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2023 Field-Edge Groundwater Monitoring Program

ANNUAL REPORT

Wisconsin Department of Agriculture, Trade and Consumer Protection

Agricultural Resource Management Division

Environmental Quality Unit

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Introduction

In 2023, the Wisconsin Department of Agriculture, Trade and Consumer Protection's (DATCP) Agrichemical Management (ACM) Bureau continued the Field-Edge Groundwater Monitoring Program to document the effect continual pesticide use is having on groundwater quality. Groundwater monitoring was performed by DATCP staff across a network of 71 monitoring wells and piezometers at 22 established locations. At each location, depth to groundwater is measured and groundwater samples are collected in the spring and fall to identify pesticide concentrations and evaluate seasonal variations. Collected samples are submitted to DATCP's Bureau of Laboratory Services (BLS) for chemical analysis. This report has been prepared to document 2023 program activities and includes a summary of groundwater level measurements and analytical data results. Recommendations for the 2023 Field-Edge Groundwater Monitoring Program plan based on historic trend results are also presented in this report.

A compilation of acronyms and definitions used throughout this document is provided in Appendix A – Acronyms and Definitions.

Purpose of Field-Edge Groundwater Monitoring

It is estimated that agriculture contributes $116.3 billion annually to Wisconsin's economy (Wisconsin Department of Agriculture, Trade and Consumer Protection, 2023a). Growers in Wisconsin use several million pounds of pesticides and tons of fertilizers annually to grow a wide variety of crops. DATCP's Field-Edge Groundwater Monitoring Program is one form of monitoring the agency performs to meet its statutory obligation to protect groundwater quality. 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 whether preventive action limits (PAL) or enforcement standards (ES) have been exceeded at points of standard application. The statute further specifies that agencies should develop monitoring plans that include provisions for conducting four types of monitoring (Wis. Stats., ch. §160.05 and §160.27):

1. Problem assessment monitoring, to detect substances in the groundwater and to assess the significance of the concentrations of the detected substances;
2. Regulatory monitoring, to determine if preventive action limits or enforcement standards are attained or exceeded and to obtain information necessary for the implementation of responses with respect to specific sites;
3. At-risk monitoring, to define and sample at-risk potable wells in areas where substances are detected in the groundwater, or where preventive action limits or enforcement standards are attained or exceeded; and
4. Management practice monitoring, to assure practices are within compliance regulations.

The purpose of the Field-Edge Groundwater Monitoring Program (Program) is to evaluate agricultural practices and agrichemical uses on groundwater quality (problem assessment and regulatory monitoring). Depth to groundwater measurements and groundwater sample results are used to measure affects from agrichemical practices and use within and adjacent to agricultural fields. Affects to groundwater quality from agrichemical use is dependent on conditions at each location. Results are used to measure both localized and regional affects to aquifers over time at each field-edge sampling site. Historic and current goals of the Program include the following:

- Provide an early warning system to detect new agrichemical compounds in groundwater before widespread contamination can occur in underlying aquifers.
- Identify and measure pesticide concentrations that may have a potential to migrate to groundwater and exceed groundwater quality standards.
- Identify which environmental conditions (i.e. depth to groundwater, soil type, and geologic setting) are most vulnerable to conditions from routine agrichemical use.

- Gather and compile data regarding the occurrence and persistence of pesticide and metabolites in groundwater that may affect drinking water wells so that health-based groundwater quality standards can be established.
- Study the dissipation of restricted use pesticides (i.e. atrazine) in groundwater after prohibition areas are established or use is restricted, and the dissipation of pesticides no longer in use (i.e. aldicarb).
- Gather and compile long-term data on nitrate contamination in groundwater and its relationship to application practices.
- Evaluate affects to groundwater quality from various land uses and related pesticide use (i.e. tree nurseries, infiltration basins, golf courses).

Program Approach

DATCP and the property owner typically have access agreements allowing DATCP to install and access a groundwater monitoring well nest for sample collection. Typically, a monitoring well nest consists of a shallow well intersecting the water table and adjacent deeper wells (piezometers) installed with well screens placed at deeper depths within the underlying aquifer. These well nests are installed at the edge of an agricultural field to measure potential affects from routine agrichemical use. Well locations were carefully selected to avoid interference from other potential sources (i.e. septic systems, or spills).

Over time, monitoring well nests have been installed within a variety of geologic settings, often in areas prone to groundwater contamination, such as areas with sandy soil, shallow depths to bedrock, or shallow groundwater. Nested well locations have two to five monitoring wells/piezometers. The shallowest well intersects the water table with piezometers installed at deeper intervals. Table B 1 in Appendix B provides construction specifications for each well in the Program's groundwater monitoring well network. Figure 1 (page 6) depicts the Program's monitoring well nest locations relative to State of Wisconsin and county boundaries.

Program data collection and documentation are completed in accordance with established protocols and guidance (Wisconsin Department of Agricutlure, Trade and Consumer Protection, 2021; Wisconsin Department of Natural Resources, 1996). Depth to water measurements and sample collection procedures are designed to collect reliable data consistently and in an unbiased fashion to ensure that localized conditions and regional impacts to aquifers over time can be evaluated. Field sampling observations and water level measurements are recorded in field notebooks. The compiled field information, along with laboratory results, are retained in databases maintained by DATCP.

Standard operating procedures for groundwater sampling include the following:

- After unlocking the protective casing, remove the well cap to allow the water level to equilibrate with atmospheric pressure before measuring and recording the water level at each well.
- Each well is then properly purged to remove a minimum of four well casing volumes. Purging is performed either by using dedicated bailers and rope, peristatic pumps (low flow) with dedicated tubing, or submersible electric pumps (i.e. whale or tornado pumps) with dedicated tubing. The volume of water removed is measured and recorded in the field logbook.
- Samples are then collected and placed in laboratory-provided containers using either sampling equipment dedicated to the well, or with equipment that is decontaminated prior to use.
- Samples are placed into coolers and held on ice while in transport to the laboratory.
- Water purged from the wells and any rinse water used for cleaning is discarded on the ground surface.
- Field information is recorded in logbooks and maintained by ACM staff.

Groundwater samples are collected using the same equipment used for purging. Samples are collected in one-liter amber glass bottles provided by BLS. (Fifty-millimeter plastic containers were used for select glyphosate sampling.) Bottles and containers are then placed in a cooler and held on ice along with a properly completed sample collection record and hand delivered to BLS within 48 hours. During the 2023 Program, there were no issues with shipping or bottle breakage.

BLS performed all groundwater analytical testing using gas chromatography/mass spectroscopy (GC/MS/MS) and liquid chromatography/mass spectroscopy (LC/MS/MS) methods in accordance with ISO 17025 accreditation standards. All samples were tested for 106 pesticide analytes as well as nitrogen as nitrate plus nitrite. Pesticide analytes are listed in Table B 2 of Appendix B along with corresponding reporting limits. A summary of the 2023 program analytical data results is listed in Table B 3 of Appendix B. Individual monitoring well or piezometer analytical reports are available upon request.

DATCP provides annual program findings documentation for each site to the respective property owner or grower. The summary letters provide the year's water level data and analytical results, and includes a brief discussion of data trends over time. As part of the letter, growers are asked to reply with information regarding crops grown, pesticide use, and the amount of nitrogen applied to the fields that specific year near the monitoring well nest.

Program Assets and Infrastructure

The groundwater-monitoring network for the 2023 Field Edge Monitoring Program included 71 groundwater monitoring wells (29 water table observation wells and 42 piezometers) at 22 locations/stations around the state. Table B 1 in Appendix B lists well construction specifications associated with these Program assets. Figure 1 (page 6) depicts the Program's monitoring sites relative to State of Wisconsin and county boundaries. Construction logs and well development forms (and abandonment forms) associated with the groundwater monitoring wells and piezometers are available upon request. The following is a summary of the Program's well installation and abandonment history.

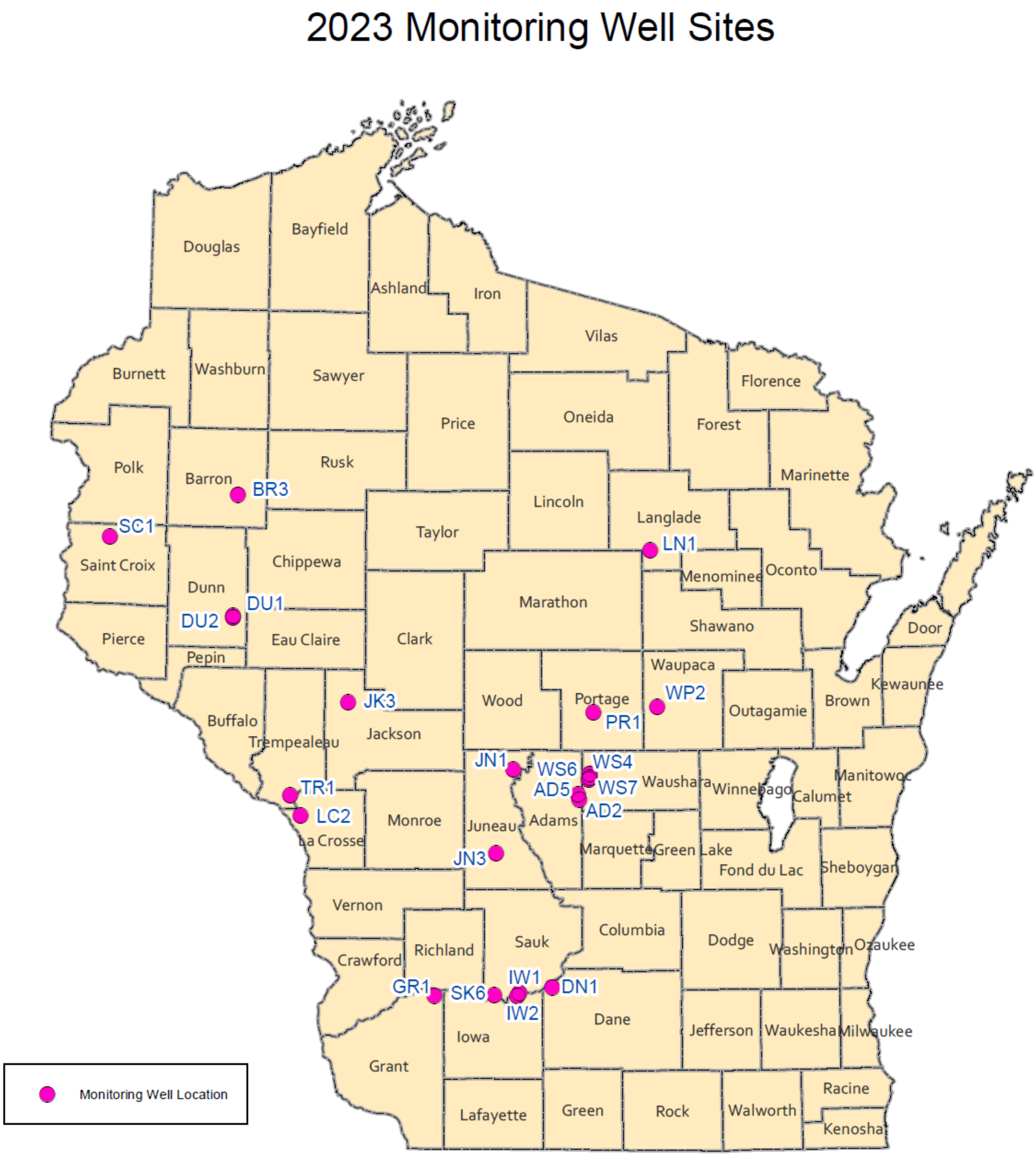

Figure 1: 2023 Monitoring Well Sites

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1985-1989 ORIGINAL MONITORING WELLS AND PIEZOMETERS

The DATCP Field-Edge Groundwater Monitoring Program began in 1985. Initially, arrangements with growers and landowners at 50 sites were established within areas highly susceptible to groundwater contamination (i.e. coarse soil over sand, shallow depth to groundwater and/or irrigated agricultural areas). Groundwater monitoring nests with three to four wells were installed at each site. Nested wells were constructed with well screens placed at various depths in the underlying aquifer. These wells were constructed adjacent to agricultural fields in the Central Sands region, Lower Wisconsin River Valley, and at other sandy soil areas throughout the state. The original Field-Edge Study was designed to collect groundwater samples from the uppermost shallow aquifer. Samples were tested for a limited number of agrichemicals and fertilizer to evaluate potential impacts to shallow groundwater from routine agricultural practices performed at nearby fields.

Data from the Program's initial years led to the establishment of statewide pesticide management plans for both atrazine and aldicarb. Over the years, many of the wells installed for the initial study have been abandoned due to changes in land ownership, urban encroachment, or damage. Of the original 50 sites, monitoring wells remain at 16 sites and were included in the 2023 monitoring program.

2005 MONITORING PROGRAM EXPANSION

In the fall of 2005, DATCP expanded its groundwater monitoring network with funding from a United States Environmental Protection Agency (US EPA) grant. New monitoring wells and piezometers were constructed at six sites based on local agricultural practices and susceptible to groundwater contamination (i.e. shallow groundwater with permeable subsurface soil units). Each of the six sites selected for program expansion were used for a prior DATCP groundwater monitoring study (Evaluation of Renewed Use of Atrazine in Atrazine Prohibition Areas), completed by DATCP in 2005. That study (also known as the Atrazine Reuse Study) was performed to gather information to evaluate the potential to repeal atrazine prohibition areas.

The groundwater flow direction was determined as part of the Atrazine Reuse Study. Using that information, two monitoring wells were installed hydraulically down gradient and adjacent to agricultural fields at the six new sites. All six of these sites (JK3, JN3, SC1, TR1, WP2, and WS6) were included in the 2023 monitoring program. Locations are depicted on Figure 1.

2010 UNIVERSITY WISCONSIN–OSHKOSH WELLS

In the spring of 2010, DATCP became aware of a forthcoming study by a University of Wisconsin-Oshkosh graduate student and the Wisconsin Geological and Natural History Survey (WGNHS). The study included installation of shallow bedrock monitoring wells at the edge of agricultural fields in a karst geological setting. It used monitoring wells at sites in Brown, Calumet, Kewaunee, and Manitowoc counties. Bedrock fractures at each well were identified by the study team. Groundwater samples were collected by the study team and DATCP, and tested annually as part of this Program between 2010 and 2014. The study was completed, and all monitoring wells were subsequently abandoned in 2014.

2011 MONITORING PROGRAM EXPANSION

In the summer and fall of 2011, DATCP expanded its groundwater monitoring network again with additional funding from an US EPA grant. Monitoring wells were constructed at two new stations in La Crosse and St. Croix counties. These wells were installed along an elevated terrace adjacent to the Mississippi River. Since the groundwater flow direction was known at each site (both locations were part of the Atrazine Reuse Study), DATCP installed two groundwater monitoring wells at each site at the hydraulically down gradient edge of each agricultural field. Wells at both sites (LC2 and SC1) remain and were included in the 2023 monitoring program. Locations are depicted on Figure 1.

2017 MONITORING PROGRAM EXPANSION

In the summer and fall of 2017, DATCP further expanded the groundwater monitoring network with additional funding from a US EPA grant. Piezometers were constructed at three existing sites (two sites in Adams County [AD2 and AD5] and one in Portage County [PR1]) and at one new site, the Hancock Agricultural

Research Station (HARS). At each of these sites, two piezometers were installed near the existing groundwater monitoring nest with five-foot screens located at depths greater than 50 feet and 80 feet. The purpose was to evaluate groundwater quality relative to agrichemical uses at deeper aquifer intervals and compare data to shallower aquifer depths. A water table observation well (well screen placed to intersect the water table) was also constructed at HARS. The HARS site and nested wells at the Adams and Portage County sites remain and were included in the 2023 Program. Locations are depicted on Figure 1.

2021 MONITORING PROGRAM EXPANSION/ABANDONMENT

In the summer and fall of 2021, DATCP obtained additional funding from a US EPA grant again to expand the groundwater monitoring network. Eleven monitoring wells/piezometers were installed at six existing nested monitoring well sites. New wells were installed at sites in Adams County (AD2 and AD5), Dane County (DN1), Sauk County (SK6), Waushara County (WS7), and at two sites in Iowa County (IW1 and IW2). A monitoring well was also installed at the Dane County site to replace a well that was damaged beyond repair and subsequently abandoned in 2018. This shallow well was installed with a well screen intersecting the water table. Wells installed at the other five sites were constructed as piezometers with well screens placed 30 to 40 feet further in depth below the deepest existing piezometer screen already on-site in the well nest. These new piezometers were constructed with 5-foot long well screens. The purpose was to evaluate groundwater quality relative to agrichemical uses at deeper aquifer intervals and compare data across vertical aquifer horizons. All new wells were included in the 2023 fall sampling event. Locations are depicted on Figure 1.

Additionally, five wells at two monitoring locations were removed from the Program in 2021 in response to a change in property ownership. New owners for two Adams County sites (AD3 and AD4) did not want to continue to participate in the Program and requested removal of the wells. Two shallow water table observation monitoring wells and three piezometers were abandoned in December 2021.

2023 MONITORING PROGRAM ABANDONMENT

In fall of 2023, it was observed during the fall groundwater sampling event that three groundwater monitoring wells associated with Program had been damaged. The wells were located in St. Croix (one constructed in 2005 and the second constructed in 2011 at a common property) and Langlade counties (one constructed in 1986). It was likely that the wells were damaged by agricultural operations conducted on the adjacent fields. In accordance with Wisconsin Administrative Code (Wisc. Admin. Code) NR141.25, the monitoring wells needed to be abandoned since they could be a conduit for groundwater contamination. In November of 2023, all three wells were properly abandoned.

2023 Results

A total of 144 water level measurements and 81 groundwater samples were collected as a part of DATCP's 2023 Field-Edge Groundwater Monitoring Program. All groundwater samples were submitted to BLS for chemical analysis. Table B 3 in Appendix B summarizes 2023 Program analytical results and provides comparative risk values. The analytical data is compared to groundwater/drinking water standards to assess potential risk to human health and the environment. The risk values are sourced from the Wisc. Admin. Code ch. NR 140 for groundwater qualitative health standard limits and Wisconsin Department of Health Services (DHS) drinking water health advisories.

Key findings for 2023 include the following.

- Information regarding field use of pesticides and fertilizer was requested from growers for 22 sites, but only nine growers responded. This is a typical response.
- Water level measurements collected in 2023 indicate an overall slight decline in water table elevations compared to prior years. In 2023, according to National Oceanic and Atmospheric Administration (NOAA), the state received on average 31.13 inches of precipitation compared to a historical average of 34.06 inches. This slight decline in water level measurements is likely related to the less than average annual precipitation.

