau and Wood Counties follows on page 18.

Portage County (17)

- One well (WA824) was sampled for the first time in 2019, and the remaining 16 wells were sampled in both 2019 and 2014 (shaded rows of table show 2014 results).
- Nitrate exceeded the 10 mg/l ES in 9 of 17 wells sampled in Portage County in 2019 (53%).
- In 2019 the nitrate concentrations for 16 wells averaged 13.3 mg/l, compared to an average of 10.8 mg/l for the same wells in 2014.
- In 2019 eight samples exceeded the 10 mg/l ES for nitrate (50%) compared to six samples in 2014 (38%).
- In 2019 nitrate concentrations ranged from not-detected (in two samples), to a high of 33.3 mg/l (PX937). In 2014, nitrate ranged from not-detected (at the same two wells sampled in 2019) to a high of 40.5 mg/l (BL731).
- The owner of well BL731 drilled a deeper new well (YN429) in 2015. The 2019 sample collected from that well detected nitrate above the ES (11.7 mg/l). The homeowner reported using a reverse osmosis treatment system.
- No pesticides were detected in 3 wells sampled in 2019 (18%). Those same wells also had no pesticide detections in 2014.
- For samples collected in 2019:
    - 82-percent contained one or more pesticides or pesticide metabolites.
    - 22 pesticides (including pesticide metabolites) were detected.
    - The most frequently detected pesticides include metolachlor-ESA (13), atrazine TCR (12), alachlor-ESA (10) and acetochlor-ESA (7).
    - Samples from five well locations contained all three insecticides clothianidin, imidacloprid, and thiamethoxam. One of those samples also contained a fourth insecticide chlorantraniliprole.
    - Imidacloprid exceeded the proposed 0.2 µg/l ES in three samples, and atrazine-TCR exceeded the 0.3 µg/l PAL in four samples.

(continued on next page)

Results for Portage County (17)

