



Pesticide Management Plan Status Report

2023-2024 Biennium

8/27/2024

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Executive Summary

The Minnesota Department of Agriculture (MDA) submits a biennial Pesticide Management Plan Status Report to the Environmental Quality Board and to the Minnesota House of Representatives and Senate committees with jurisdiction over the environment, natural resources, and agriculture.

The Pesticide Management Plan (PMP) is a guidance document for the prevention, evaluation, and mitigation of occurrences of pesticides or their breakdown products in Minnesota groundwater and surface water due to non-point source pollution from the legal use of pesticide products.

In the 2023-2024 biennium (June 2022 through June 2024), the MDA conducted prevention activities and continued efforts to inform pesticide applicators and others about the importance of minimizing pesticide impacts to water quality to the extent practicable. The MDA's prevention activities included education and outreach activities coordinated through the PMP's Education and Promotion Team.

The MDA's Monitoring and Assessment Program for water quality continued to be the foundation of evaluation activities in the 2023-2024 biennium. It is further supported by data collected from pesticide applicator use surveys, the Pesticide Management Plan Committee's review of data, and consultation with risk assessors and water quality program staff at the Minnesota Department of Health and the Minnesota Pollution Control Agency.

Mitigation activities in the 2023-2024 biennium included ongoing education and outreach specific to common detection pesticides in groundwater, surface water pesticides of concern, evaluation of pesticide best management practices (BMPs), and the promotion and distribution of BMPs. Activities also involved developing new water quality BMPs for the agricultural use of clothianidin and imidacloprid and updating three additional water quality BMPs for pesticides.

There continues to be a great deal of activity at the MDA in support of the PMP, with coordinated implementation of prevention, evaluation, and mitigation efforts within the MDA and in cooperation with tribes, other state agencies, the University of Minnesota, industry groups, and other stakeholders.

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Introduction

The following biennial status report provides background and outlines major activities conducted by the Minnesota Department of Agriculture (MDA) during the 2023-2024 biennium (June 2022 through June 2024) in support of the Pesticide Management Plan (PMP).

The PMP is a guidance document for the prevention, evaluation, and mitigation of occurrences of pesticides or pesticide breakdown products in Minnesota groundwaters and surface waters due to non-point source pollution from the legal use of pesticide products. The plan includes sections on prevention, evaluation, and mitigation which coincide with the three statutorily required components of the PMP. It also includes information on other pesticide-related environmental activities. While the PMP is required by statute, it is a guidance document and has no inherent enforceable or regulatory requirements.

The PMP is available on the [MDA's Pesticide Management Plan webpage](#). Additional information on many of the activities discussed in this report, as well as others undertaken by the MDA, are available through the [Pesticide Management webpage](#) and the MDA's general website.

Background

The Pesticide Control Law (MINN. STAT. 18B.045) directs the MDA to submit a biennial PMP status report to the Environmental Quality Board (EQB) and to the Minnesota House of Representatives and Senate committees with jurisdiction over the environment, natural resources, and agriculture:

By September 1 of each even-numbered year, the commissioner must submit a status report on the plan to the Environmental Quality Board for review and then to the house of representatives and senate committees with jurisdiction over the environment, natural resources, and agriculture.

Copies of previous status reports are available through the [Minnesota Legislative Reference Library](#).

The statutory requirements and purpose for the PMP are outlined in the enabling legislation (MINN. STAT. 18B.045 subd. 1):

The commissioner shall develop a pesticide management plan for the prevention, evaluation, and mitigation of occurrences of pesticides or pesticide breakdown products in groundwaters and surface waters of the state. The pesticide management plan must include components promoting prevention, developing appropriate responses to the detection of pesticides or pesticide breakdown products in groundwater and surface waters, and providing responses to reduce or eliminate continued pesticide movement to groundwater and surface water.