- Laboratory analysis include 106 pesticide analytes for the laboratory testing methods. During 2023, 31 pesticide analytes were detected in excess of reporting limits in numerous groundwater samples, which is similar to previous years.
- Groundwater sample collected in 2023 with pesticides concentrations detected in excess of laboratory reporting limits include 12 herbicides, 13 herbicide metabolites, five insecticides, and one fungicide.
- It appears that pesticides were detected at slightly greater concentrations during the spring sampling event compared to fall results.
- Overall, analytical data collected at nested monitoring wells indicates that pesticide and nitrogen concentrations increase with depth. Greater concentrations at depth indicate that pesticides migrate vertically and laterally within the underlying aquifers. This trend is consistent with prior years' findings.
- Metolachlor ethanesulfonic acid (ESA) was detected in excess of laboratory reporting limits in 96% of all samples collected and was the most frequently detected pesticide in 2023. Additionally, metolachlor ESA was detected at each groundwater monitoring site, which is the only compound detected at each monitoring well nest location. This is consistent with prior years' findings.
- Metolachlor OA was the second most frequently detected compound. It was detected in excess of laboratory reporting limits in 77% of the samples collected, and at 15 of the 22 groundwater monitoring sites. These observations are consistent with findings from prior years.
- Alachlor ESA was the third most frequently detected compound. It was detected in excess of laboratory reporting limits in 73% of the samples collected. However, the number of sites where it was detected (13 sites) has been decreasing when compared to previous year's findings.
- Atrazine or one of its breakdown products (de-ethyl atrazine, de-isopropyl atrazine, and diamino atrazine) was detected in excess of laboratory reporting limits in 48% of the samples collected. At each site with nested wells, results were evaluated by well depth. The greatest concentrations were detected in groundwater samples collected from the deepest piezometers. This is consistent with historical data.
- Neonicotinoid compounds clothianidin, imidacloprid, and thiamethoxam were detected in excess of laboratory reporting limits in 22%, 31%, and 43%, respectively, of the samples collected in 2023. The frequency of detection is similar to observations from the previous year.
- There were three Wisc. Admin. Code, ch. NR 140 ES exceedances of an established groundwater quality health standards. (Note; only 29 of the 106 pesticides tested for have established groundwater quality health standard levels). The parent material metolachlor and metribuzin exceeded their respective ES in a November groundwater sample collected from a well nest located in Waushara County. A subsequent groundwater sample collected from the same monitoring well in December to validate the results again contained only a metolachlor concentration still exceeding the ES, but at a lesser concentration. Additionally, there were Wisc. Admin. Code, ch. NR 140 PAL exceedances for alachlor ESA, atrazine, de-ethyl atrazine, de-isopropyl atrazine, di-amino atrazine, and atrazine total chlorinated residuals (TCR) at multiple locations and monitoring wells.
- DHS has also established drinking water quality advisories for several pesticides. Imidacloprid was detected at eight out of 22 sites, with four of the 25 detections exceeding the DHS drinking water health advisory level of 0.2 micrograms per liter (µg/L) or parts per billion (ppb). The number of exceedances is a reduction from previous years.

GROWER RESPONSES

DATCP obtained information for 2023 regarding crops grown, pesticide use, and the amount of nitrogen applied to the fields adjacent to monitoring well nests. A request for this information was included with each 2022 summary letter sent to nearby property owners and growers. Responses to the information request is voluntary. DATCP received replies from nine of the 21 sites. No information was requested from HARS for site WS7. Table B 4 in Appendix B summarizes information provided by the growers along with available information from the previous seven years. The following Table 1 is a summary of crops grown adjacent to the monitoring well nests and nitrogen use data for 2023 based on property owners and growers' responses.

Table 1: Crops Grown and Nitrogen Applied on Fields Adjacent to 2023 Field Edge Stations

Crop	Number of Sites with Crops	Percent of Sites (reported)	Range of Nitrogen Applied (lbs / acre)
Corn	5	56%	225 – 400
Soybeans	2	22%	0 and 42.5
Potato	1	11%	54.3
Carrots	1	11%	183

Irrigation systems are present at 19 of the 22 monitoring sites. Of the 19 sites with irrigation systems, seven sites provided water usage data for 2023. Growers reported that the range of irrigation water applied to the fields in 2023 ranged from 6.65 to 30.2 inches per acre.

Growers were also asked if they have state-approved Nutrient Management Plans for the adjacent fields. Of the nine respondents, five indicated they have an approved plan.

A wide variety of pesticides used on fields adjacent to field edge monitoring wells was reported by the growers. Glyphosate was the most widely used active ingredient pesticide followed by metolachlor. A total of 21 different active ingredients (pesticide compounds) were reported to be applied in 2023 to the nine fields. Table B 4 in Appendix B identifies the complete list of pesticides used in 2023 as reported by the growers.

WATER LEVEL MEASUREMENTS

Depth to water level is measured at each well prior to collection of groundwater samples for laboratory testing, and measurements are compared with past DATCP records to determine any historic trends. Water level measurements are typically taken in late spring and again in late fall. In 2023, this included April, May, June, October, and November. Overall, measured water levels of sampled wells increased slightly during 2023 by an average of 0.89 inches. Additionally, well water levels were slightly higher on average than historic measurements made during the same months.

Wisconsin averages 34.06 inches of precipitation annually according to the 1991-2020 historic climate information (Midwestern Regional Climate Center, 2023). In 2023, the state was slightly drier than usual, receiving 31.13 inches of total precipitation (Midwestern Regional Climate Center, 2023). Figure 2 depicts the total accumulated precipitation in Wisconsin over the course of 2023 (Wisconsin State Climatology Office, 2023). The map shows a relatively even distribution of total accumulated precipitation, with most of the state receiving between 30 and 40 inches. Several isolated spots received relatively less rain (between 25 and 30 inches), particularly in the southwestern region of the state.

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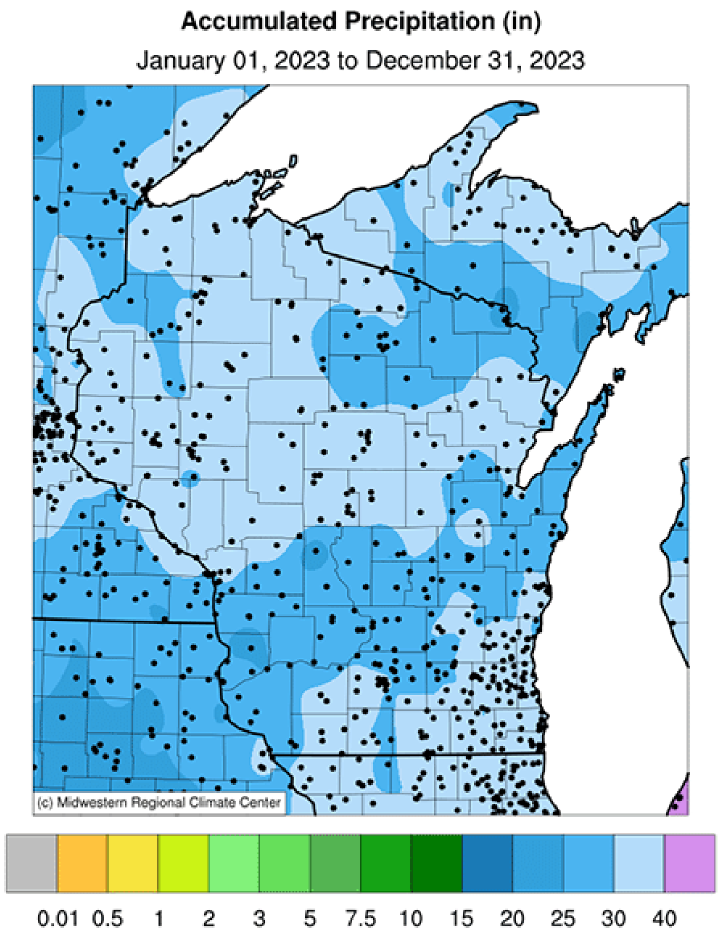
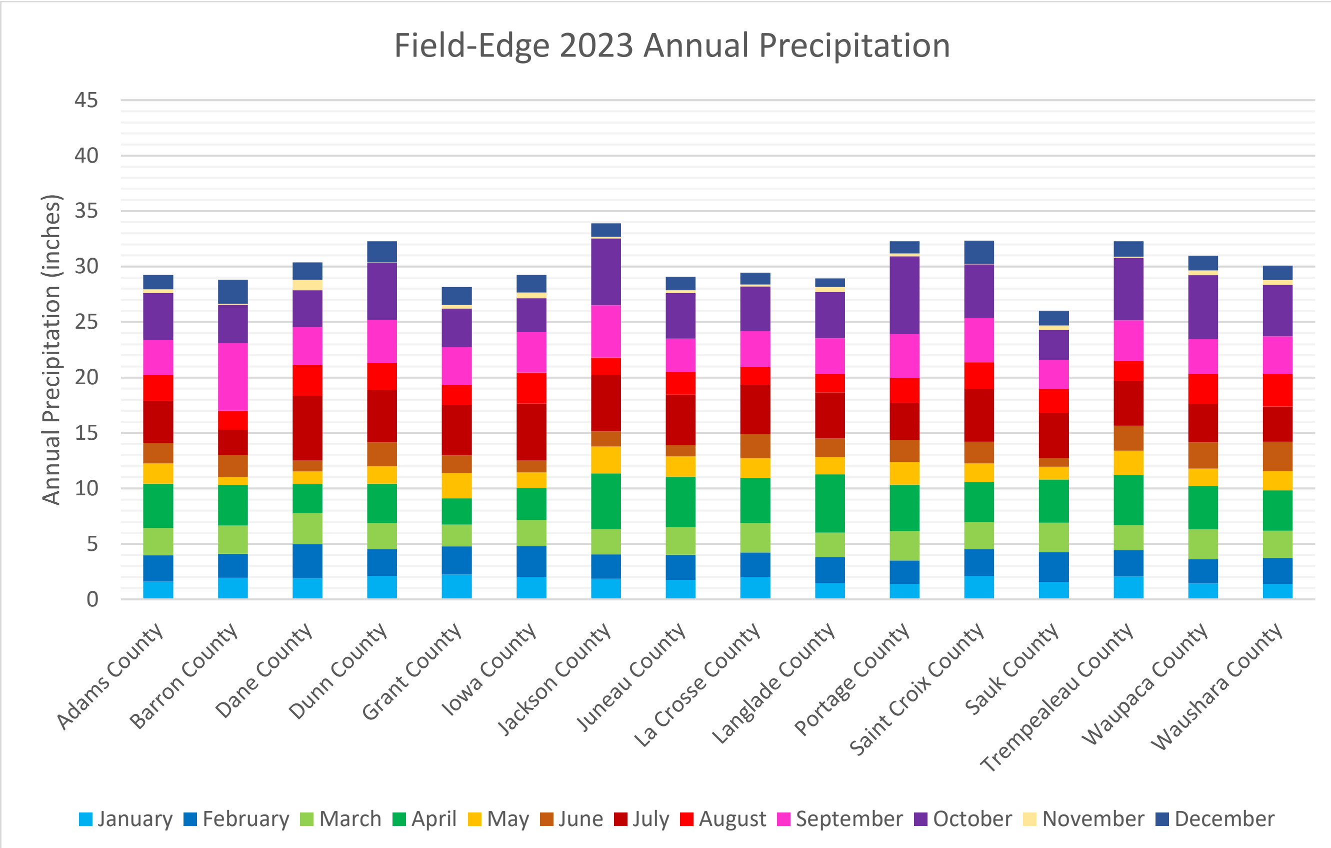
Figure 2: Accumulated Precipitation from the Wisconsin Monthly Climate Watch Archive



The monthly total precipitation for each county with a Field-Edge Program monitoring well nest is shown in Figure 3 below. The figure was produced using data from the NOAA National Centers for Environmental Information (2023). Each color within a bar represents the amount of precipitation received during its corresponding month.

Figure 3: 2023 Monthly Precipitation Totals for Sampling-Site Counties from the NOAA Monthly Climate Watch Archive



Records of storm events provide specifics relating to precipitation patterns seen in sampled counties during 2023 (NOAA National Centers for Environmental Information, 2023). Between January and April of 2023, heavy snowfall events occurred on six occasions in nine counties across central and southern counties of Wisconsin. Heavy rain events in October occurred on three days in four counties, primarily in the western portion of the state. Throughout the year, 12 counties saw hail on 13 separate days throughout the state. These hail events primarily occurred during the months of July and October.

Figure 4 depicts the monthly statewide precipitation departures from the historic 1991-2020 average (Wisconsin State Climatology Office, 2023). Positive precipitation departure values indicate more precipitation was received than average for that month, and negative means relatively less was received. In 2023, the months of January, February, March, April, and October had positive departures from the historic average. May, June, July, August, and November had negative departures from the historic average. May and June saw the biggest negative departures and were in excess of -2 inches. The values of negative precipitation departure ranged from nearly 0 to approximately -2.9 inches and positive precipitation departure values ranged from about 0.1 to 1.2 inches.

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Figure 4: Wisconsin Monthly Precipitation Departures (from 1991-2020 Average) for 2023

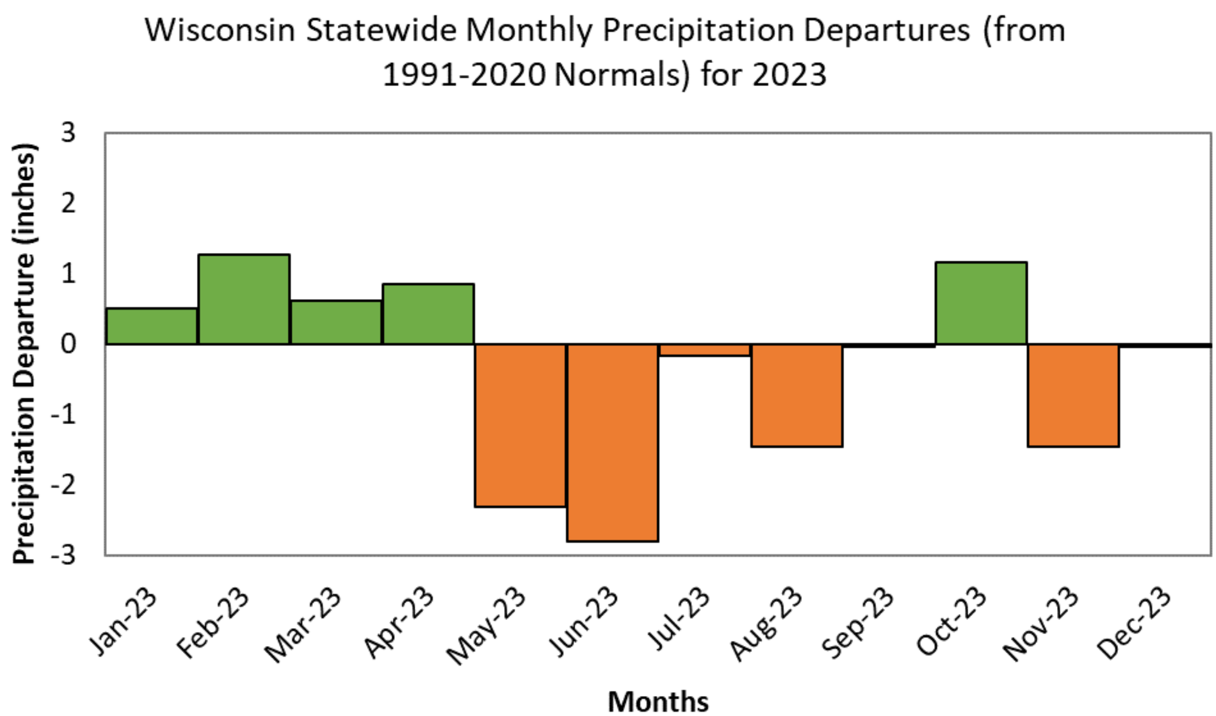
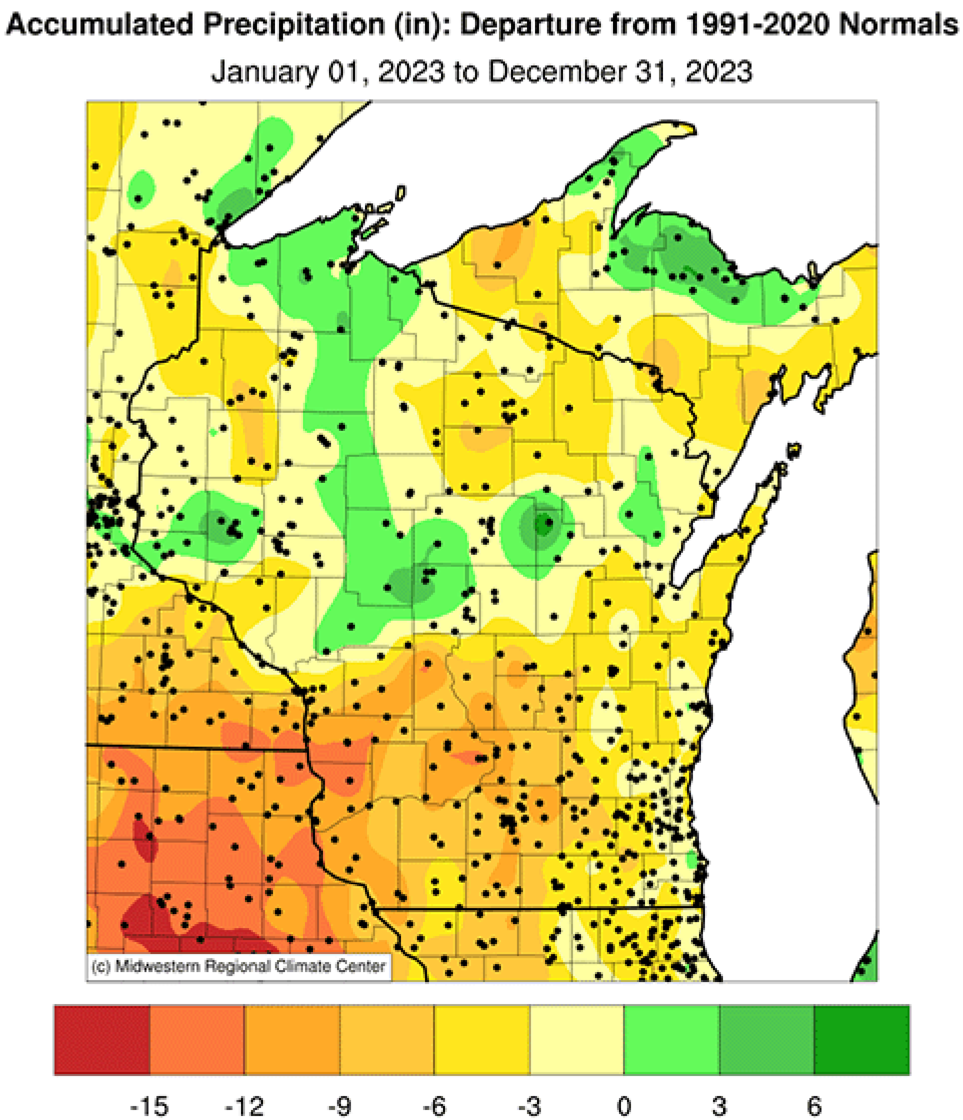


Figure 5 shows the accumulated precipitation departure in 2023 across Wisconsin as provided by the Wisconsin State Climatology Office (2023). The colors on the map show the difference between the amounts of precipitation received in 2023 compared to the 1991-2020 historic average. Yellow and green indicate more precipitation accumulated than average while orange and red indicate less. Most of Wisconsin generally received slightly less total precipitation than usual, particularly in the northwestern region of the state where some regions received three to nine inches less than normal. Several areas in the eastern region received greater than average precipitation, up to three to six inches. Overall, the total precipitation accumulated during 2023 was classified as "near average" relative to historic records (NOAA National Centers for Environmental Information, 2024).