WUWN	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ACETOCHLOR ESA	ACETOCHLOR OA	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	BENTAZON	CHLRNTRANLIPRLE	CLOPYRALID	CLOTHIANIDIN	DIMETHEN-ESA	DIMETHEN-OA	FLUMETSULAM	FOMESAFEN	IMIDACLOPRID	METALAXYL	METOLACHLOR	METOLACHL-ESA	METOLACHL-OA	METRIBUZIN	METRIBUZIN DA	METRIBUZIN DADK	THIAMETHOXAM	NITRATE
BC672	PORTAGE							6/19/2019	0	0	0.304	0	0.171	0.183	0	0	0.028	0	0	0	0.41	0.246	0.115	0	22.1	12.6	0	0	0	0.089	28.3
BC672	PORTAGE							8/26/2014	0	0	1.29	0	0				0					0		0	0.407	0.185	0			0	4.66
BL447	PORTAGE		17					6/19/2019	0	0	0.959	0	0	0	0.111	0	0.066	8.01	0.3	0	0	0.471	0.123	0	0.684	0	0.072	0.168	2.83	0.228	16.6
BL447	PORTAGE		17					6/25/2014	0	0	3.14	0	0				0					0.299		0	4.17	1.85	0.097			0	8.03
YN429	PORTAGE	Jun-15	80	76	8	Sand		6/19/2019	0	0	1.33	0	0.086	0	0	0	0	0	0	0	0	0	0	0	1.36	0	0	0	0.277	0	11.7
BL731	PORTAGE							6/25/2014	0	0	0.573	0	0				0					0		0	7.65	5.7	0.106			0	40.5
CH094	PORTAGE	Nov-90	87	84	63	Sand		6/19/2019	0	0	0	0	0.059	0	0	0	0	0	0	0	0	0	0	0	1.56	0	0	0	0	0	5.83
CH094	PORTAGE	Nov-90	87	84	63	Sand		8/26/2014	0	0	0	0	0				0					0		0	1.19	0.749	0			0	9.63
HI425	PORTAGE	Nov-93	30	27.3	7.5	Sand		6/19/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.811	0.329	0	0	0.19	0	0
HI425	PORTAGE	Nov-93	30	27.3	7.5	Sand		6/25/2014	0	0	0.402	0	0				0					0		0	3.6	3.04	0			0	0
HP730	PORTAGE	Mar-94	91	86	60	Sand		6/19/2019	0	0	0.302	0	0.089	0	0	0	0	0	0	0	0	0	0	0	0.105	0	0	0	0	0	9.38
HP730	PORTAGE	Mar-94	91	86	60	Sand		7/1/2014	0	0	0.345	0	0				0					0		0	0	0	0			0	6.63
MK872	PORTAGE	Jan-00	119	116	95	Sand		6/19/2019	0.247	0	1.56	0	1.152	0	0	0	0	0	0	0	0	0	0	0	1.38	0	0	0	0	0	22.8
MK872	PORTAGE	Jan-00	119	116	95	Sand		7/1/2014	0	0	0.862	0	0.629				0					0		0	0.292	0	0			0	19.2
NW351	PORTAGE	Jun-00	52	49	30	Sand		6/19/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW351	PORTAGE	Jun-00	52	49	30	Sand		6/25/2014	0	0	0	0	0				0					0		0	0	0	0			0	0
PX687	PORTAGE							6/19/2019	0.691	0.383	0.329	0.098	0.222	0	0	0.186	0.034	0	0	0.206	0	0.0324	0	0.926	7.19	1.51	0	0	0.26	0.0306	19.4
PX687	PORTAGE							6/25/2014	0	0	0.625	0	0.354				0					0		0	7.29	3.46	0			0	14.1
PX697	PORTAGE							6/19/2019	0	0	1.21	0	0.099	0	0	0	0.036	0	0	0	0	0.0574	0	0	4.02	1.17	0	0	0	0.018	21.8
PX697	PORTAGE							7/1/2014	0	0	3.02	0	0				0					0		0	3.2	0.992	0.055			0	20.5
PX698	PORTAGE		102	99	72	Sand		6/19/2019	0	0	1.78	0	0.995	0	0	0	0	0	0	0	0	0	0	0	0.284	0	0	0	0	0	16.9
PX698	PORTAGE		102	99	72	Sand		7/1/2014	0	0	1.38	0	0				0					0		0	0.429	0	0			0	12.7
PX700	PORTAGE							6/19/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.69
PX700	PORTAGE							7/1/2014	0	0	0	0	0				0					0		0	0	0	0			0	3.65
PX916	PORTAGE							6/19/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.37
PX916	PORTAGE							7/1/2014	0	0	0	0	0				0					0		0	0	0	0			0	4.83
PX937	PORTAGE							6/19/2019	0	0	0	0	0.307	0	0	0	1.15	0	0	0	0	0.568	0	0.31	19.1	8.26	2.01	0	2.59	0.304	33.3
PX937	PORTAGE							8/26/2014	0	0	0	0	0				0					0.701		0	6.82	3.05	1.14			0	20.3
PX939	PORTAGE							6/19/2019	0	0	0	0	0.085	0	0	0	0	0	0	0	0	0	0	0	0.171	0	0	0	0	0	9.37
PX939	PORTAGE							8/26/2014	0	0	0	0	0				0					0		0	0.21	0	0			1.03	5.21
SP866	PORTAGE	Jul-05	104	100	70	Sand		6/19/2019	0.132	0	0.441	0	0.475	0	0	0	0	0	0	0	0	0	0	0	2.13	0.284	0	0	0	0	8.78
SP866	PORTAGE	Jul-05	104	100	70	Sand		7/1/2014	0	0	0.331	0	0				0					0		0	0	0	0			0	3.77
WA824	PORTAGE							6/19/2019	0	0	0.375	0	0.137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.04

Notes: Shaded rows are data for the same well as the unshaded row above, but from a prior date. WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

(continued on next page)