Figure 5: Wisconsin Accumulated Precipitation (in): Departure from 1991-2020 Average



The following Figures (6 to 8) provide examples of measured water level fluctuations over time for three wells in the groundwater monitoring network. These three wells are at sites with infrastructure for irrigation. Graphs showing water level measurement trends for all other wells in the groundwater monitoring network are available upon request.

2023 water level data for Field-Edge Monitoring Program Adams County station AD2 indicate a lowering water level relative to the past several years (Figure 6). In 2023, water levels were statistically at the average for the duration of the monitoring program. According to NOAA, Adams County received only 29.26 inches of precipitation in 2023, which was notably less than the past nine years, compared to an average yearly precipitation of 34.24 inches. This precipitation decrease is likely the explanation for the decrease in 2023 water level observations compared to the previous years.

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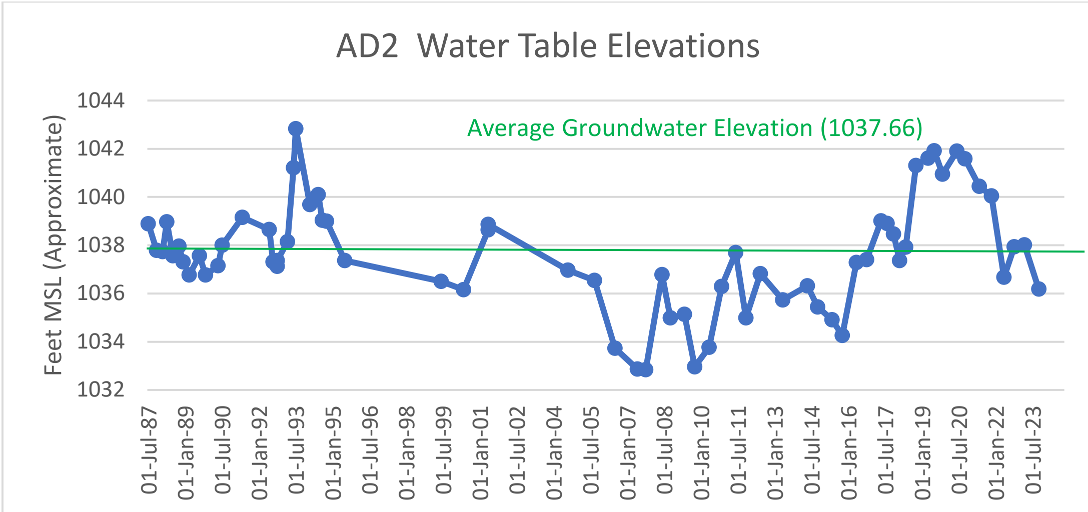
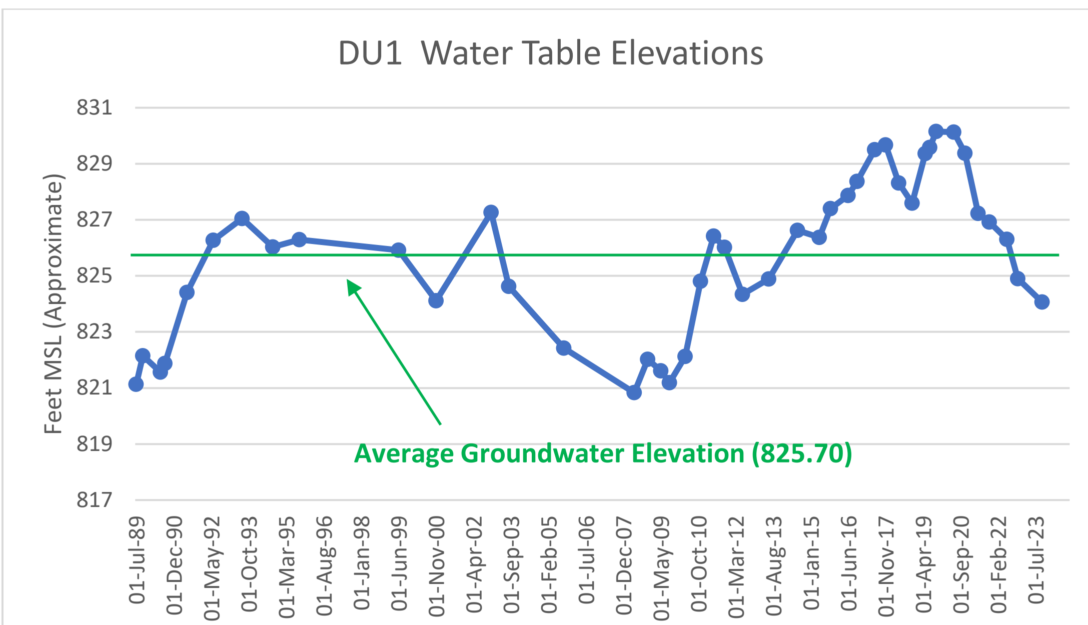
Figure 6: Historic Water Table Level Data for a Field-Edge Monitoring Station AD2 in Adams County



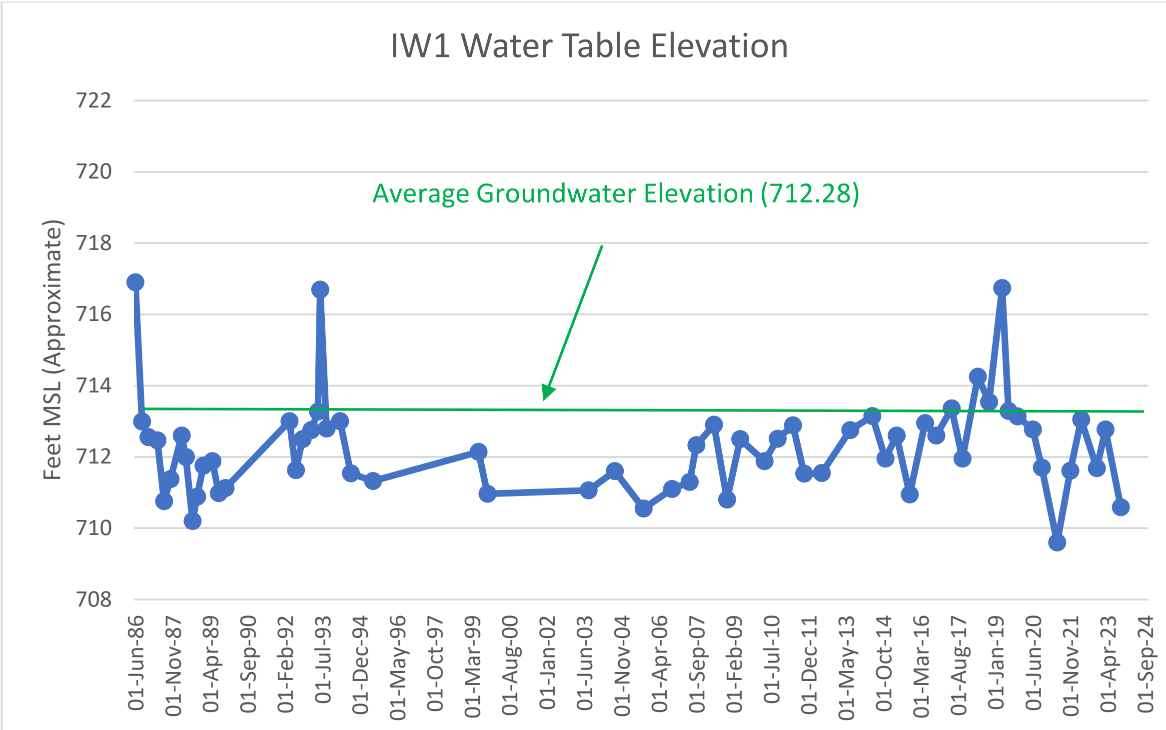
2023 water level data for Dunn County station DU1 also indicated a continued decrease compared to the previous year (Figure 7). In 2023, the water levels continue to drop slightly below its historic average. In Dunn County, NOAA has reported that precipitation levels over the past couple of years have been less than average. The receding water level recorded in the DU1 location wells likely reflect that decreasing precipitation.

Figure 7: Historic Water Table Level Data for a Field-Edge Monitoring Station DU1 in Dunn County



2023 water level data for Iowa County station IW1 indicates stable water table conditions (compared to the previous three reported locations), consistent with historical measurements (Figure 8). Because this site is near the Wisconsin River, it is likely influenced by river water levels and the dams that control water stage and flow. High water table conditions in the spring have been observed several times at this location over the course of the monitoring program. The overall trend continues to indicate a stable trend over the past 20 years, which likely correlates to nearby river elevations. Precipitation amount have less of an effect.

Figure 8: Historic Water Table Level Data for a Field-Edge Monitoring Station IW1 in Iowa County



DATCP is planning to complete an additional evaluation of groundwater elevation data for each individual monitoring site as part of a detailed study. Historical water level monitoring data will be evaluated for each site and results will be documented in a separate report prepared for each site (*Historical Field-Edge Site Data Analysis*). This evaluation will include a comparison of water level trends to precipitation records. These reports are planned to be completed over a three-year period with the first group available in 2025.

PESTICIDE DETECTION FREQUENCY

Thirty-two of the 106 analytes tested in DATCP's 2023 Field-Edge Groundwater Monitoring Program were detected in excess of laboratory reporting limits. The number of compounds detected in 2023 were fairly consistent from 2022 when 32 analytes were also detected and is consistent with historical detection numbers.

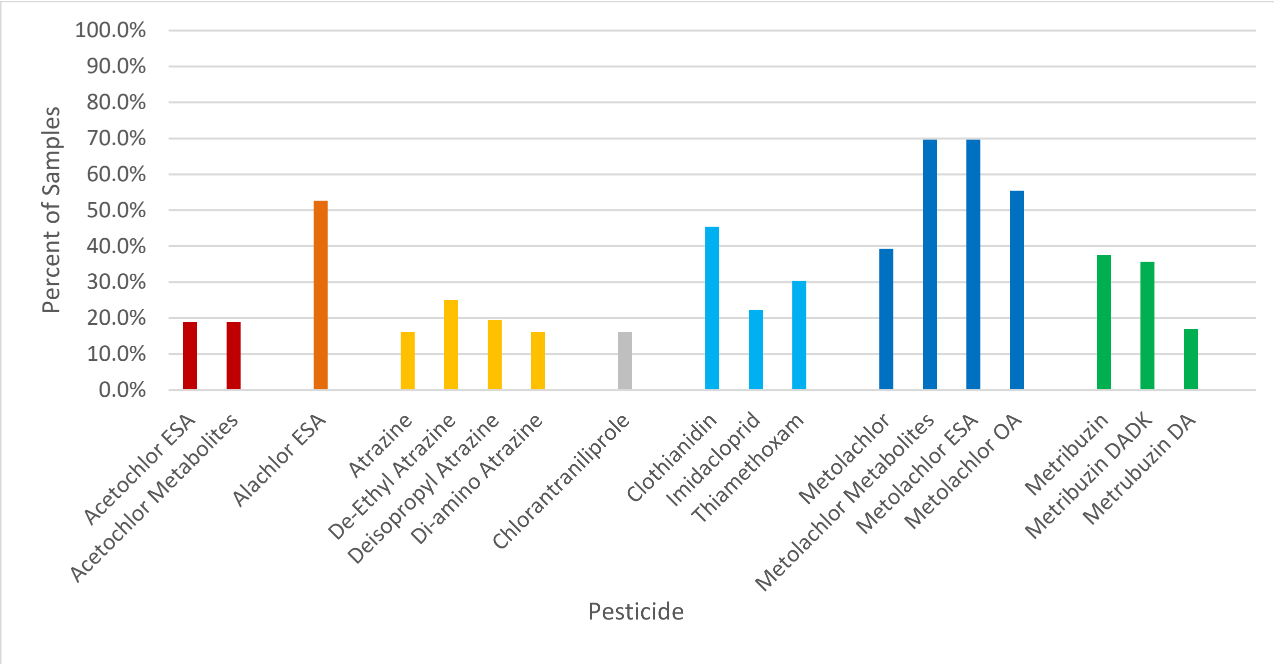
Picloram was detected for the first time in the field-edge monitoring program in 2023. Picloram is a herbicide used to control deeply rooted herbaceous weeds and woody plants. It was detected in a groundwater sample collected in the fall from a well located in Adams County within a road right-of-way.

There were some recurrent trends regarding analyte detections. There continues to be an absence of bromacil, dicamba, and imazethapry in groundwater samples. These three compounds were consistently detected in the prior years, but not in the last two. Clopyralid and dimethenamid (and its metabolites) have continued to be detected in field-edge groundwater well samples, which is a recent trend.

At least two pesticide analytes were detected in every groundwater sample collected in the 2023 Field-Edge Program. Pesticides detected in excess of laboratory reporting limits in 2023 samples include 13 herbicides, 12 herbicide metabolites, five insecticides, and one fungicide

The most frequently detected pesticide compounds in 2023 are listed in Figure 9. This figure includes all pesticide analytes detected at a concentration greater than the laboratory reporting limit at a frequency greater than 15%.

Figure 9: Percentage of 2023 Samples with Detectable Pesticide Concentrations (Includes All Analytes Detected in 15% or More of All Samples Collected)



Notes: *Atrazine TCR is total chlorinated residues of atrazine, which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.*

Metolachlor ESA was once again the most frequently detected analyte in excess of laboratory reporting limits. It is a breakdown product of metolachlor, which is an active ingredient in corn herbicides. Metolachlor ESA was detected at every site and in 96.3% of all samples collected in 2023.

The second most frequently detected analyte for the 2023 program was metolachlor OA. It is another breakdown product of metolachlor. Metolachlor OA was detected in excess of laboratory reporting limits at 15 of 22 sites and in 76.5% of collected samples.

Alachlor ESA was the third most frequently detected compound in 2023. It was detected in excess of laboratory reporting limits at 13 of the 22 sites and in 72.8% of the samples collected. Alachlor ESA is now commonly detected at most field-edge monitoring well sites within agricultural-intense areas.

COMPARISON TO STANDARDS

The Wisconsin Department of Natural Resources (DNR) sets groundwater quality standards in Wisc. Admin. Code ch. NR 140, which includes substances of public health concern based on recommendations from DHS. These standards have two parts, the ES, and the PAL. The ES is a level that, if exceeded, requires intervention from the appropriate authority. In the case of pesticides in drinking water, DATCP is required to intervene if levels exceed the ES. The PAL is a percentage of the ES: 10% of the ES for carcinogenic, mutagenic, or teratogenic properties; and 20% of the ES for all other substances. The PAL is intended to act as a trigger for intervention by the appropriate authority before the pollutant becomes a risk to public health. These NR 140 standards have been established for 29 of the 106 analytes tested for in this program.

Additionally, DHS has established drinking water health advisories for 16 pesticides parent materials and metabolites. Pesticide concentrations identified during DATCP's 2023 Program were compared to these WAC ch. NR 140 Groundwater Quality standards and DHS drinking water health advisories. Table B 3 in Appendix B lists the existing standards alongside the range of concentrations for the pesticide compounds detected in 2023 groundwater samples.

In 2023, four groundwater samples contained an analyte that exceeded an established DHS Drinking Water Health Advisory. Elevated concentrations of imidacloprid were detected in excess of the 0.2 µg/L drinking water health advisory level in groundwater samples collected in the fall from well IW2-3 in Iowa County and two wells in Adams County; AD2-5 in the spring and AD5-5 in the fall and spring. Both of these sites are either located in the Lower Wisconsin River Valley or Central Sands Agricultural Region. The imidacloprid concentrations in these four samples ranged from 0.236 to 0.353 µg/L. No other analytes were detected at concentrations greater than their respective DHS drinking water health advisory.

Additionally in 2023, one groundwater sample contained concentrations of the parent material metolachlor and metribuzin exceeding their respective Wisc. Admin. Code ch. NR 140 ES. That groundwater sample was collected in November from a well nest located in Waushara County. This was the first time such an elevated concentration for these two compounds was detected at this location. A subsequent groundwater sample collected from the same monitoring well in December to validate the results contained only a metolachlor concentration still exceeding the ES, but at a lower concentration. The metribuzin had also decreased but exceeded the PAL standard. DATCP believes these elevated concentrations are associated with a nearby point-source release and not from adjacent field applications. Further monitoring and investigation will be conducted by DATCP.

As depicted in Table B 3 of Appendix B, concentrations of alachlor ESA, atrazine, de-ethyl atrazine, de-isopropyl atrazine, di-amino atrazine, and atrazine TCR (which is the sum of atrazine and its three analyzed metabolites) were detected in excess of their respective Wisc. Admin. Code ch. NR 140 PAL standards.

Table B 3 of Appendix B also includes results for pesticides and their metabolites with no established ES or PAL or DHS drinking water advisories. Sixty-two of 106 pesticides compounds tested have no established Wisconsin groundwater quality standard or advisory. A review of 2023 data indicates that 31 different pesticides compounds were detected in excess of laboratory reporting limits, and 16 of these 31 compounds have no Wisc. Admin. Code ch. NR 140 established standard. However, eight of the 16 analytes with no Wisc. Admin. Code ch. NR 140 standards have a DHS drinking water health advisories (chlorantraniliprole, clothianidin, fomesafen, imidacloprid, metalaxyl, saflufenacil, sulfentrazone, and thiamethoxam).

Five of the 17 compounds with no established standards or DHS advisories are metabolites for compounds with standards (alachlor, dimethenamid, or metribuzin). The remaining three detected compounds with no existing standard or DHS advisory are bicyclopyrone, clopyralid, and cyantraniliprole. Table 2 includes a detection summary of these remaining three compounds that are not metabolites and have no standard or advisory.

Table 2: Detected Parent Compounds That Have No Wisc. Admin. Code ch. NR 140 Standard or DHS Drinking Water Health Advisory Levels

Analyte	Sites with Detects (out of 22)	Number of Detects (out of 80)	% of Samples Detected	Concentration Range (in µg/L)
bicyclopyrone	1	1	1.3%	0.0731
Clopyralid	1	2	2.5%	0.0904–0.141
Cyantraniliprole	1	1	1.3%	0.126

It is important to note that comparisons of detected pesticides and their metabolite concentrations to established groundwater quality standards and drinking water advisories are based on exposure to a single compound. These comparisons do not fully evaluate the risk to human health when two or more compounds are present. Currently, there are no calculations to predict potential risk when multiple compounds are present. Since the current approach does not account for potential cumulative risk, potential toxicity may be underestimated when two or more compounds are present.

OTHER NOTABLE OBSERVATIONS

Neonicotinoids:

Interest in the neonicotinoid class of insecticides has increased greatly in recent years due to concerns over possible effects on pollinators. DATCP began testing for these compounds in 2008 with thiamethoxam. BLS now analyzes for six neonicotinoid compounds. Three of these compounds, clothianidin, imidacloprid, and thiamethoxam (CIT), were detected in field-edge groundwater samples collected in 2023. The other three neonicotinoid compounds, acetamiprid, dinotefuran, and thiacloprid, were not detected in excess of laboratory reporting limits in any groundwater samples. The presence of the three CIT compounds in groundwater is expected as these compounds are used in many insecticide products and are known to readily leach when applied to crops grown in sandy soils. CIT compounds are labeled for use on most crops grown in the state including corn, soybeans, potatoes, many other vegetables, fruit crops, and most small grains.

Historic field-edge monitoring results indicate that CIT compounds are becoming more prevalent in groundwater over time. CIT compounds were observed at 15 of the 22 locations in 2023, which is less compared to prior years. Additionally, concentrations seem to be stable or slightly decreasing at areas with known impacts. Thiamethoxam and imidacloprid have been detected in field-edge samples since testing for neonicotinoid compounds began, primarily at sites within the Central Sands Agricultural Region and Lower Wisconsin River Valley.

No Wis. Admin. Code ch. NR 140 ES or PAL groundwater quality standards have been established for the CIT compounds. However, DHS has identified drinking water health advisories for each CIT compound.

Clothianidin and thiamethoxam were detected in 45.5% and 30.4%, respectively, of all 2023 samples collected from Field-Edge monitoring wells. This is consistent with historical detection percentages. Clothianidin concentrations ranged from 0.126 to 2.65 µg/L and thiamethoxam concentrations ranged from 0.0102 to 2.86 µg/L. These detections are again consistent with historical detection ranges. Additionally, these detected concentrations do not exceed any of the respective DHS drinking water health advisories for clothianidin or thiamethoxam.

Imidacloprid concentrations exceeding laboratory reporting limits were detected in 22.3% of the 2023 groundwater samples collected. It was detected in samples collected from eight of 22 sites at concentrations ranging from 0.0109 to 1.49 µg/L. This detection frequency and range are consistent with 2022 values but represent an overall increasing trend. Imidacloprid exceeded the DHS drinking water health advisory of 0.2 µg/L in six groundwater samples. These groundwater samples were collected from sites within the Central Sands Agricultural Region and Lower Wisconsin River Valley (Adams and Iowa counties). The imidacloprid data relative to each monitoring location is summarized in Table B 5 in Appendix B.

One observation regarding the 2023 data suggests that the imidacloprid and thiamethoxam are migrating vertically and horizontally within Central Sands Agricultural Region aquifers. Concentrations appear not to fluctuate seasonally, but greater concentrations have been detected in the groundwater collected from deeper screened wells at sites AD2-5, AD3-3, AD5-5, and WS7-3 compared to adjacent shallow wells. Additionally, imidacloprid and thiamethoxam have also been detected in nearby surface water samples indicating that groundwater is discharging to surface water year-round as base flow (see DATCP's *2023 Surface Water Sampling Report* - Wisconsin Department of Agriculture, Trade and Consumer Protection, 2023b).

Results from DATCP's Field-Edge Groundwater Monitoring Program can also be compared to nearby historical Surface Water Sampling Program results. This data can then be used to further evaluate mobility, persistence, and discharge to surface water. DATCP intends to report findings of the evaluation along with an evaluation of historical results as part of DATCP's upcoming detailed comprehensive report for each field edge site.

Alachlor:

As noted previously, alachlor ESA was the third most frequently detected compound in 2023 samples. It was detected in excess of laboratory reporting limits in more than 72.8% of the samples collected and at 13 of the 22 field edge monitoring sites. The alachlor ESA data relative to each monitoring location is summarized in Table B 6 in Appendix B.

Alachlor ESA concentrations ranged from 0.052 to 17.5 µg/L in 2023 samples. The greatest concentration of alachlor ESA was 17.5 µg/L in a groundwater sample collected from monitoring well JN3-1. In 2022, an alachlor ESA was detected at a concentration of 23.2 µg/L in a groundwater sample collected from this same monitoring well. This 2023 concentration exceeds the 4.0 µg/L Wis. Admin. Code ch. NR 140 PAL, but not the ES of 20.0 µg/L (as observed the previous year).

As observed since 2017, groundwater samples collected from deeper wells AD5-5 and WS7-3 detected alachlor ESA at concentrations in excess of the Wis. Admin. Code ch. NR 140 PAL of 4.0 µg/L. Between 2018 and 2023, no PAL exceedances were observed in samples collected from wells screened at shallower depths at these same sites. Although alachlor ESA remains at concentrations in excess of the PAL, it cannot be attributed to current use at nearby fields. Alachlor ESA is a breakdown product of alachlor. Alachlor production ceased in December 2014 and could not be sold in Wisconsin after August 2018. The parent alachlor was not detected in excess of laboratory reporting limits in any samples collected in 2023 and has not been detected since 2018.

Alachlor ESA was also widely detected in surface water and groundwater samples collected throughout the state. Because alachlor is no longer sold in Wisconsin and field use has ceased, it is expected that metabolite concentrations will decline over time. Additional data collection and evaluation of data from multiple years is needed to validate these observations.

Atrazine:

There are currently 101 atrazine Prohibition Areas (PAs) covering approximately 1.2 million acres within Wisconsin. It is illegal to apply any pesticide containing the active ingredient atrazine within an atrazine PA. In non-PAs, atrazine use is restricted but not prohibited. Since PAs have been in place for greater than 10 years, it is anticipated that atrazine and its metabolite concentrations in groundwater would be limited/decreasing, or not present at all. Of the 22 field-edge sites in the Program, only 11 are located within a PA. No grower self-reported atrazine use on adjacent fields within the PAs.

Atrazine or one of its breakdown products (de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine) were detected in excess of laboratory reporting limits in 48.75% of the groundwater samples collected in 2023. No atrazine parent material, atrazine metabolites, or atrazine TCR concentrations were detected exceeding the 3.0 µg/L Wis. Admin. Code ch. NR 140 ES. However, atrazine TCR was observed in 24 groundwater samples (21% of collected samples) at a concentration greater than the 0.3 µg/L Wisc. Admin. Code ch. NR 140 PAL. Concentrations for atrazine TCR ranged from 0.065 to 1.439 µg/L. Parent material atrazine, metabolite, and atrazine TCR data for each monitoring site is presented in Table B 7 in Appendix B.

The 2023 groundwater results indicated atrazine or one of its metabolites was detected in samples collected from 13 of the 22 sites. Groundwater samples with detections in excess of the Wis. Admin. Code ch. NR 140 PAL for atrazine TCR were collected from monitoring well networks located at nine of the 22 sites as follows:

- At two locations in Adams (AD2 and AD5), Iowa (IW1 and IW2), and Waushara counties (WS6 and WS7); and
- at one location in Saint Croix (SC1), Sauk (SK6) and Portage (PR1) counties.

Of these nine sites, four are located in a PA: both Iowa County locations one of the Waushara locations (WS6), and Sauk County. Of the four locations within a PA, parent material atrazine was found in excess of detection limits at site in Sauk and Iowa (IW2) counties. All of these detections were identified in a groundwater sample collected from the recently constructed (2021) piezometer at the deepest monitoring depths. This is consistent with previous year's results. Based on grower self-reporting, atrazine has not been used on the adjacent SK6 or WS4 fields for over 20 years. These results indicate that the source for the parent material atrazine detections is not from adjacent fields. It is likely from a source beyond the immediate area, or it may be from historic use prior to establishment of the PAs.

As observed during previous years, the greatest concentrations of atrazine TCR in 2023 samples were typically detected in samples collected from deeper screened wells. Figure 10 depicts atrazine TCR concentrations relative to groundwater sample well depth. As indicated, elevated concentrations of atrazine TCR were detected in samples collected from monitoring wells screened between 50 and 60 feet below ground surface (bgs), and at deeper wells screened between 80 and 115 feet bgs. On average, shallow wells screened between 10 and 40 feet bgs detected atrazine TCR at lesser concentrations. Based on atrazine TCR concentrations observed across the aquifer depth, it is possible that atrazine is applied at nearby agricultural fields at rates that are not affecting shallow groundwater quality. The greater atrazine concentrations observed at depth likely indicate affects from historic use rather than an on-going source from field use. A trend analysis is needed to show all historical groundwater data to determine if the atrazine TCR concentrations are decreasing within PAs as intended. DATCP intends to report these finding along with an evaluation of historical results as part of DATCP's detailed comprehensive report for each field edge site.

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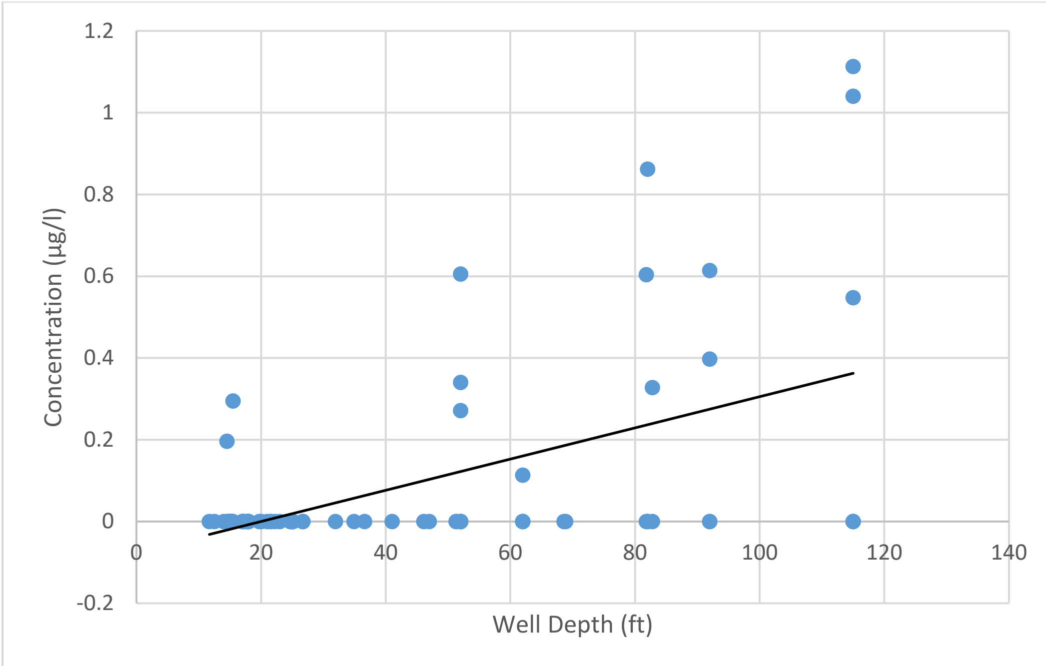
Figure 10: 2023 Atrazine TCR Concentrations Relative to Groundwater Sample Well Depth



Notes: *Line through data represents trend of concentrations relative to depth.*

Nitrogen:

DATCP's Field-Edge Groundwater Monitoring Program primary focus is on pesticide affects to groundwater quality. In addition to pesticides, BLS also performs nitrogen as nitrate plus nitrite analyses. Nitrogen impacts in groundwater and drinking water are the primary responsibility of DNR. However, BLS includes nitrogen as nitrate plus nitrite analyses as part of this program, and that data is shared with DNR.

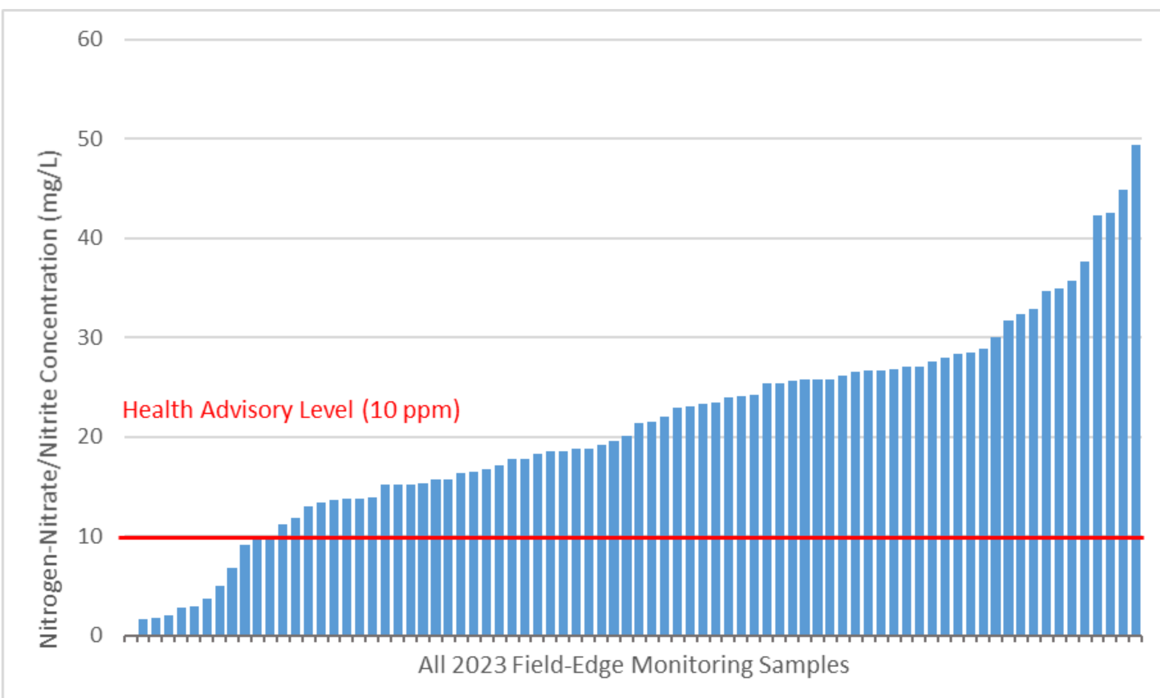
Nitrogen as nitrate plus nitrite was detected in excess of laboratory reporting limits in 79 of the 80 field-edge groundwater samples collected in 2023. The average nitrogen concentration for all 2023 samples was 20.81 milligram per liter (mg/L or parts per million [ppm]). This is the greatest average nitrogen-nitrate/nitrite concentration observed in the last six years but is likely a biased result. Not all monitoring wells were sampled as part of the 2023 Field-Edge Groundwater Monitoring Well Program for both the spring and fall rounds. Monitoring wells not sampled in the spring of 2023 have historically detected nitrogen-nitrate/nitrite at lower concentrations. Including more sample with lower concentrations would lower the average. Subsequent monitoring will be needed to substantiate an increasing or decreasing trend. Historical average nitrogen as nitrate and nitrite concentrations is summarized in Table 3.

Table 3: Average Nitrogen as Nitrate plus Nitrite Concentration over Previous Years

Year	Average Nitrogen-Nitrate/Nitrite Concentration (in parts per million)
2017	17.90
2018	17.72
2019	14.61
2020	16.89
2021	16.28
2022	16.42
2023	20.81

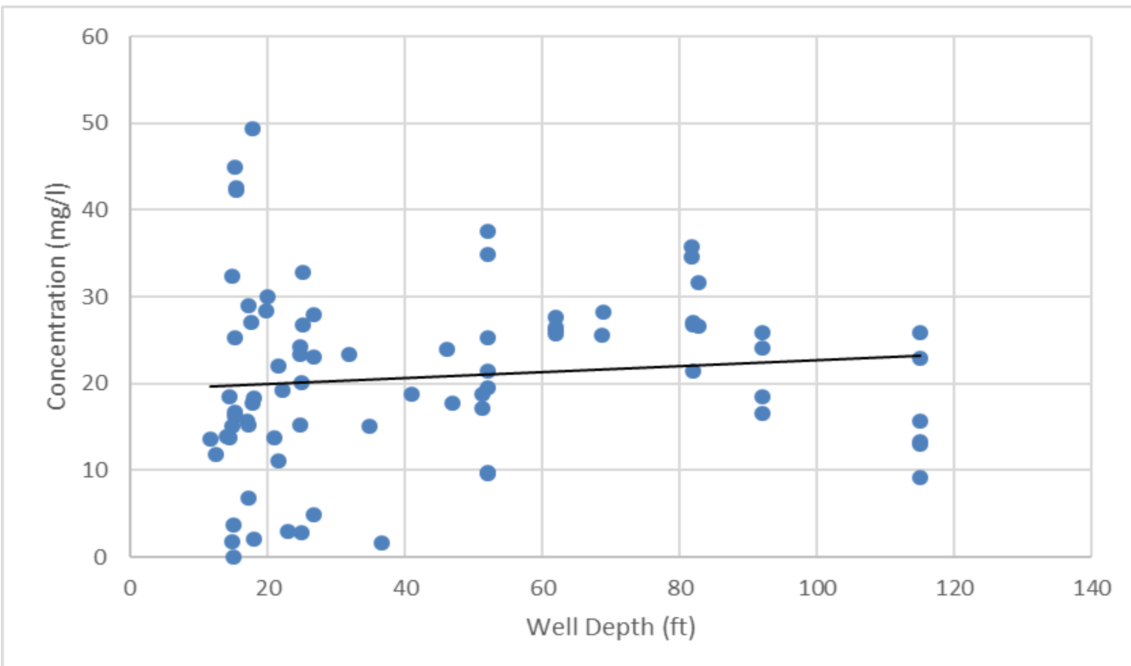
The Wis. Admin. Code ch. NR 140 ES of 10 mg/L for nitrogen as nitrate plus nitrite was exceeded in 68 of the 80 groundwater samples collected in 2023. Of the 12 that did not exceed the ES, nine groundwater samples exceeded the Wis. Admin. Code ch. NR 140 PAL of 2.0 mg/L. The greatest concentration of nitrogen (49.4 mg/L) was detected in the AD2-1 groundwater sample collected in the spring at an Adams County station. All nitrogen as nitrate plus nitrite data relative to each monitoring location is summarized in Table B 8 of Appendix B. Figure 11 depicts the 2023 nitrogen concentration distribution.

Figure 11: Nitrogen as Nitrate plus Nitrite Results Distribution in Groundwater Samples from All-Wells



Nitrogen as nitrate plus nitrite concentrations were also compared to wells screened at different depths. Figure 12 depicts nitrogen concentrations for all wells by depth. As indicated, nitrogen as nitrate plus nitrite was detected over a wide range of concentrations in groundwater samples collected from wells screened at shallow depths (between 10 and 40 feet bgs) compared to deeper wells. Groundwater samples collected from deeper wells typically detected nitrogen as nitrate plus nitrite at greater concentrations compared to the shallower screened well nest. However, it does appear concentrations decrease below a depth of 80 feet bgs. As indicted, nitrogen as nitrate plus nitrite exceeded the 10 mg/L ES in samples collected from nearly all the monitoring wells screened across the aquifer at a depth greater than 40 feet bgs, and in more than half the wells less than 40 feet deep.