Waushara (1), Adams (3), Juneau (4) and Wood (1) Counties

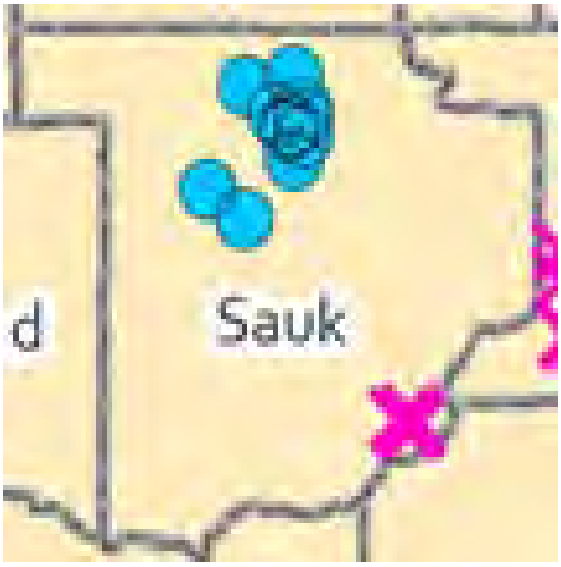
- One well (AB136) had no detections of nitrate or pesticides during 2014 and 2019. This well is shallow (51 feet deep) and draws water from the unconsolidated sand aquifer.
- Five out of 9 wells sampled in 2019 exceeded the 10 mg/l ES for nitrate (56%) while seven exceeded the ES in 2014 (78%). These results suggest an overall improvement in water quality for nitrate.
- One well (QP237) showed an increase in nitrate from 27.7 mg/l to 46.4 mg/l between 2014 and 2019.
- In 2014, the highest nitrate concentration was detected at BN039 (36.3 mg/l). In 2019, the highest nitrate concentration was detected at QP237 (46.4 mg/l).
- For samples collected in 2019:
  - 89-percent contained one or more pesticides (including pesticide metabolites).
  - 17 pesticides or pesticide metabolites were detected.
  - The most frequently detected pesticides include alachlor-ESA (8), metolachlor-ESA (7), and atrazine TCR (6).
  - Four insecticides clothianidin, imidacloprid, thiamethoxam and chlorantraniliprole were detected in numerous samples, often commingled in the same well samples.
  - Imidacloprid exceeded its proposed 0.2 µg/l ES in three samples, and atrazine-TCR exceeded the 0.3 µg/l PAL in two samples.
- One well was replaced (PX941) with a deeper well (YU773). The 2019 sample from the replacement well had a slightly lower nitrate concentration, but more pesticides were detected compared to the sample from the old well.

WUWN	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	BENTAZON	CHLRNTRANLIPRLE	CLOTHIANIDIN	DIMETHEN-ESA	FLUMETSULAM	IMIDACLOPRID	METALAXYL	METOLACHLOR	METOLACHL-ESA	METOLACHL-OA	METRIBUZIN	METRIBUZIN DA	METRIBUZIN DADK	THIAMETHOXAM	NITRATE
BN039	WAUSHARA		30					6/26/2019	0.068	0.115	0.357	0	0.715	0.502	0	0	0.054	0	6.33	17.3	14.7	5.6	0.725	1.97	0.443	29.3
BN039	WAUSHARA		30					8/26/2014	0	0	0			0			0		2.21	5.36	5.18	1.16			0	36.3
AB136	ADAMS	Apr-88	51		51	31	Sand	6/26/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AB136	ADAMS	Apr-88	51		51	31	Sand	9/16/2014	0	0	0			0			0		0	0	0	0			0	0
AS274	ADAMS	Apr-89	142		139	107	Sand	6/26/2019	0.061	0	0.092	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.29
AS274	ADAMS	Apr-89	142		139	107	Sand	9/16/2014	0	0	0			0			0		0	0	0	0			0	2.51
YU773	ADAMS	Oct-17	118		114	34	Sand	6/26/2019	0.068	0.091	1.489	0	0	0	0	0.072	0	0	0	1.27	0	0	0	0	0	9.17
PX941	ADAMS							9/16/2014	0	0	0			0			0		0	1.24	0	0			0	10.1
PX912	JUNEAU							6/26/2019	0.092	0	0	1.66	0.546	0.489	0	0	0.076	0.089	0.17	4.61	2.27	0.226	0	0.2	0.593	7.96
PX912	JUNEAU							7/8/2014	0.495	0	0			0.297			0.599		0	10.1	7.27	1.42			0	21.9
PX913	JUNEAU							6/26/2019	1.27	0.053	0.114	0.107	0.088	0.196	0	0	1	0	0.409	15.2	10.6	0	0	0	0.033	20.3
PX913	JUNEAU							7/8/2014	1.93	0	0			0.249			0.363		0.519	20.8	17.1	0			0	23.7
PX914	JUNEAU							6/26/2019	1.63	0.057	0.128	0.275	0	0.156	0	0	0.357	0	0.265	13.2	9.58	0.305	0	0	0	23.4
PX914	JUNEAU							7/8/2014	6.73	0	0			0.244			0		0	9.84	6.25	0.296			0	27
QP237	JUNEAU	Aug-02	53		6	22	Sand	6/26/2019	1.3	0.076	0.076	0	0.146	0.399	0.158	0	0.435	0.278	0.1	21.1	17.2	0.916	0.138	1.34	1.29	46.4
QP237	JUNEAU	Aug-02	53		6	22	Sand	7/8/2014	2.42	0.195	0.195			0			0.631		0	9.44	7.95	1.39			0.206	27.7
PX915	WOOD							6/26/2019	0.542	0	0	2.17	0	0.186	0	0	0.276	0.053	0	3.88	2.22	0.645	0	0	0.03	18.5
PX915	WOOD							7/8/2014	0.858	0	0			0			0.284		0	13.1	8.85	0.949			0	22