Figure 12: 2023 Nitrogen as Nitrate plus Nitrite Concentrations Relative to Groundwater Sample Well Depth



Notes: Line through data represents trend of concentrations relative to depth.

Groundwater samples collected from deeper screened wells also indicate less seasonal variation in nitrogen concentrations compared to shallow wells, which would be expected. As depicted on Figure 13 below, nitrogen as nitrate plus nitrite concentrations fluctuated between -5 mg/L to + 5 mg/L in samples collected between spring and fall 2023 at the majority of monitoring well locations. On average, nitrogen concentrations increased by 0.32 mg/L between spring and fall. Overall, this suggests that nitrogen as nitrate plus nitrite concentrations for the majority of wells indicate little seasonal variation.

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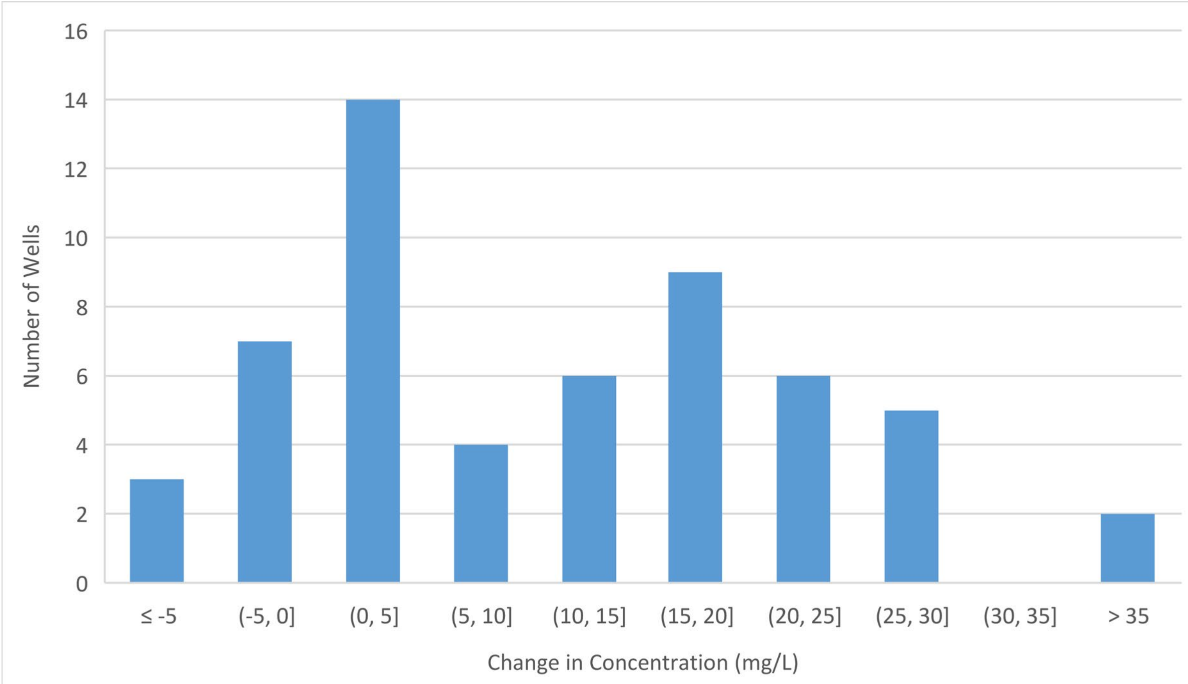
Figure 13: 2023 Nitrogen as Nitrate plus Nitrite Concentrations Variability from Spring to Fall at Individual Wells



Seasonal data based on nitrogen as nitrate plus nitrite concentration variances relative to groundwater depths was evaluated. It appears that there is a limited seasonal variability with the depth. This likely indicates nitrogen applications at the surface influence groundwater quality seasonally. As depicted on the Figure 14 below, groundwater samples collected from shallower wells have a somewhat greater range of variability in nitrogen concentrations to deeper wells. Nitrogen as nitrate plus nitrite concentrations in samples collected from deeper screened wells are expected to show less variability and serve as a baseline, with little seasonal influence occurring. This has not been observed throughout all the years of monitoring. Additional years of monitoring are necessary to validate or refute this observation.

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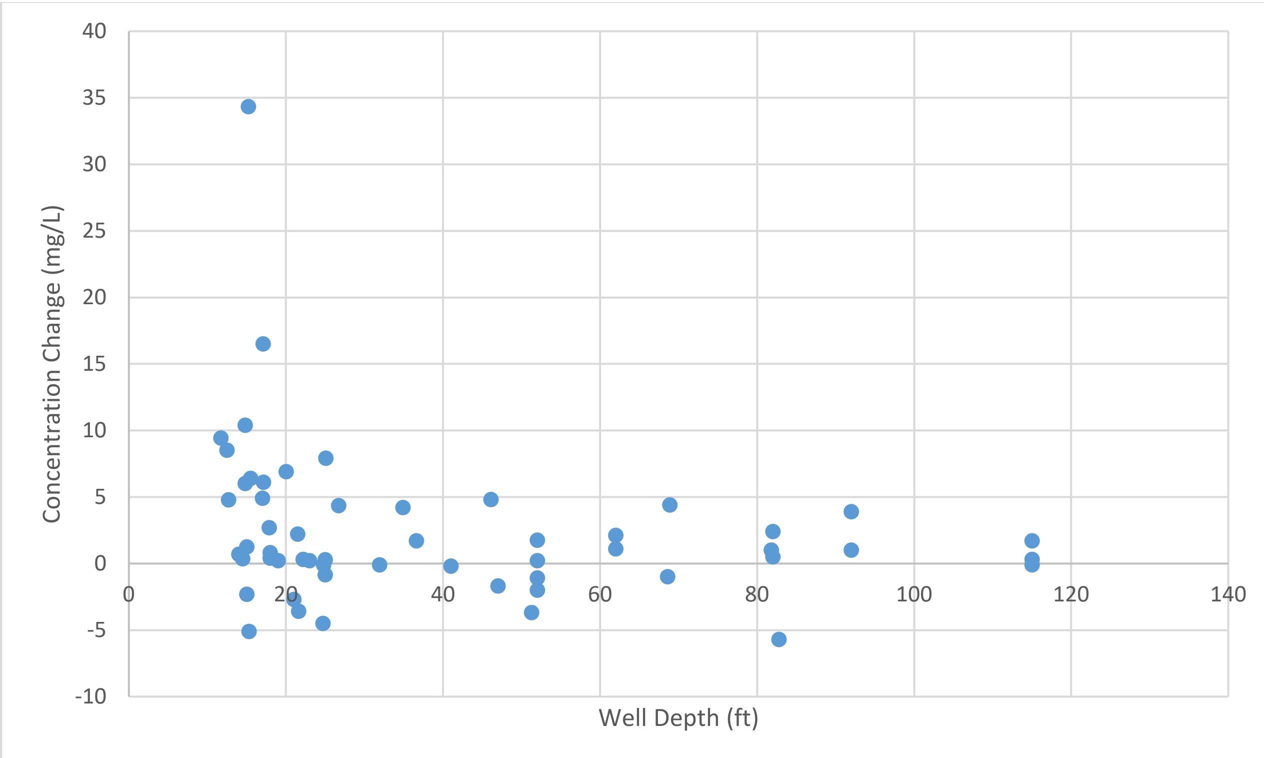
Figure 14: 2023 Nitrogen Concentrations Variability by Depth from Spring to Fall of Individual Wells



2024 Program Goals and Objectives

The Field-Edge Groundwater Monitoring Program mission is to monitor groundwater quality at strategic geographic locations within agricultural areas to characterize agrichemical migration to underlying aquifers, and act as an early warning signal for nearby drinking water wells. The program will continue in 2024.

Program goals for 2024 include:

- Collaborate with BLS and develop a 2024 Field-Edge Groundwater Monitoring Program Sampling Plan.
- Conduct a groundwater sampling event in the spring and fall (limited) from the Program's groundwater monitoring network. BLS capacity will be limited in fall due to equipment updates and personnel shortage.
- Document annual activities completed and summarize results for each site in a letter sent to each grower.
- Continue to monitor the groundwater quality at the WS6 location in Waushara County related to a likely point source release.
- Document the annual activities completed and summarize results in a *2024 Field-Edge Groundwater Monitoring Program Summary Report*.

2024 data will be added to the existing database to ensure that long-term water level and groundwater monitoring data can be used to identify trends in groundwater quality over time. Long-term groundwater quality trends may be used to further evaluate the effectiveness of atrazine PAs. Long-term groundwater data will also be compared to surface water data from within the same watershed to identify potential relationships between surface water and groundwater quality. This evaluation may also be used to evaluate seasonal surface water flow variations and base flow groundwater discharge to surface water. DATCP intends to report finding along with an evaluation of historical results as part of DATCP's detailed comprehensive report for each field-edge site.

Acknowledgments

ACM's financial information includes the state fiscal year (FY) 2022 and 2023, from July 1, 2022 through June 30, 2023. Federal grants operate October 1, 2022 through September 30, 2023. This report covers those portions of the federal grants that occurred during the state fiscal year. The primary sources of revenue for ACM are industry fees for licenses, permits, registrations, and tonnage under the feed, fertilizer, soil and plant additive, lime, and pesticide programs. In addition, a federal grant provides some funding to cover annual pesticide program expenses. ACM recognizes these important partnerships with industry and the federal government and works hard to maximize the use of this funding for the benefit of the industry, consumers, and the environment.

The raw data required to reproduce the above findings are available upon request. For any questions and clarifications, please do not hesitate to reach out to us at DATCPGW@wisconsin.gov or at (608) 224-4502.

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Appendix A

The acronyms and terminology included on this list are generic definitions intended to help understand the Field-Edge Monitoring Program. Some of these terms are more specifically defined in various regulations.

ACRONYMS

µg/l	Micrograms per liter (a liquid equivalent of ppb)
ACM	DATCP Bureau of Agrichemical Management
AMPA	Aminomethylphosphonic acid
bgs	Below ground surface
BLS	DATCP Bureau of Laboratory Services
CAS	Chemical Abstract Service
CIT	clothianidin, imidacloprid and thiamethoxam
DADK	Desaminodiketo
DATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
DHS	Wisconsin Department of Health Services
DNR	Wisconsin Department of Natural Resources
ES	Enforcement Standard
ESA	Ethane Sulfonic Acid
GC	Gas Chromatography
GCC	Wisconsin Groundwater Coordinating Council
HARS	Hancock Agricultural Research Station
ISO	International Organization for Standardization
LC	Liquid Chromatography
mg/L	Milligrams per liter (a liquid equivalent of ppm)
MS	Mass Spectroscopy
msl	Mean sea level
N	Nitrogen
ND	No Detect – concentrations are less than laboratory reporting limits
NOAA	National Oceanic and Atmospheric Administration
OA	Oxanilic Acid
PA	Prohibition Area
PAL	Preventive Action Limit
PPB	Parts per billion
PPM	Parts per million
TCR	Total chlorinated resides of atrazine
TPVC	Top of well casing
TSAMP	Targeted Sampling Program
USDA	United States Department of Agriculture
US EPA	United States - Environmental Protection Agency
WGNHS	Wisconsin Geological and Natural History Survey
Wis. Admin. Code	Wisconsin Administrative Code
WUWN	Wisconsin Unique Well Number

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DEFINITIONS

Analyte - A chemical substance that has a defined Chemical Abstract Service (CAS) number

Atrazine Prohibition Area - An area where atrazine use is currently prohibited under Administrative Code ATCP 30

Chronic Exposure value - The highest concentration of a chemical to which the organism can be exposed without causing chronic toxicity to the organism in question

Compound - A substance formed by the chemical union of two or more ingredients

Detection - When an analyte has a concentration that can be quantified (i.e., a concentration greater than the Laboratory Reporting Limit)

Herbicide - A pesticide used to kill or inhibit the growth of plants, weeds, or grasses

Insecticide - A pesticide used to kill or inhibit the growth of insects

Metabolite or Residual compound or Breakdown product - A chemical substance left behind by a parent compound that has degraded through natural chemical breakdown and/or been metabolized by bacteria

Neonicotinoids- Insecticides that target the neurological systems of insects. The neonicotinoid family includes acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, nithiazine, thiacloprid, and thiamethoxam

NR140 - Wisconsin Administrative Code which establishes groundwater quality standards and required responses when the standards are exceeded

Pesticide - Substance used to kill, repel, or control certain forms of plant or animal life that are considered to be pests. The pesticide category includes herbicides, insecticides, rodenticides, fungicides, and bactericides

Piezometer – Monitoring well with screened section in saturated conditions within the aquifer beneath the groundwater surface

Reporting limit - The minimum analyte concentration that can be reliably quantified and reported by the laboratory

Total chlorinated residues (TCR) of atrazine - Sum of atrazine and atrazine metabolites (de-ethyl atrazine, de-isopropyl atrazine, and diamino atrazine)

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APPENDIX B

Table B 1: Field-Edge Groundwater Monitoring Program - Monitoring Wells and Piezometers Construction Specifications

County	Site (Grower)	Well Identification	WUWN	Year Constructed	Prohibition Area	Irrigation Available	Ground Elevation (MSL)	TPVC Elevation (MSL)	Well Depth (ft)	Bottom of Well (MSL)	Screen Length (ft)	Top of Screen (ft)	Sampling Method
Adams	AD2	AD2-1	BH954	1987	No	Yes	1,051.7	1,053.96	17.87	1,036.09	5	1,053.96	Peristolic Pump
		AD2-2	BH953	1987				1,054.14	22.83	1,031.31	5	1,054.14	
		AD2-3	BH952	1987				1,054.17	27.62	1,026.55	5	1,054.17	
		AD2-4	VR844	2017				1,054.44	54.70	999.74	5	1,054.44	Whale Pump and Dedicated Tubing
		AD2-5	VR845	2017				1,054.35	85.70	968.65	5	1,054.35	
		AD2-6	PT421	2021				--	116.40	--	5	--	
	AD3	AD3-1[4]	BH999	1987	No	Yes	1,008.0	1,010.48	14.93	995.55	5	1,010.48	
		AD3-2[4]	BI000	1987				1,010.34	19.64	990.70	5	1,010.34	
		AD3-3[4]	BI001	1987				1,010.44	24.69	985.75	5	1,010.44	
	AD4	AD4-1[1]	BH996	1987				1,017.38	24.71	992.67	5	1,017.38	
		AD4-2[4]	BH997	1987	No	Yes	1,013.9	1,017.26	29.69	987.57	5	1,017.26	
		AD4-3[4]	BH998	1987				1,016.56	34.57	981.99	5	1,016.56	
	AD5	AD5-1	CL461	1988	No	Yes	1,051.1	1,053.18	15.24	1,037.94	5	1,053.18	Peristolic Pump
		AD5-2	CL455	1988				1,053.31	19.91	1,033.40	5	1,053.31	
		AD5-3	CL456	1988				1,053.27	25.23	1,028.04	5	1,053.27	
		AD5-4	VR846	2017				1,053.63	53.20	1,000.43	5	1,053.63	Whale Pump and Dedicated Tubing
		AD5-5	VR847	2017				1,053.68	85.70	967.98	5	1,053.68	
		AD5-6	PT422	2021				--	117.50	--	5	--	
Barron	BR3	BR3-1	BR279	1987	No	Yes	1,052.7	1,055.79	15.03	1,040.76	5	1,055.79	Peristolic Pump
		BR3-2	BR280	1987				1,055.37	20.02	1,035.35	5	1,055.37	
		BR3-3	BR281	1987				1,054.93	25.02	1,029.91	5	1,054.93	
Dane	DN1	DN1-1[2]	BR250	1985				744.38	12.10	732.28	5	744.38	
		DN1-1	PT428	2021	93-57-04	Yes	743.7	745.32	14.90	730.42	5	745.32	Dedicated Bailer
		DN1-2	BR251	1985				745.87	17.40	728.47	5	745.87	Peristolic Pump
		DN1-3	BR252	1985				746.08	22.20	723.88	5	746.08	
Dunn	DU1	DU1-1	AO384	1989	No	Yes	852.5	853.92	34.90	819.02	5	853.92	Dedicated Bailer
		DU1-2	AO385	1989				854.87	40.80	814.07	5	854.87	
		DU1-3	AO386	1989				855.12	46.10	809.02	5	855.12	
	DU2	DU2-1	AO387	1989	No	Yes	856.2	858.05	26.70	831.35	5	858.05	Peristolic Pump
		DU2-2	AO388	1989				858.17	31.30	826.87	5	858.17	
		DU2-3	AO389	1989				858.48	36.60	821.88	5	858.48	
Grant	GR1	GR1-1	BR255	1985	93-57-04	No	683.8	686.32	12.50	673.82	5	686.32	Peristolic Pump
		GR1-2	BR256	1985				686.48	17.30	669.18	5	686.48	
		GR1-3	BR257	1985				686.12	21.60	664.52	5	686.12	
Iowa	IW1	IW1-1[3]	BH955	1986					14.90		5		
		IW1-2[3]	BH956	1986					19.90		5		
		IW1-3[3]	BH957	1986					24.90		5		
		IW1-4	BR259	1986	93-57-04	Yes	722.5	723.85	17.10	706.75	5	723.85	Peristolic Pump
		IW1-5	BR260	1986				723.84	21.30	702.54	5	723.84	
		IW1-6	BR261	1986				723.67	26.70	696.97	5	723.67	
		IW1-7	BH967	1987				723.67	61.99	661.68	5	723.67	Whale Pump and Dedicated Tubing
		IW1-8	PT425	2021				723.06	93.97	629.09	5	723.67	
	IW2	IW2-1	BR036	1986	93-57-04	Yes	723.8	726.76	14.80	711.96	5	726.76	Peristolic Pump
		IW2-2	BR037	1986				726.50	19.70	706.80	5	726.50	
		IW2-3	BR038	1986				726.40	24.70	701.70	5	726.40	
		IW2-4	PT426	2021				725.89	65.92	659.97	5	725.89	Whale Pump and Dedicated Tubing
		IW2-5	PT427	2021				726.24	94.81	631.43	5	726.24	
Jackson	JK3	JK3-1	JH991	2005	94-27-04	No	1,025.3	1,028.06	27.33	1,000.73	10	1,028.06	Peristolic Pump
		JK3-2	JH981	2005			1,023.7	1,026.44	25.77	1,000.67	10	1,026.44	
Juneau	JN1	JN1-1	BR046	1985	No	Yes	939.7	941.26	11.70	929.56	5	941.26	Peristolic Pump
		JN1-2	BR047	1985				941.21	16.70	924.51	5	941.21	
		JN1-3	BR048	1985				941.34	21.50	919.84	5	941.34	
	JN3	JN3-1	JH937	2005	94-29-01	No	901.5	903.84	20.42	883.42	10	903.84	Peristolic Pump
		JN3-2	JH936	2005			902.0	905.20	18.14	887.06	10	905.20	
La Crosse	LC2	LC2-1	VZ391	2011	No	Yes	684.1	686.40	49.22	637.18	10	686.40	Dedicated Bailer
		LC2-2	VZ392	2011			687.8	681.91	43.98	637.93	10	681.91	

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Langlade	LN1	LN1-1	BH964	1986	No	No	1,471.6	1,473.85	14.80	1,459.05	5	1,473.85	Peristolic Pump
		LN1-2	BH965	1986				1,474.44	19.70	1,454.74	5	1,474.44	
		LN1-3	BH966	1986				1,473.74	24.80	1,448.94	5	1,473.74	
Portage	PR1	PR1-1	BR207	1986	No	Yes	1,079.7	1,082.01	12.70	1,069.31	5	1,082.01	Peristolic Pump
		PR1-2	BR208	1988				1,081.94	17.60	1,064.34	5	1,081.94	
		PR1-3	BR209	1988				1,081.72	22.50	1,059.22	5	1,081.72	
		PR1-4	VR848	2017				1,082.83	55.30	1,027.53	5	1,082.83	Whale Pump and Dedicated Tubing
		PR1-5	VR849	2017				1,082.77	84.70	998.07	5	1,082.77	
St. Croix	SC1	SC1-1	JH938	2005	94-56-02	Yes	1,006.8	1,010.14	24.87	985.27	10	1,010.14	Peristolic Pump
		SC1-1 (D)	VZ390	2011				1,009.16	30.10	979.06	10	1,009.16	
		SC1-2	JH939	2005			1,003.9	1,006.63	21.87	984.76	10	1,006.63	
		SC1-2(D)	VZ393	2011				1,006.40	30.17	976.23	10	1,006.40	
Sauk	SK6	SK6-1	BB246	1988	93-57-04	Yes	711.8	713.68	14.92	698.76	5	713.68	Peristolic Pump
		SK6-2	BB247	1988				713.37	20.04	693.33	5	713.37	
		SK6-3	BB248	1988				713.55	25.10	688.45	5	713.55	
		SK6-4	PT424	2021			710.2	711.56	53.42	658.14	5	711.56	Whale Pump and Dedicated Tubing
Trempealeau	TR1	TR1-1	PX201	2005	No	Yes	730.4	733.29	75.55	657.74	10	733.29	Dedicated Bailer
		TR1-2	PX202	2005			731.1	733.83	75.20	658.63	10	733.83	
Waupaca	WP2	WP2-1	JH985	2005	94-69-01	No	908.4	911.03	20.45	890.58	10	911.03	Peristolic Pump
		WP2-2	JH984	2005			905.7	908.82	20.43	888.39	10	908.82	
Waushara	WS4	WS4-1	BB258	1988	93-70-01	Yes	1,082.4	1,084.97	17.13	1,067.84	5	1,084.97	Peristolic Pump
		WS4-2	BB259	1988				1,085.03	22.02	1,063.01	5	1,085.03	
		WS4-3	BB260	1988				1,084.98	27.16	1,057.82	5	1,084.98	
		WS4-4	BB261	1988				1,084.88	31.94	1,052.94	5	1,084.88	
	WS6	WS6-1	JH989	2005	93-70-01	Yes	1,076.8	1,080.90	18.27	1,062.63	10	1,080.90	Peristolic Pump
		WS6-2	JH990	2005				1,079.07	17.02	1,062.05	10	1,079.07	
	WS7	WS7-1	VR841	2017	No	Yes	1,075.7	1,078.65	18.40	1,060.25	10	1,078.65	Peristolic Pump
		WS7-2	VR842	2017				1,078.79	54.70	1,024.09	5	1,078.79	Whale Pump and Dedicated Tubing
		WS7-3	VR843	2017				1,078.78	84.80	993.98	5	1,078.78	
		WS7-4	PT423	2021				--	104.10	--	5	--	

Notes:	--	Elevation surveying in progress.
	1	Monitoring well was abandoned on May 30, 2019 because integrity of protective casing was compromised during spring 2019 sampling.
	2	Monitoring well was abandoned on December 13, 2018 because integrity of protective casing was compromised by a vehicle prior to fall 2018 sampling.
	3	Monitoring wells were abandoned June 11, 1993 because they were no longer needed for the monitoring program.
	4	Monitoring wells were abandoned December 1, 2021 because ownership no longer wished to participate in the monitoring program.
	WUWN	Wisconsin Unique Well Number
	MSL	Mean sea level
	TPVC	Top of well casing (PVC)
		Monitoring Well/Piezometer abandoned.
		Monitoring Well/Piezometer construction was financed by a 2021 U.S. EPA grant.
		Monitoring Well/Piezometer construction was financed by a 2017 U.S. EPA grant.
		Monitoring Well/Piezometer construction was financed by a 2011 U.S. EPA grant.
		Monitoring Well/Piezometer construction was financed by a 2005 U.S. EPA grant.
		Monitoring Wells/Piezometers assocaited with initial program activities and financed by State.

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Table B 2: 2023 Sample Analytes, Applicable Wis. Admin. Code ch. NR 140 PALs & ESs, Drinking Water Health Advisories, and Laboratory Reporting Limits

Analyte Description	Prentive Action Limit	Enforcement Standard	Advisory*	Reporting Limit (µg/l)
2,4-D (dichlorophenoxyacetic acid)	7	70		0.050
2,4-DB				1.00
2,4-DP				0.050
2,4,5-T				0.050
2,4,5-TP (trichlorophenoxy-prop. acid)	5	50		0.050
ACETAMIPRID				0.010
ACETOCHLOR	0.7	7		0.050
ACETOCHLOR ESA	46[1]	230[1]		0.050
ACETOCHLOR OA	46[1]	230[1]		0.30
ACIFLUORFEN				0.050
ALACHLOR	0.2	2		0.050
ALACHLOR ESA	4	20		0.050
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		0.150
ATRAZINE TCR (calculated)	0.3[3]	3[3]		0.050
AZOXYSTROBIN				0.050
BENFLURALIN				0.050
BENTAZON	60	300		0.050
BICYCLOPYRONE				0.050
BROMACIL				0.050
BIFENTHRIN				0.005
CARBARYL	4	40		0.050
CARBOFURAN	8	40		0.050
CHLORAMBEN	30	150		0.32
CHLORANTRANILIPROLE			16,000	0.050
CHLOROTHALONIL				0.10
CHLORPYRIFOS	0.4	2		0.050
CHLORPYRIFOS OXYGEN ANALOG				0.050
CLOMAZONE				0.050
CLOPYRALID				0.050
CLOTHIANIDIN			1,000	0.010
CYANTRANILIPROLE				0.050
CYCLANILIPROLE				0.20
CYFLUTHRIN				0.050
CYPERMETHRIN				0.10
CYPROSULFAMIDE				0.050
DACTHAL	14	70		0.050
DACTHAL DI-ACID			70[2]	0.050
DACTHAL MONO-ACID			70[2]	0.050
DIAZINON				0.050
DIAZINON OXYGEN ANALOG				0.050
DICAMBA	60	300		0.200
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	Prentive Action Limit	Enforcement Standard	Advisory*	Reporting Limit
EPTC	50	250		0.050
ESFENVALERATE				0.025
ETHALFLURALIN				0.050
ETHOFUMESATE				0.050
FLUMETSULAM			10,000	0.050
FLUPYRADIFURONE				0.050
FLUROXYPYR				0.050
FOMESAFEN			25	0.050
GLYPHOSATE			10,000	0.50
GLYPHOSATE AMMONIUM				0.50
AMPA			10,000	0.50
HALOSULFURON METHYL				0.050
HEXAZINONE			400	0.050
IMAZAPYR				0.050
IMAZETHAPYR				0.050
IMIDACLOPRID			0.2	0.010
ISOXAFLUTOLE			3[4]	0.050
ISOXAFLUTOLE DKN			3[4]	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			800	0.050
METHYL PARATHION				0.050
METOLACHLOR	10	100		0.050
METOLACHLOR ESA	260[5]	1300[5]		0.050
METOLACHLOR OA	260[5]	1300[5]		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			460	0.050
SIMAZINE	0.4	4		0.050
SULFENTRAZONE			1,000	0.050
SULFOMETURON-METHYL				0.050
TEBUPIRIMPHOS				0.050
TEMBOTRIONE				0.10
THIACLOPRID				0.010
THIAMETHOXAM			120	0.010
THIENCARBAZONE-METHYL			800	0.050
TRICLOPYR				0.050
TRIFLURALIN	0.75	7.5		0.050
NITROGEN-NITRATE/NITRITE (mg/L)	2	10		0.5

All concentrations are presented as micrograms per liter (µg/L) or parts per billion, excpet for Nitrogen.

* Wisconsin Department of Health Services Drinking Water Health Advisory (June 2019, November 2020, Revised February 2022).

[1] Combined sum of acetochlor metabolites ESA and OA.

[2] Combined sum of metabolites (di- and mono-acid) and parent material dacthal.

[3] Total Chlorinated Residue for Atrazine. Combined sum of metabolites (de-ethyl, de-isopropyl and di-amino) and parent material atrazine.

[4] Combined sum of metabolite (DKN) and parent material isoxaflutole.

[5] Combined sum of metolachlor metabolites ESA and OA.

mg/L - milligrams per liter or parts per million.

DA - desamino

DADK - desaminodiketo

DKN - diketonitrile

ESA - ethane sulfonic acid.

OA - oxanilic acid, can also be identified as OXA.

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Table B 3: Field-Edge Groundwater Monitoring Program - 2023 Groundwater Analytical Results

2022 Ground Water Project Results (all concentrations in ug/L)							Wisconsin Department of Health Services	Wisconsin Admin. Code Chapter NR 140	
Pesticide Name	Pesticide Class	Reporting Limit	Number of Sites with Detects[1]	Number of Total Detects[2]	Percent of Samples with Detects	Concentration Range	Drinking Water Health Advisory[3]	Enforcement Standard	Preventive Action Limit
2,4-D (dichlorophenoxyacetic acid)	Herbicide	0.05	--	--	--	--	--	70	7
2,4-DB	Herbicide	1.00	--	--	--	--	--	--	--
2,4-DP	Herbicide	0.05	--	--	--	--	--	--	--
2,4,5-T	Herbicide	0.05	--	--	--	--	--	--	--
2,4,5-TP (trichlorophenoxy-propionic acid)	Herbicide	0.05	--	--	--	--	--	50	5
Acetamiprid	Insecticide	0.010	--	--	--	--	--	--	--
Acetochlor	Herbicide	0.05	--	--	--	--	--	7	0.7
Acetochlor ESA	Metabolite	0.05	12	21	25.9%	1.69 - 0.0517	--	230	46
Acetochlor OA	Metabolite	0.3	--	--	--	--	--	230	46
Acetochlor Combination[4]	Summation	N/A	12	21	25.9%	1.69 - 0.0517	--	230[4]	46[4]
Acifluorfen	Herbicide	0.05	--	--	--	--	--	--	--
Alachlor	Herbicide	0.05	--	--	--	--	--	2	0.2
Alachlor ESA	Metabolite	0.05	13	59	72.8%	17.5 - 0.052	--	20	4
Alachlor OA	Metabolite	0.25	2	6	7.4%	2.28 - 0.255	--	--	--
Aldicarb Sulfone	Insecticide	0.05	--	--	--	--	--	--	--
Aldicarb Sulfoxide	Insecticide	0.071	--	--	--	--	--	--	--
Aminopyralid	Herbicide	0.15	--	--	--	--	--	--	--
Atrazine	Herbicide	0.05	7	18	22.2%	0.554 - 0.0502	--	3	0.3
De-ethyl atrazine	Metabolite	0.05	9	28	34.6%	0.906 - 0.0568	--	3	0.3
De-isopropyl atrazine	Metabolite	0.05	10	22	27.2%	0.444 - 0.0516	--	3	0.3
Di-amino atrazine	Metabolite	0.15	10	18	22.2%	0.306 - 0.153	--	3	0.3
Atrazine (TCR)	Summation	0.05	13	39	48.1%	1.439 - 0.065	--	3	0.3
Azoxystrobin	Fungicide	0.05	--	--	--	--	--	--	--
Benfluralin	Herbicide	0.05	--	--	--	--	--	--	--
Bentazon	Herbicide	0.05	5	14	17.3%	19.7 - 0.0503	--	300	60
Bicyclopyrone	Herbicide	0.05	1	1	1.2%	0.0731 - 0.0731	--	--	--
Bifentrin	Insecticide	0.0050	--	--	--	--	--	--	--
Bromacil	Herbicide	0.05	--	--	--	--	--	--	--

Carbaryl	Insecticide	0.05	--	--	--	--	--	40	4
Carbofuran	Insecticide	0.05	--	--	--	--	--	40	8
Chloramben	Herbicide	0.32	--	--	--	--	--	150	30
Chlorantraniliprole	Insecticide	0.050	7	18	22.2%	0.244 - 0.056	16,000	--	--
Chlorothalonil	Fungicide	0.10	--	--	--	--	--	--	--
Chlorpyrifos	Insecticide	0.05	--	--	--	--	--	2	0.4
Chlorpyrifos Oxon	Metabolite	0.05	--	--	--	--	--	--	--
Clomazone	Herbicide	0.05	--	--	--	--	--	--	--
Clopyralid	Herbicide	0.05	1	2	2.5%	0.141 - 0.0904	--	--	--
Clothianidin	Insecticide	0.010	15	51	63.0%	2.65 - 0.126	1,000	--	--
Cyantraniliprole	Insecticide	0.050	1	1	1.2%	0.126 - 0.126	--	--	--
Cyclaniliprole	Insecticide	0.2	--	--	--	--	--	--	--
Cyfluthrin	Insecticide	0.050	--	--	--	--	--	--	--
lambda- Cyhalothrin	Insecticide	0.020	--	--	--	--	--	--	--
Cypermethrin	Insecticide	0.1	--	--	--	--	--	--	--
Cyprosulfamide	Safener	0.05	--	--	--	--	--	--	--
Dacthal	Herbicide	0.05	--	--	--	--	--	70	14
Dacthal Di-acid	Metabolite	0.05	--	--	--	--	70	--	--
Dacthal Mono-acid	Metabolite	0.05	--	--	--	--	70	--	--
Dacthal Combination[5]	Summation	N/A	--	--	--	--	70[5]	--	--
Diazinon	Insecticide	0.05	--	--	--	--	--	--	--
Diazinon oxon	Metabolite	0.05	--	--	--	--	--	--	--
Dicamba	Herbicide	0.20	--	--	--	--	--	300	60
Dichlobenil	Herbicide	0.05	--	--	--	--	--	--	--
Dimethenamid	Herbicide	0.05	1	1	1.2%	3.11 - 3.11	--	50	5
Dimethenamid ESA	Metabolite	0.05	4	12	14.8%	5.49 - 0.11	--	--	--
Dimethenamid OA	Metabolite	0.05	2	2	2.5%	0.311 - 0.0801	--	--	--
Dimethoate	Insecticide	0.050	--	--	--	--	--	2	0.4
Dinotefuran	Insecticide	0.010	--	--	--	--	--	--	--
Diuron	Herbicide	0.05	--	--	--	--	--	--	--
EPTC	Herbicide	0.05	--	--	--	--	--	250	50
Esfenvalerate	Insecticide	0.025	--	--	--	--	--	--	--
Ethalfluralin	Herbicide	0.05	--	--	--	--	--	--	--
Ethofumesate	Herbicide	0.05	--	--	--	--	--	--	--
Flumetsulam	Herbicide	0.05	--	--	--	--	10,000	--	--
Flupyradifurone	Insecticide	0.05	--	--	--	--	--	--	--

Fluroxypyr	Insecticide	0.050	--	--	--	--	--	--	--
Fomesafen	Herbicide	0.05	2	4	4.9%	0.202 - 0.0602	25	--	--
Halosulfuron methyl	Herbicide	0.05	--	--	--	--	--	--	--
Hexazinone	Herbicide	0.05	--	--	--	--	400	--	--
Imazapyr	Herbicide	0.05	--	--	--	--	--	--	--
Imazethapyr	Herbicide	0.05	--	--	--	--	--	--	--
Imidacloprid	**Insecticide**	**0.010**	**8**	**25**	**30.9%**	**0.353 - 0.0109**	**0.2**	**--**	**--**
Isoxaflutole	Herbicide	0.05	--	--	--	--	3	--	--
Isoxaflutole DKN	Metabolite	0.05	--	--	--	--	3	--	--
Isoxaflutole Combination[6]	Summation	N/A	--	--	--	--	3[6]	--	--
Linuron	Herbicide	0.05	--	--	--	--	--	--	--
MCPA	Herbicide	0.05	--	--	--	--	--	--	--
MCPB	Herbicide	0.1	--	--	--	--	--	--	--
MCPP	Herbicide	0.05	--	--	--	--	--	--	--
Malathion	Insecticide	0.05	--	--	--	--	--	--	--
Mesotrione	Herbicide	0.1	--	--	--	--	--	--	--
Metalaxyl	Fungicide	0.05	4	13	16.0%	0.369 - 0.0898	800	--	--
Methyl Parathion	Insecticide	0.05	--	--	--	--	--	--	--
Metolachlor	**Herbicide**	**0.05**	**11**	**44**	**54.3%**	**959 - 0.0579**	**--**	**100**	**10**
Metolachlor ESA	Metabolite	0.05	22	78	96.3%	67.1 - 0.0737	--	1,300	260
Metolachlor OA	Metabolite	0.27	15	62	76.5%	92.3 - 0.311	--	1,300	260
Metochlor Combination[7]	Summation	N/A	22	78	96.3%	959 - 0.0579	--	1,300[7]	260[7]
Metribuzin	**Herbicide**	**0.05**	**9**	**42**	**51.9%**	**82.6 - 0.0519**	**--**	**70**	**14**
Metribuzin DA	Metabolite	0.1	8	19	23.5%	12.1 - 0.12	--	--	--
Metribuzin DADK	Metabolite	0.12	10	40	49.4%	30.4 - 0.123	--	--	--
Metsulfuron methyl	Herbicide	0.05	--	--	--	--	--	--	--
Nicosulfuron	Herbicide	0.05	--	--	--	--	--	--	--
Norflurazon	Herbicide	0.05	--	--	--	--	--	--	--
Oxadiazon	Herbicide	0.05	--	--	--	--	--	--	--
Pendimethalin	Herbicide	0.05	--	--	--	--	--	--	--
Permethrin	Insecticide	0.030	--	--	--	--	--	--	--
Picloram	Herbicide	0.05	1	1	1.2%	0.434 - 0.434	--	500	100
Prometone	Herbicide	0.05	1	2	2.5%	0.0749 - 0.0748	--	100	20
Prometryn	Herbicide	0.05	--	--	--	--	--	--	--
Propiconazole	Fungicide	0.05	--	--	--	--	--	--	--
Prothioconazole-desthio	Metabolite	0.050	--	--	--	--	--	--	--

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Saflufenacil	Herbicide	0.05	1	1	1.2%	0.229 - 0.229	460	--	--
Simazine	Herbicide	0.05	2	6	7.4%	0.331 - 0.0664	--	4	0.4
Sulfentrazone	Herbicide	0.05	1	1	1.2%	0.0894 - 0.0849	1,000	--	--
Sulfometuron methyl	Herbicide	0.05	--	--	--	--	--	--	--
Tebupirimphos	Insecticide	0.05	--	--	--	--	--	--	--
Tembotrione	Herbicide	0.10	--	--	--	--	--	--	--
Thiacloprid	Insecticide	0.010	--	--	--	--	--	--	--
Thiamethoxam	Insecticide	0.010	13	34	42.0%	2.86 - 0.0102	120	--	--
Thiencarbazone methyl	Herbicide	0.05	--	--	--	--	800	--	--
Triclopyr	Herbicide	0.05	--	--	--	--	--	--	--
Trifluralin	Herbicide	0.05	--	--	--	--	--	7.5	0.75

Notes:

1 Total number of sites in 2023 were 22.
2 Total number of samples collected in 2023 were 81.
3 Wisconsin Department of Health Services(DHS) Drinking Water Health Advisory (June 2019, November 2020, revised February 2022).
4 Combined sum of acetochlor metabolites ESA and OA.
5 Combined sum of metabolites (di- and mono-acid) and parent material dacthal.
6 Combined sum of metabolite DKN and parent material isoxaflutole.
7 Combined sum of metolachlor metabolites ESA and OA.
-- Indicates that Health Advisory Level value in Wisconsin not established.
DKN diketonitrile
ESA ethane sulfonic acid
OA oxanilic acid; can also be identified as OXA.
µg/L micrograms per liter or parts per billion
TCR Total Chlorinated Residue for Atrazine. Reflects an additive quantity of atrazine (parent material) and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).