Notes: Shaded rows are data for the same well as the unshaded row above, but from a prior date. WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

5. *Summary: Sauk County*

In 2019, DATCP collected samples from 17 residential wells in Sauk County. Eleven wells were sampled in the north half of the county near Reedsburg and Loganville (●), and six in the south half of the county near Sauk City (X). Test results are shown in the table below. Wells in the northern area were sampled in both 2014 and 2019, while those in the south were sampled for the first time in 2019.



Near Reedsburg, crops observed at the time of sampling were mainly corn, soybeans, hay and alfalfa. Near Sauk City, crops observed were mainly corn and soybeans with less forage. The area near Reedsburg had no irrigation, while near Sauk City there were numerous fields under irrigation. Soils in cropped areas of the northern area ranged from silt loam variants south of Reedsburg to coarser sandy soils east of the city. In the area to the south, soils are predominantly sandy loam and loamy sands that formed on the Wisconsin River terrace. Both areas are marked by shallow groundwater.

Sauk County

- Records indicate that wells sampled near Sauk City withdraw water from unconsolidated sand.
- Records indicate that wells sampled near Reedsburg are cased into sandstone bedrock and withdraw water from depths between 20 to 100 feet bgs.
- Nitrate was detected in all but one well sampled near Sauk City (VR809); this well had no detections of nitrate or pesticides in 2019. Information on the depth and construction of this well was not available.
- Two well samples (MP685 and PX686) from northern Sauk Co. in 2019 detected no pesticides.
- Samples from the 11 wells sampled in 2014 and again in 2019 had remarkably similar test results. The same four wells exceeded the 10 mg/l ES for nitrate (36-percent) in both years; the ES was not exceeded in the remaining wells samples in 2014 and again in 2019. Nitrate concentrations declined in seven 2019 samples, and observed increases were less than 2 mg/l above the 2014 result. These results suggest the same if not improved nitrate water quality in 2019 compared to 2014.
- The highest nitrate and pesticide concentrations were detected in well samples collected within southern Sauk Co. Nitrate concentrations in these samples ranged from non-detect to 38.5 mg/l (FO431).
- For samples collected in 2019:
    - 82-percent of samples contained one or more pesticides or pesticide metabolites.
    - Nine pesticides or pesticide metabolites were detected.
    - The most frequently detected pesticides include metolachlor-ESA (13), atrazine TCR (11) and alachlor-ESA (7).
    - The insecticide clothianidin was detected in four samples.
    - Atrazine-TCR exceeded the PAL (0.3 µg/l) in five samples.

(continued on next page)

Results for Sauk County (17)