(white)	Indicates no detects in excess of laboratory reporting limits.
(light yellow)	Indicates detects in excess of laboratory reporting limits.
(peach)	Indicates detects in excess of laboratory reporting limits and a Wis. Admin. Code ch. NR 140 Preventive Action Limit.
(red)	Indicates detects in excess of laboratory reporting limits and either a Wis. Admin. Code ch. NR 140 Enforcement Standard or a DHS Drinking Water Health Advisory.

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Table B 4: Field-Edge Groundwater Monitoring Program - 2023 Land Pesticide/Nitrogen- and Irrigation-Use (as Provided by Growers)

COUNTY	SITE (Grower)	YEAR	CROP	NUTRIENT MANAGEMENT PLAN	IRRIGATION APPLIED (in inches)	NITROGEN APPLIED (in lbs/acre)	PESTICIDE PRODUCT APPLIED
Adams	AD2	2016	corn silage	---	6.45	374.8	glyphosate
							atrazine
							dicamba
		2017 [1]	---	---	---	---	---
		2018 [1]	---	---	---	---	---
		2019 [1]	---	---	---	---	---
		2020 [1]	---	---	---	---	---
		2021 [1]	---	---	---	---	---
		2022 [1]	---	---	---	---	---
		2023 [1]	---	---	---	---	---
	AD5	2016 [1]	---	---	---	---	---
		2017 [1]	---	---	---	---	---
		2018 [1]	---	---	---	---	---
		2019 [1]	---	---	---	---	---
		2020 [1]	---	---	---	---	---
		2021 [1]	---	---	---	---	---
		2022 [1]	---	---	---	---	---
		2023 [1]	---	---	---	---	---
Barron	BR3	2016 [1]	---	---	---	---	---
		2017 [1]	---	---	---	---	---
		2018 [1]	---	---	---	---	---
		2019	corn	no	2.24	300	glyphosate
							topramezone, dimethenamid
							acetochlor, flumetsulam, clopyralid
		2020 [1]	---	---	---	---	---
		2021 [1]	---	---	---	---	---
		2022 [1]	---	---	---	---	---
		2023 [1]	---	---	---	---	---
Dane	DN1	2016	seed corn	---	3	216.7	simazine
							metolachlor
							mesotrione
							topramezone
							bifenthrin
							pyraclastrobin, metconazole
							2,4-D
							glyphosate
							sodium chlorate
		2017	soybeans	---	2	6.0	glyphosate
							clethodim
							lambda-cyhalothrin
							glufosinate
		2018 [1]	---	---	---	---	---
		2019	soybeans	yes	2	1.7	glyphosate
							metribuzin
							dimethenamid
							glufosinate
							clethodim
							lambda-cyhalothrin
		2020	seed corn	yes	4	201.95	metolachlor
							glycine
							mesotrione
							simazine
							topramezone
							acetochlor
							simazine
							azoxystrobin, cyproconazole
							bifenthrin
							metaconazole, pyraclostrobin
		2021 [1]	---	---	---	---	---
		2022	corn	yes	5	415	simazine
							bifenthrin
							pydiflumatafen
							metolachlor
							glyphosate
							mesotrione
							acetochlor
							azoxystrobin
		2023	soybeans	yes	8	0	glyphosate
							metribuzin
							bifenthrin, imidacloprid
							glufosinate
							lambda-cyhalothrin
							2,4-D

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Dunn	DU1	2016	soybeans	---	3.43	100.0	dimethenamid flumioxazin clethodim benzoic acid
		2017	horseradish	---	0.8	140.5	peroxyacetic acid, hydrogen peroxide oxyfluorfen sulfentrazone glyphosate clethodim boscolid chlorothalonil
		2018	corn (grain)	no	3.97	193.3	glyphosate dicamba dimethenamid, saflufenacil
		2019 [1]	---	---	---	---	---
		2020	kidney beans	no	2.5	91.98	pendimethalin metolachlor imazamox sodium bentazon clethodim beta-cyfluthrin, imidacloprid saflufenacil
		2021	corn	no	15.6	1076.9	dicamba dimethenamide glyphosate saflufenacil
		2022 [1]	---	---	---	---	---
		2023 [1]	---	---	---	---	---
	DU2	2016	corn	---	8	241.0	glyphosate dimethenamid, saflufenacil
		2017	kidney beans	---	4	85.0	pendimethalin metolachlor bentazon fomesafen imazamox clethodim saflufenacil thiamethoxam, fludioxonil
		2018	corn	---	5	66.2	dimethenamid, saflufenacil glyphosate atrazine
		2019	kidney beans	yes	3.25	72.5	pendimethalin glyphosate metolachlor imazamox bentazon fomesafen clethodim imidacloprid saflufenacil
		2020	kidney beans	no	2.5	91.98	pendimethalin metolachlor imazamox sodium bentazon clethodim beta-cyfluthrin, imidacloprid saflufenacil
		2021	corn	no	4.2	85	clothianidin glyphosate dicamba dimethenamide pyroxasulfone saflufenacil
		2022	soybeans	no	4	0	metolachlor metribuzin glufosinate glyphosate
		2023	corn	no	8	255	dimethenamid, saflufenacil dicamba glyphosate
Grant	GR1	2016 [1]	---	---	na	---	---
		2017 [1]	---	---	na	---	---
		2018 [1]	---	---	na	---	---
		2019 [1]	---	---	na	---	---
		2020 [1]	---	---	na	---	---
		2021 [1]	---	---	na	---	---
		2022 [1]	---	---	na	---	---
		2023 [1]	---	---	na	---	---

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Iowa	IW1	2016	potatoes	---	18.4	374.4	metam sodium azoxystrobib, difenoconazole metalaxyl imidacloprid azoxystrobin metribuzin novaluron spinosad beta-cyfluthrin rimsulfuron chlorothalonil pyraclostrobin boscolid abamectin pyrimethanil mancozeb diquat bromide
		2017	seed corn	---	8.9	198.5	glyphosate bifenthrin glufosinate MCPA, bromoxynil pendimethalin pyraclostrobin, metconazole propiconazole, azoxystrobin
		2018	snap beans	no	5.7	77.0	thiamethoxam halosulfuron-methyl s-metolachlor imazamox, bentazon sethoxydim
		2019 [1]	---	---	---	---	---
		2020	potatoes	no	21	225.93	bifenthrin, pyraclostrobin metribuzin metolachlor indoxacarb acetamiprid chlorothalonil spinosad lambda-cyhalothrin mefentrifluconazole abamectin zoxamide pyrimethanil mancozeb fentin hydroxide diquat dibromide
		2021	seed corn	no	9.4	199	abamectin azoxystrobin bifenthrin bromoxynil fludioxonil tembotrione glyphosate mefanoxam pendimethalin propiconazole pydiflumetofen thiabendazole thiamethoxam
		2022 [1]	---	---	---	---	---
		2023	seed corn	no	15.665	321.29	azoxystrobin bifenthrin bicyclopyrone metolachlor mesotrione glyphosate glufosinate pendimethalin propiconazole pydiflumetofen pyraclostrobin metconazole
	IW2	2016	seed corn	---	12.8	195.5	glyphosate bifenthrin metolachlor pendimethalin tembotrione bromoxynil azoxystrobin
		2017	snap beans	---	6.6	72.2	glyphosate EPTC thiamethoxam bifenthrin imazamox, bentazon
		2018	seed corn	no	12.1	256.0	bifenthrin bicyclopyrone, metolachlor, mesotrione pendimethalin thiamethoxam azoxystrobin
		2019 [1]	---	---	---	---	---
		2020	seed corn	no	10.6	223.2	bifenthrin glufosinate metolachlor nicosulfuron pyroxasulfone pendimethalin azoxystrobin, propiconazole, pydiflumetofen
		2021	snap beans	no	5.2	65	bifenthrin captan glyphosate imazomox, bentazon halosulfuron-methyl matalaxyl sethoxydim metolachlor thiophanate-methyl thiram thiamethmoxam
		2022 [1]	---	---	---	---	---
		2023	potatoes	yes	30.2	54.3	glyphosate polyacrylamide pendimethalin metolachlor novaluron indoxacarb tolfenpyrad clethodim pyrimethanil chlorothalonil bifenthrin metalaxyl dimethylpolysiloxane

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Jackson	JK3	2016[1]	---	---	na	---	---
		2017[1]	---	---	na	---	---
		2018[1]	---	---	na	---	---
		2019[1]	---	---	na	---	---
		2020[1]	---	---	na	---	---
		2021[1]	---	---	na	---	---
		2022[1]	---	---	na	---	---
		2023	coen/soybeans	no	na	275	glyphosate
							acetochlor, clopyralid, flumetsulam
							dicamba
							2,4-D
Juneau	JN1	2016	sweet corn	---	8	211.0	atrazine
							metolachlor
		2017	snap beans	---	2.9	122.0	metolachlor
							halosulfuron-methyl
		2018	sweet corn	no	8	228.6	atrazine
							metolachlor
		2019	potatoes	no	12.5	65.05	azoxystrobin
							chlorothalonil
							esfenvalerate
							spinosad
							thiamethoxam
							diquat dibromide
							boscalid
							metribuzin
							cyantraniliprole, abamectin
							metam sodium
							metalaxyl
		2020	sweet corn	no	9.5	212.37	atrazine
							metolachlor
		2021	snap beans	no	5	152.6	halosulfuron-methyl
							metolachlor
		2022[1]	---	---	---	---	---
		2023[1]	---	---	---	---	---
	JN3	2016[1]	---	---	na	---	---
		2017[1]	---	---	na	---	---
		2018[1]	---	---	na	---	---
		2019[1]	---	---	na	---	---
		2020[1]	---	---	na	---	---
		2021[1]	---	---	na	---	---
		2022[1]	---	---	na	---	---
		2023[1]	---	---	na	---	---
La Crosse	LC2	2016	corn silage	---	---	179.5	glyphosate
							lorsban
							acetochlor
							dicamba
		2017	soybeans	---	---	0.0	glyphosate
							2,4-D
							imazethapyr
		2018	corn	yes	2.5	705.7	glyphosate
							atrazine, acetochlor
							mesotrione
		2019	beans	---	---	0.0	glyphosate
							methansulfonamide
							metribuzin
							metolachlor
							glyphosate, imazethapyr
		2020[1]	---	---	---	---	---
		2021[1]	---	---	---	---	---
		2022	alfalfa	yes	5.25	0	none
		2023[1]	---	---	---	---	---
Langlade	LN1	2016[1]	---	---	---	---	---
		2017[1]	---	---	---	---	---
		2018[1]	---	---	---	---	---
		2019[1]	---	---	---	---	---
		2020[1]	---	---	---	---	---
		2021[1]	---	---	---	---	---
		2022	sweet corn	yes	2	220	nicosulfuron
		2023[1]	---	---	---	---	---
Portage	PR1	2016[1]	---	---	---	---	---
		2017[1]	---	---	---	---	---
		2018	sweet corn	yes	4.6	164.0	metolachlor
							atrazine
		2019	potatoes	yes	6.7	159	chlorothalonil
							azoxystrobin
							spinetram
							abamectin, cyantraniliprole
							imidacloprid
							novaluron
							diqust
		2020[1]	field corn	---	7.2	167.17	glyphosate
		2021[1]	---	---	---	---	---
		2022[1]	---	---	---	---	---
		2023[1]	---	---	---	---	---

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St. Croix	SC1	2016	soybeans	---	na	---	glyphosate
		2017	corn	---	na	250.0	glyphosate
							tembotrione
							acetochlor
		2018	soybeans	no	na	0.0	glyphosate
		2019 [1]	---	---	na	---	---
		2020 [1]	---	---	na	---	---
		2021 [1]	---	---	na	---	---
		2022 [1]	---	---	na	---	---
		2023 [1]	---	---	na	---	---
Sauk	SK6	2016 [1]	---	---	na	---	---
		2017 [1]	---	---	na	---	---
		2018 [1]	---	---	na	---	---
		2019 [1]	---	---	---	---	---
		2020 [1]	---	---	---	---	---
		2021 [1]	---	---	---	---	---
		2022 [1]	---	---	---	---	---
		2023 [1]	---	---	---	---	---
Trempealeau	TR1	2016 [1]	---	---	---	---	---
		2017 [1]	---	---	---	---	---
		2018 [1]	---	---	---	---	---
		2019 [1]	---	---	---	---	---
		2020 [1]	---	---	---	---	---
		2021 [1]	---	---	---	---	---
		2022 [1]	---	---	---	---	---
		2023	corn	yes	12	400	glyphosate
Waupaca	WP2	2016	corn	---	na	132.0	acetochlor
							clopyralid
							flumetsulam
		2017	soybeans	---	na	0.0	glyphosate
		2018	soybeans	yes	na	0.0	glyphosate
		2019	corn	yes	na	122.0	acetochlor, clopyralid, flumetsulam
							glyphosate
		2020	corn	yes	na	97.9	acetochlor, clopyralid, flumetsulam
		2021	soybeans	yes	na	0	glyphosate
		2022 [1]	---	---	---	---	---
		2023	corn	yes	na	225	glyphosate
							acetochlor, clopyralid, flumetsulam

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Waushara	WS4	2016	carrots	---	9.08	176.0	glyphosate
							pendimethalin
							chlorothalonil
							esfenvalerate
							clethodim
							azoxystrobin
		2017	potatoes	---	13.62	115.1	glyphosate
							thiamethoxam, fludioxonil
							mancozeb
							azoxystrobin
							pentachloronitrobenzene
							metolachlor
							metribuzin
							rimsulfuron
							chlorothalonil
							novaluron
							metalaxyl
							spinosad
							boscolid
							cyantraniliprole, abamectin
							pyraclostrobin
							oxathiapiprolin
							fentin hydroxide
							diquat bromide
		2018	corn	no	9.1	70.6	metolachlor
							simazine
							glyphosate
							ammonium sulfamate
		2019	beans	no	2.42	24.96	metolachlor
							halosulfuron-methyl
		2020	carrots	no	12.12	241.3	pendimethalin
							clethodim
							prometryn
							carfentrazone-ethyl
							esfenvalerate
							chlorothalonil
							azoxystrobin
							boscalid
		2021	potatoes	no	12.71	292.3	abamectin
							cyantraniliprole
							esfenvalerate
							metolachlor
							novaluron
							pendimethalin
							phosmet
							spinetoram
		2022 [1]	---	---	---	---	---
		2023	beans	no	6.65	42.5	metolachlor
							halosulfuron-methyl
	WS6	2016	corn	---	8.35	70.4	glyphosate
							simazine
							metolachlor
		2017	beans	---	6	105.6	glyphosate
							metolachlor
							halosulfuron-methyl
		2018	carrots	no	12.76	254.1	clethodim
							carfentrazone-ethyl
							cypermethrin
							azoxystrobin
		2019	potatoes	no	10.9	200.16	pendimethalin
							metribuzin
							novaluron
							phosmet
							chlorothalonil
							boscolid
							cyantraniliprole, abamectin
							metalaxyl
							fentin hydroxide
							diquat dibromide
		2020	corn	no	7.93	70.78	glyphosate
							metolachlor
							simazine
							tembotrione
		2021	corn	no	14.6	133	metolachlor
							simazine
							topramezone
		2022 [1]	---	---	---	---	---
		2023	carrots	no	14.07	183	glyphosate
							chllorpropham
							clethodim
							metribuzin
	WS7	2016					
		2017					
		2018					
		2019					
		2020					
		2021					
		2022					
		2023					

Notes:

1 Grower did not provide information in Annual Reporting Form.

(green) Site is located within an atrazine Prohibition Area.

--- Information not provided by Grower.

na Fields are not equipped to irrigate.

(hatched) Site is a research location with multiple crops and herbicide types and application rates. Information not available for publication.