WUWN	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ACETOCHLOR ESA	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	BENTAZON	CLOTHIANIDIN	DIMETHEN-ESA	METOLACHL-ESA	METOLACHL-OA	NITRATE
DL437	SAUK		100		60		Sandstone	7/16/2019	0	0.245	0	0	0	0	0	0	0	1.95
DL437	SAUK		100		60		Sandstone	6/17/2014	0	0	0	0		0		0	0	2.39
EF654	SAUK	Jan-75	109	40	45		Sandstone	7/16/2019	0	0	0	0.164	0	0.035	0	2.33	0	11.6
EF654	SAUK	Jan-75	109	40	45		Sandstone	6/10/2014	0.259	0	0.225	0.782		0		2.63	0.262	17.8
ME723	SAUK	May-98	114		41	55	Sandstone	7/16/2019	0	0	0	0	0	0	0	0.993	0	12.5
ME723	SAUK	May-98	114		41	55	Sandstone	6/10/2014	0	0	0	0		0		0.278	0	11.5
MP685	SAUK	Oct-98	100		32	33	Sandstone	7/16/2019	0	0	0	0	0	0	0	0	0	2.74
MP685	SAUK	Oct-98	100		32	33	Sandstone	7/29/2014	0	0.44	0	0		0		0	0	3.15
OH825	SAUK	Apr-01	80	9	42	41	Sandstone	7/16/2019	0	1.34	0.144	0.372	0	0	0	4.3	0	11.2
OH825	SAUK	Apr-01	80	9	42	41	Sandstone	6/10/2014	0	6.92	0.274	0.81		0		3.42	0	14.7
PX679	SAUK							7/16/2019	0	0	0	0.437	0	0	0	0.808	0	4.42
PX679	SAUK							6/10/2014	0	0.237	0.174	0.502		0		1.75	0.148	8.31
PX680	SAUK							7/16/2019	0	0	0.076	0.659	0	0	0	2.82	0	8.79
PX680	SAUK							6/10/2014	0	0	0	0.395		0		2.62	0	7.54
PX686	SAUK							7/16/2019	0	0	0	0	0	0	0	0	0	3.57
PX686	SAUK							6/10/2014	0	0	0	0		0		0	0	3.96
PX692	SAUK							7/16/2019	1.68	0	0	0.081	0	0.039	0.819	1.26	0	15.2
PX692	SAUK							6/17/2014	0.774	0	0	0.34		0		8.96	2.72	18.8
PX696	SAUK							7/16/2019	0.126	0.109	0	0.132	0	0	0	0.241	0	3.37
PX696	SAUK							6/17/2014	0	0	0	0		0		0.134	0	2.74
UB944	SAUK	Mar-11	112		61	20	Sandstone	7/16/2019	0	0	0.07	0.309	0	0	0	0.125	0	2.4
UB944	SAUK	Mar-11	112		61	20	Sandstone	6/10/2014	0	0	0	0.34		0		0	0	1.88
CJ343	SAUK	Jul-89	131		126	15	Sand	8/13/2019	0	0.207	0	0.066	0	0	0	0.196	0	5.31
FO431	SAUK	Dec-92	99		95	12	Sand	8/13/2019	0	0.646	0.078	0.241	0	0.352	0	13.5	8.06	38.5
HI811	SAUK	Jun-94	105		100	58	Sand	8/13/2019	0	0	0	0	0	0	0	1.04	0	4.68
RZ423	SAUK	Oct-02	140		137	15	Sand	8/13/2019	0	0.489	0	0.059	0.204	0.099	0	5.94	2.23	31.6
VR809	SAUK							8/13/2019	0	0	0	0	0	0	0	0	0	0
WA841	SAUK							8/13/2019	0	1.18	0.071	0.807	0	0	0	0.413	0	9.84

Notes: Shaded rows are data for the same well as the unshaded row above, but from a prior date. WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

6. *Summary: Jefferson and Washington Counties*

In 2019, DATCP collected samples from seven residential wells in Jefferson County and four in Washington County. Well locations are shown on the figure to the right.

Field crops observed include corn, soybeans, wheat and forage. Regional geology in both consists of glacial landforms like drumlins, outwash valleys, drift and end moraine deposits. Soil types vary greatly over short distances, from poorly drained mucks to well drained sands, and sandy and silt loams. Agricultural fields are often small and follow hills and valleys on the landscape. Irrigation is uncommon.

- One well (WA842) was sampled for the first time in 2019, and the remaining wells were sampled in 2014 and 2019. Nitrate exceeded the 10 mg/l ES in three Jefferson County wells (PX923, PX924 and WA842), and was detected below the ES in the remaining samples. Results for all four Washington County wells had similar test results for 2019 compared to 2014.
- The highest nitrate concentrations were observed at well PX924. It declined from 33.2 mg/l in 2014 to 29.7 mg/l in 2019. Nitrate concentrations at well PX923 increased from 9.71 mg/l in 2014 to 16.9 mg/l in 2019.
- For samples collected in 2019:
  - 72-percent of samples contained one or more pesticides or pesticide metabolites, no sample contained more than three.
  - The most frequently detected pesticides include metolachlor-ESA (4) and atrazine TCR (4).
  - The insecticide clothianidin was detected in one sample.
- Atrazine-TCR exceeded the 0.3 µg/l PAL in one sample.

Results for Jefferson (7) and Washington (4) Counties

WUWN	County	InstallationDate	WellDepth	BedrockDepth	CasingDepth	StaticWaterDepth	Description	SampleDate	ALACHLOR ESA	ATRAZINE	ATRAZINE TCR	CLOTHIANIDIN	METOLACHL-ESA	PICLORAM	TRICLOPYR	NITRATE
PX917	JEFFERSON							8/6/2019	0	0	0	0	0	0.346	0.227	3.25
PX917	JEFFERSON							7/15/2014	0	0	0	0	0			4.3
PX918	JEFFERSON							8/6/2019	0	0	0	0	0	0	0	1.38
PX918	JEFFERSON							7/15/2014	0	0	0	0	0			0
PX919	JEFFERSON							8/6/2019	0.066	0	0	0	0	0	0	0
PX919	JEFFERSON							7/15/2014	0	0	0	0	0			0
PX922	JEFFERSON							8/6/2019	0.164	0	0	0	0	0	0	0.635
PX922	JEFFERSON							7/15/2014	0.501	0	0	0	0			0.831
PX923	JEFFERSON							8/6/2019	0	0	0.29	0	0.19	0	0	16.9
PX923	JEFFERSON							7/15/2014	0	0	0	0	0.265			9.71
PX924	JEFFERSON							8/6/2019	0	0	0.569	0	2.68	0	0	29.7
PX924	JEFFERSON							7/15/2014	0.12	0	0.607	0	2.72			33.2
WA842	JEFFERSON							8/6/2019	0	0	0.079	0.015	0.55	0	0	10.6
PX925	WASHINGTON							8/6/2019	0	0	0.517	0	0	0	0	6.63
PX925	WASHINGTON							7/22/2014	0	0	0	0	0			6.55
PX928	WASHINGTON							8/6/2019	0	0	0	0	0	0	0	1.34
PX928	WASHINGTON							7/22/2014	0	0	0	0	0			0.828
PX931	WASHINGTON							8/6/2019	0	0	0	0	0	0	0	1.17
PX931	WASHINGTON							7/22/2014	0	0	0	0	0			0
PX932	WASHINGTON		80.5		78			8/6/2019	0	0	0	0	0.326	0	0	0
PX932	WASHINGTON		80.5		78			7/22/2014	0	0	0	0	0.103			0

Notes: Shaded rows are data for the same well as the unshaded row above, but from a prior date. WUWN means Wisconsin Unique Well Number. Depths shown are in feet. Concentrations are micrograms per liter (µg/l) with the exception of nitrate, which is milligrams per liter (mg/l). Compound names may be abbreviated, see Table 2 for full names. Zero (0) = less than reporting limit shown in Appendix A.

Recommendations

- Attempt to resample all wells again in five years (2024) to evaluate trends in water quality.
- Continue to evaluate data for key pesticides in area wells, including the insecticides clothianidin, imidacloprid, thiamethoxam and chlorantraniliprole.
- Consider resampling wells in 2020 where samples exceeded the proposed ES for imidacloprid.
- Share this summary report with health departments and land conservation departments in the counties where sampling occurred.
- Share monitoring data and report findings with EPA and Groundwater Coordinating Council (GCC) member agencies.