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Table B 5: Field-Edge Groundwater Monitoring Program - 2023 Imidacloprid Concentrations in Groundwater Samples

County	Site (Grower)	Well Name	WUWN	Sample Date	Imidacloprid
Adams	AD2	AD2-1	BH954	3/15/2023	0
		AD2-2	BH953	10/4/2023	0
		AD2-4	VR844	3/15/2023	0.0174
				10/4/2023	0
		AD2-5	VR845	3/15/2023	0.265
				10/4/2023	0.0975
		AD2-6	PT421	3/15/2023	0
				10/4/2023	0
	AD5	AD5-1	CL461	5/17/2022	0
				10/18/2022	0
		AD5-4	VR846	3/15/2023	0.0607
				10/4/2023	0.0275
		AD5-5	VR847	3/15/2023	0.239
				10/4/2023	0.267
		AD5-6	PT422	3/15/2023	0
				10/4/2023	0
Barron	BR3	BR3-1	BR279	10/19/2023	0
		BR3-3	BR281	10/19/2023	0
Dane	DN1	DN1-1	PT428	11/7/2023	0
		DN1-3	BR252	11/7/2023	0
Dunn	DU1	DU1-1	AO384	10/19/2023	0
		DU1-3	AO386	10/19/2023	0
	DU2	DU2-1	AO387	10/18/2023	0
		DU2-3	AO389	10/18/2023	0
Grant	GR1	GR1-1	BR255	11/7/2023	0
		GR1-3	BR257	11/7/2023	0
Iowa	IW1	IW1-4	BR259	3/7/2023	0
				10/24/2023	0.0219
		IW1-6	BR261	3/7/2023	0.0437
				10/24/2023	0.0266
		IW1-7	BH967	3/7/2023	0.0227
				10/24/2023	0.0196
		IW1-8	PT425	3/7/2023	1.49
				10/24/2023	0.0999
	IW2	IW2-1	BR036	3/7/2023	0
		IW2-2	BR037	10/24/2023	0.0675
		IW2-3	BR038	3/7/2023	0.0793
				10/24/2023	0.353
		IW2-4	PT426	3/7/2023	0.367
				10/24/2023	0.0451
		IW2-5	PT427	3/7/2023	0
				10/24/2023	0
Jackson	JK3	JK3-1	JH982	10/18/2023	0
		JK3-2	JH981	10/18/2023	0
Juneau	JN1	JN1-1	BR046	11/9/2023	0
		JN1-3	BR048	11/9/2023	0
	JN3	JN3-1	JH937	11/29/2023	0
		JN3-2	JH936	11/29/2023	0
La Crosse	LC2	LC2-1	VZ391	10/18/2023	0
		LC2-2	VZ392	10/18/2023	0
Langlade	LN1	LN1-1	BH964	10/11/2023	0
		LN1-3	BH966	10/11/2023	0

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Portage	PR1	PR1-2	BR208	10/11/2023	0
		PR1-4	VR848	10/11/2023	0
		PR1-5	VR849	10/11/2023	0
St. Croix	SC1	SC1-1	JH938	10/19/2023	0
Sauk	SK6	SK6-1	BB246	3/22/2023	0
		SK6-2	BB247	11/7/2023	0
		SK6-3	BB248	3/22/2023	0
				11/7/2023	0.0162
		SK6-4	PT424	3/22/2023	0
				11/7/2023	0
Trempealeau	TR1	TR1-1	PX201	10/18/2023	0
		TR1-2	PX202	10/18/2023	0
Waupaca	WP2	WP2-1	JH985	10/11/2023	0
		WP2-2	JH984	10/11/2023	0
Waushara	WS4	WS4-1	BB258	11/1/2023	0.0391
		WS4-4	BB261	11/1/2023	0
	WS6	WS6-1	JH989	11/1/2023	0
				12/14/2023	0
		WS6-2	JH990	11/1/2023	0.0273
				12/14/2023	0.02
	WS7	WS7-1	VR841	3/22/2023	0
				11/1/2023	0
		WS7-2	VR842	3/22/2023	0
				11/1/2023	0
		WS7-3	VR843	3/22/2023	0.0109
				11/1/2023	0
		WS7-4	PT423	3/22/2023	0.0161
				11/1/2023	0

Notes:

WUWN	Wisconsin Unique Well Number
µg/L	Micrograms per liter or parts per billion
0	Concentration does not exceed laboratory reporting limit of 0.01 µg/L.
	Exceeds Wisconsin Department of Health Services Drinking Water Health Advisory of 0.2 µg/L (June 2019, November 2020, revised February 2022).

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Table B 6: Field-Edge Groundwater Monitoring Program - 2023 Alachlor ESA Concentrations in Groundwater Samples

County	Site (Grower)	Well Name	WUWN	Sample Date	Alachlor ESA
Adams	AD2	AD2-1	BH954	3/15/2023	0.261
		AD2-2	BH953	10/4/2023	0.118
		AD2-4	VR844	3/15/2023	0.222
				10/4/2023	0.414
		AD2-5	VR845	3/15/2023	0.667
				10/4/2023	0.742
		AD2-6	PT421	3/15/2023	2.54
				10/4/2023	1.52
	AD5	AD5-1	CL461	3/15/2023	0.366
				10/4/2023	0.131
		AD5-4	VR846	3/15/2023	0.904
				10/4/2023	0.971
		AD5-5	VR847	3/15/2023	8.93
				10/4/2023	7.12
		AD5-6	PT422	3/15/2023	3.27
				10/4/2023	6.11
Barron	BR3	BR3-1	BR279	10/19/2023	0
		BR3-3	BR281	10/19/2023	0
Dane	DN1	DN1-1	PT428	11/7/2023	0
		DN1-3	BR252	11/7/2023	0
Dunn	DU1	DU1-1	AO384	10/19/2023	0.162
		DU1-3	AO386	10/19/2023	1.112
	DU2	DU2-1	AO387	10/18/2023	0
		DU2-3	AO389	10/18/2023	0
Grant	GR1	GR1-1	BR255	11/7/2023	0
		GR1-3	BR257	11/7/2023	0
Iowa	IW1	IW1-4	BR259	3/7/2023	0.253
				10/24/2023	0.192
		IW1-6	BR261	3/7/2023	1.02
				10/24/2023	0.966
		IW1-7	BH967	3/7/2023	1.61
				10/24/2023	1.67
		IW1-8	PT425	3/7/2023	1.53
				10/24/2023	1.39
	IW2	IW2-1	BR036	3/7/2023	0.196
		IW2-2	BR037	10/24/2023	0.299
		IW2-3	BR038	3/7/2023	0.297
				10/24/2023	0.288
		IW2-4	PT426	3/7/2023	0.498
				10/24/2023	0.584
		IW2-5	PT427	3/7/2023	0.331
				10/24/2023	0.332
Jackson	JK3	JK3-1	JH982	10/18/2023	0
		JK3-2	JH981	10/18/2023	0
Juneau	JN1	JN1-1	BR046	11/9/2023	0
		JN1-3	BR048	11/9/2023	0.497
	JN3	JN3-1	JH937	11/29/2023	17.5
		JN3-2	JH936	11/29/2023	0

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La Crosse	LC2	LC2-1	VZ391	10/18/2023	0
		LC2-2	VZ392	10/18/2023	0
Langlade	LN1	LN1-1	BH964	10/11/2023	0
		LN1-3	BH966	10/11/2023	0
Portage	PR1	PR1-2	BR208	10/11/2023	0.686
		PR1-4	VR848	10/11/2023	0.38
		PR1-5	VR849	10/11/2023	0.62
St. Croix	SC1	SC1-1	JH938	10/19/2023	0
Sauk	SK6	SK6-1	BB246	3/22/2023	1.29
		SK6-2	BB247	11/7/2023	0.381
		SK6-3	BB248	3/22/2023	0.664
				11/7/2023	0.444
		SK6-4	PT424	3/22/2023	0.28
				11/7/2023	0.151
Trempealeau	TR1	TR1-1	PX201	10/18/2023	0
		TR1-2	PX202	10/18/2023	0
Waupaca	WP2	WP2-1	JH985	10/11/2023	0
		WP2-2	JH984	10/11/2023	0.052
Waushara	WS4	WS4-1	BB258	11/1/2023	0.928
		WS4-4	BB261	11/1/2023	0.383
	WS6	WS6-1	JH989	11/1/2023	0.234
				12/14/2023	0.123
		WS6-2	JH990	11/1/2023	0
				12/14/2023	0.0688
	WS7	WS7-1	VR841	3/22/2023	0.244
				11/1/2023	0.242
		WS7-2	VR842	3/22/2023	0.354
				11/1/2023	0.337
		WS7-3	VR843	3/22/2023	2.81
				11/1/2023	3.15
		WS7-4	PT423	3/22/2023	4.34
				11/1/2023	3.62

Notes:

WUWN	Wisconsin Unique Well Number
µg/L	Micrograms per liter or parts per billion
0	Concentration does not exceed laboratory reporting limit of 0.05 µg/L.
	Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Preventive Action Limit of 4.0 µg/L.
	Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Enforcement Standard of 20.0 µg/L.

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Table B 7: Field-Edge Groundwater Monitoring Program - 2023 Atrazine and Metabolite Concentrations in Groundwater Samples

County	Site (Grower)	Well Name	WUWN	Sample Date	Atrazine	De-ethyl Atrazine	De-isopropyl Atrazine	Di-amino Atrazine	Atrazine TCR
Adams	AD2	AD2-1	BH954	3/15/2023	0	0	0	0	0
		AD2-2	BH953	10/4/2023	0	0	0	0	0
		AD2-4	VR844	3/15/2023	0.124	0.147	0	0	0.271
				10/4/2023	0.116	0.201	0	0	0.317
		AD2-5	VR845	3/15/2023	0.0842	0.243	0	0	0.3272
				10/4/2023	0.108	0.355	0	0	0.463
		AD2-6	PT421	3/15/2023	0.25	0.603	0	0.187	1.04
				10/4/2023	0.21	0.414	0	0	0
	AD5	AD5-1	CL461	3/15/2023	0	0	0	0	0
				10/4/2023	0	0	0	0	0
		AD5-4	VR846	3/15/2023	0	0	0.141	0.199	0.34
				10/4/2023	0	0	0.171	0.223	0.394
		AD5-5	VR847	3/15/2023	0.127	0.549	0	0.186	0.862
				10/4/2023	0.138	0.498	0	0.192	0.828
		AD5-6	PT422	3/15/2023	0	0.906	0	0.207	1.113
				10/4/2023	0	0.815	0	0.306	1.118
Barron	BR3	BR3-1	BR279	10/19/2023	0	0	0	0	0
		BR3-3	BR281	10/19/2023	0	0	0	0	0
Dane	DN1	DN1-1	PT428	11/7/2023	0	0	0	0	0
		DN1-3	BR252	11/7/2023	0	0	0	0	0
Dunn	DU1	DU1-1	AO384	10/19/2023	0	0	0.105	0	0.105
		DU1-3	AO386	10/19/2023	0	0	0.141	0	0.141
	DU2	DU2-1	AO387	10/18/2023	0	0	0	0	0
		DU2-3	AO389	10/18/2023	0	0	0	0	0
Grant	GR1	GR1-1	BR255	11/7/2023	0	0	0	0	0
		GR1-3	BR257	11/7/2023	0	0	0	0	0
Iowa	IW1	IW1-4	BR259	3/7/2023	0	0	0	0	0
				10/24/2023	0	0	0	0	0
		IW1-6	BR261	3/7/2023	0	0	0	0	0
				10/24/2023	0	0	0	0	0
		IW1-7	BH967	3/7/2023	0	0.0615	0.0516	0	0.1131
				10/24/2023	0	0.0584	0.0562	0	0.1146
		IW1-8	PT425	3/7/2023	0	0.0729	0.121	0.203	0.3969
				10/24/2023	0	0.0671	0.1	0.214	0.3811
	IW2	IW2-1	BR036	3/7/2023	0	0	0	0	0
		IW2-2	BR037	10/24/2023	0	0	0	0	0
		IW2-3	BR038	3/7/2023	0	0	0	0	0
				10/24/2023	0	0	0	0	0
		IW2-4	PT426	3/7/2023	0	0	0	0	0
				10/24/2023	0	0	0	0	0
		IW2-5	PT427	3/7/2023	0.162	0.155	0.112	0.185	0.614
				10/24/2023	0.18	0.109	0.0866	0	0.3756
Jackson	JK3	JK3-1	JH982	10/18/2023	0	0	0	0	0
		JK3-2	JH981	10/18/2023	0	0	0	0	0
Juneau	JN1	JN1-1	BR046	11/9/2023	0	0	0	0	0
		JN1-3	BR048	11/9/2023	0	0	0	0	0
	JN3	JN3-1	JH937	11/29/2023	0	0	0	0	0
		JN3-2	JH936	11/29/2023	0	0	0	0	0
La Crosse	LC2	LC2-1	VZ391	10/18/2023	0.0502	0.131	0	0	0.1812
		LC2-2	VZ392	10/18/2023	0	0.124	0	0	0.124
Langlade	LN1	LN1-1	BH964	10/11/2023	0	0	0	0	0
		LN1-3	BH966	10/11/2023	0	0	0	0	0
Portage	PR1	PR1-2	BR207	10/11/2023	0.0718	0.238	0	0	0.3098
		PR1-4	VR848	10/11/2023	0	0.065	0	0	0.065
		PR1-5	VR849	10/11/2023	0	0.0863	0	0	0.0863
St. Croix	SC1	SC1-1	JH938	10/19/2023	0	0.0568	0.0787	0.278	0.4135
Sauk	SK6	SK6-1	BB246	3/22/2023	0	0	0	0	0
		SK6-2	BB247	11/7/2023	0	0	0	0	0
		SK6-3	BB248	3/22/2023	0	0	0	0	0
				11/7/2023	0	0	0	0	0
		SK6-4	PT424	3/22/2023	0.0973	0.186	0.169	0.153	0.6053
				11/7/2023	0.554	0.518	0.201	0.166	1.439
Trempealeau	TR1	TR1-1	PX201	10/18/2023	0	0	0	0	0
		TR1-2	PX202	10/18/2023	0	0	0	0	0
Waupaca	WP2	WP2-1	JH985	10/11/2023	0	0	0.058	0.172	0.23
		WP2-2	JH984	10/11/2023	0	0	0	0	0

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Waushara	WS4	WS4-1	BB258	11/1/2023	0	0	0.078	0	0.078
		WS4-4	BB261	11/1/2023	0	0	0.0743	0.166	0.2403
	WS6	WS6-1	JH989	11/1/2023	0	0	0.444	0.175	0.619
				12/14/2023	0	0	0.295	0	0.295
		WS6-2	JH990	11/1/2023	0	0	0.15	0	0.15
				12/14/2023	0	0	0.196	0	0.196
	WS7	WS7-1	VR841	3/22/2023	0	0	0	0	0
				11/1/2023	0	0	0	0	0
		WS7-2	VR842	3/22/2023	0	0	0	0	0
				11/1/2023	0	0	0	0	0
		WS7-3	VR843	3/22/2023	0.0967	0.401	0.16	0	0.6037
				11/1/2023	0.0738	0.337	0.0879	0.156	0.6547
		WS7-4	PT423	3/22/2023	0.0831	0.464	0	0	0.5471
				11/1/2023	0.0936	0.472	0	0.164	0.7296

Concentrations identified as micrograms per liter or parts per billion.

TCR Total Chlorinated Residue for Atrazine. Reflects an additive quantity of atrazine and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).

WUWN Wisconsin Unique Well Number

µg/L Micrograms per liter or parts per billion.

0 Concentration does not exceed laboratory reporting limit of 0.05 µg/L.

Site is located within an atrazine Prohibition Area.

Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Preventive Action Limit of 0.3 µg/L.

Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Enforcement Standard of 3.0 µg/L.

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Table B 8: Field-Edge Groundwater Monitoring Program - 2023 Nitrogen-Nitrate/Nitrite Concentrations in Groundwater Samples

County	Site (Grower)	Well Name	WUWN	Sample Date	Nitrogen-Nitrate/Nitrite
Adams	AD2	AD2-1	BH954	3/15/2023	49.4
		AD2-2	BH953	10/4/2023	17.7
		AD2-4	VR844	3/15/2023	19.5
				10/4/2023	25.3
		AD2-5	VR845	3/15/2023	26.6
				10/4/2023	31.7
		AD2-6	PT421	3/15/2023	13
				10/4/2023	13.3
	AD5	AD5-1	CL461	3/15/2023	44.9
				10/4/2023	25.3
		AD5-4	VR846	3/15/2023	34.9
				10/4/2023	37.6
		AD5-5	VR847	3/15/2023	26.7
				10/4/2023	27
		AD5-6	PT422	3/15/2023	9.13
				10/4/202	15.7
Barron	BR3	BR3-1	BR279	10/19/2023	0
		BR3-3	BR281	10/19/2023	20.1
Dane	DN1	DN1-1	PT428	11/7/2023	13.9
		DN1-3	BR252	11/7/2023	19.2
Dunn	DU1	DU1-1	AO384	10/19/2023	15.1
		DU1-3	AO386	10/19/2023	23.9
	DU2	DU2-1	AO387	10/18/2023	4.95
		DU2-3	AO389	10/18/2023	1.6
Grant	GR1	GR1-1	BR255	11/7/2023	11.8
		GR1-3	BR257	11/7/2023	11.1
Iowa	IW1	IW1-4	BR259	3/7/2023	15.3
				10/24/2023	6.74
		IW1-6	BR261	3/7/2023	23
				10/24/2023	28
		IW1-7	BH967	3/7/2023	26.1
				10/24/2023	25.7
		IW1-8	PT425	3/7/2023	25.8
				10/24/2023	24.1
	IW2	IW2-1	BR036	3/7/2023	1.77
		IW2-2	BR037	10/24/2023	28.4
		IW2-3	BR038	3/7/2023	24.2
				10/24/2023	23.3
		IW2-4	PT426	3/7/2023	27.6
				10/24/2023	26.5
		IW2-5	PT427	3/7/2023	16.5
				10/24/2023	18.5
Jackson	JK3	JK3-1	JH982	10/18/2023	2.75
		JK3-2	JH981	10/18/2023	2.95
Juneau	JN1	JN1-1	BR046	11/9/2023	13.6
		JN1-3	BR048	11/9/2023	22
	JN3	JN3-1	JH937	11/29/2023	3.65
		JN3-2	JH936	11/29/2023	2

La Crosse	LC2	LC2-1	VZ391	10/18/2023	17.8
		LC2-2	VZ392	10/18/2023	18.8
Langlade	LN1	LN1-1	BH964	10/11/2023	15.1
		LN1-3	BH966	10/11/2023	15.2
Portage	PR1	PR1-2	BR208	10/11/2023	27
		PR1-4	VR848	10/11/2023	21.5
		PR1-5	VR849	10/11/2023	21.4
St. Croix	SC1	SC1-1	JH938	10/19/2023	18.8
		SK6-1	BB246	3/22/2023	32.3
Sauk	SK6	SK6-2	BB247	11/7/2023	30
		SK6-3	BB248	3/22/2023	26.8
				11/7/2023	32.8
		SK6-4	PT424	3/22/2023	9.61
				11/7/2023	9.73
Trempealeau	TR1	TR1-1	PX201	10/18/2023	25.6
		TR1-2	PX202	10/18/2023	28.3
Waupaca	WP2	WP2-1	JH985	10/11/2023	18.3
		WP2-2	JH984	10/11/2023	15.7
Waushara	WS4	WS4-1	BB258	11/1/2023	28.9
		WS4-4	BB261	11/1/2023	23.4
	WS6	WS6-1	JH989	11/1/2023	42.3
				12/14/2023	42.5
		WS6-2	JH990	11/1/2023	13.7
				12/14/2023	18.5
	WS7	WS7-1	VR841	3/22/2023	16.3
				11/1/2023	16.7
		WS7-2	VR842	3/22/2023	18.8
				11/1/2023	17.1
		WS7-3	VR843	3/22/2023	34.6
				11/1/2023	35.7
		WS7-4	PT423	3/22/2023	22.9
				11/1/2023	25.8

Notes:

WUWN	Wisconsin Unique Well Number
mg/L	Milligrams per liter or parts per million
0	Concentration does not exceed laboratory reporting limit of 0.5 mg/L.
(yellow)	Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Preventive Action Limit of 2.0 mg/L.
(orange)	Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Enforcement Standard of 10.0 mg/L.