Appendix A

2019 Sample Analytes and Applicable ch. NR 140 PALs, ESs and Reporting Limits

Analyte Description	PAL (µg/l)	ES (µg/l)	Reporting Limit (µg/l)
2,4,5-T			0.050
2,4,5-TP	5	50	0.050
2,4-D	7	70	0.050
2,4-DB			0.80
2,4-DP			0.050
ACETAMIPRID			0.010
ACETOCHLOR	0.7	7	0.050
ACETOCHLOR ESA	46	230	0.050
ACETOCHLOR OA	46	230	0.30
ACIFLUORFEN			0.050
ALACHLOR	0.2	2	0.050
ALACHLOR ESA	4	20	0.053
ALACHLOR OA			0.25
ALDICARB SULFONE			0.050
ALDICARB SULFOXIDE			0.071
AMINOPYRALID			0.150
ATRAZINE	0.3	3	0.050
DE-ETHYL ATRAZINE	0.3	3	0.050
DEISOPROPYL ATRAZINE	0.3	3	0.050
DIAMINO ATRAZINE	0.3	3	0.20
ATRAZINE TCR (calculated)	0.3	3	0.050
AZOXYSTROBIN			0.050
BENFLURALIN			0.050
BENTAZON	60	300	0.050
BICYCLOPYRONE			0.050
BROMACIL			0.0050
BIFENTHRIN			0.050
CARBARYL	4	40	0.050
CARBOFURAN	8	40	0.050
CHLORAMBEN	30	150	0.32
CHLORANTRANILIPROLE			0.050
CHLOROTHALONIL			0.10
CHLORPYRIFOS	0.4	2	0.050
CHLORPYRIFOS OXYGEN ANALOG			0.050
CLOMAZONE			0.050
CLOPYRALID			0.050
CLOTHIANIDIN	200 p	1000 p	0.010
CYANTRANILIPROLE			0.050
CYCLANILIPROLE			0.20
CYFLUTHRIN			0.050
CYPERMETHRIN			0.10
CYPROSULFAMIDE			0.050
DACTHAL	14	70	0.050
DIAZINON			0.050
DIAZINON OXYGEN ANALOG			0.050
DICAMBA	60	300	0.30
DICHLOBENIL			0.050
DIMETHENAMID	5	50	0.050
DIMETHENAMID ESA			0.050
DIMETHENAMID OA			0.050
DIMETHOATE	0.4	2	0.050
DINOTEFURAN			0.010
DIURON			0.050

Analyte Description	PAL (µg/l)	ES (µg/l)	Reporting Limit (µg/l)
EPTC	50	250	0.050
ESFENVALERATE			0.025
ETHALFLURALIN			0.050
ETHOFUMESATE			0.050
FLUMETSULAM			0.050
FLUPYRADIFURONE			0.050
FLUROXYPYR			0.070
FOMESAFEN			0.050
HALOSULFURON METHYL			0.050
HEXAZINONE			0.050
IMAZAPYR			0.050
IMAZETHAPYR			0.050
IMIDACLOPRID	0.02 p	0.2 p	0.010
ISOXAFLUTOLE	0.3 p	3 p	0.050
ISOXAFLUTOLE RPA202248 (DKN)	0.3 p	3 p	0.050
LAMBDA-CYHALOTHRIN			0.020
LINURON			0.050
MALATHION			0.050
MCPA			0.050
MCPB			0.10
MCPP			0.050
MESOTRIONE			0.10
METALAXYL			0.050
METHYL PARATHION			0.050
METOLACHLOR	10	100	0.050
METOLACHLOR ESA	260	1300	0.050
METOLACHLOR OA	260	1300	0.27
METRIBUZIN	14	70	0.050
METRIBUZIN DA			0.10
METRIBUZIN DADK			0.12
METSULFURON-METHYL			0.050
NICOSULFURON			0.050
NORFLURAZON			0.050
OXADIAZON			0.050
PENDIMETHALIN			0.050
PERMETHRIN			0.030
PICLORAM	100	500	0.050
PROMETONE	20	100	0.050
PROMETRYN			0.050
PROPICONAZOLE			0.050
PROTHIOCONAZOLE-DESTHIO			0.050
SAFLUFENACIL			0.050
SIMAZINE	0.4	4	0.050
SULFENTRAZONE	100 p	1000 p	0.050
SULFOMETURON-METHYL			0.050
TEBUPIRIMPHOS			0.050
TEMBOTRIONE			0.10
THIACLOPRID			0.010
THIAMETHOXAM	10 p	100 p	0.010
THIENCARBAZONE-METHYL	160 p	800 p	0.050
TRICLOPYR			0.050
TRIFLURALIN	0.75	7.5	0.050
NITROGEN-NITRATE/NITRITE (mg/l)	2	10	0.50 mg/l

p: proposed at time of reporting