The PMP includes components promoting prevention, developing appropriate responses to the detection of pesticides or pesticide breakdown products in groundwater and surface waters, and providing recommendations to reduce or eliminate pesticide movement to groundwater and surface water. The PMP is to be coordinated with other state agency plans and with other state agencies through the EQB. Development of the PMP included input from the University of Minnesota (UMN) Extension, farm organizations, farmers, environmental organizations, and industry (MINN. STAT. 18B.045 subd. 2).

Development of the PMP began in 1990, with a final draft published in 1996. Minor revisions were made in 1998. The United States Environmental Protection Agency (EPA) provided a formal concurrence with the original 1996 version and with the revised 1998 version. The MDA again revised the PMP in June 2005 after conducting an issues forum and several public meetings. Additional revisions were incorporated in November 2007 based on recommendations made the previous year by the Office of the Legislative Auditor's review of MDA's pesticide programs.

In 2020, a new report from the Office of Legislative Auditor recommended that the MDA should review PMP on a regular basis and revise it when necessary. The PMP revisions are currently proceeding in response to this recommendation. In 2023, a draft of proposed revisions to the PMP was completed, and the MDA began the process of coordinating with tribes. The MDA plans to solicit public comment on the proposed revisions in 2024.

Prevention Activities

Water quality problems due to pesticide pollution are best addressed by first focusing on prevention. The MDA has developed best management practices (BMPs) for Pesticide Management and Handling. These include BMPs for general pesticide distribution, storage, handling, use, and disposal. These BMPs continue to be promoted by the MDA and cooperators through pesticide applicator training programs, seasonal updates, and other distribution and outreach mechanisms, such as the MDA's Pesticide and Fertilizer Management Division (PFMD) Update newsletter, which is sent to private and commercial pesticide applicators. The BMPs for pesticide management and handling are available on the MDA's [Pesticide Best Management Practices webpage](#).

The MDA has developed voluntary BMPs that focus on the general use of agricultural herbicides, fungicides, and insecticides, as well as BMPs for specific pesticides of concern for water resources. Many of these BMPs were developed, in part, in direct response to the MDA's mandates under the state Groundwater Protection Act (MINN. STAT. chapter 103H) and are designed to minimize pesticide detections in groundwater and prevent concentrations from exceeding drinking water standards. The BMPs also address surface water concerns to minimize losses of pesticides to lakes, rivers, and streams, and to avoid possible impairment declarations for specific water bodies under the Clean Water Act.

The pesticide specific BMPs, along with the BMPs for general pesticide management and handling, form the foundation of MDA's prevention efforts. This also involves the MDA's product registration reviews, use inspections and enforcement, applicator training, incident response program, waste pesticide product disposal, and certification and licensure efforts.

In the 2023-2024 biennium, the MDA developed [Water Quality Best Management Practices for Agricultural Use of Clothianidin & Imidacloprid](#) (February 2023). The MDA has also updated, or is in the process of updating, the following BMPs:

- [Water Quality BMPs for All Agricultural Herbicides \(PDF, May 2024\)](#)
- [Water Quality BMPs for Acetochlor \(PDF\)](#)
- [Water Quality BMPs for Chlorpyrifos \(PDF, February 2024\)](#)

Additionally, a shortened version of the acetochlor water quality BMPs and the [Stewardship Guidelines and BMPs for Neonicotinoid Insecticide-Treated Seed \(PDF\)](#) were developed. The MDA also continues to promote and distribute a number of other pesticide BMPs. Examples of efforts to promote BMPs and the responsible, safe use of pesticides in 2023-2024 are summarized in the following sections.

Education and Outreach

During the 2023-2024 biennium, the MDA, along with UMN Extension, commodity groups, registrants, and others, provided informational documents, presentations, and video for use by pesticide applicators, retailers, educators, and other interested parties.

Information about statewide and regional impacts of pesticides on water quality, along with information about preventing such impacts, was prepared for and coordinated with UMN Extension staff engaged in multi-regional pesticide applicator training. Information concerning pesticide applicator certification and training is available on the MDA's website and on the [UMN-Pesticide Safety and Environmental Education website](#).

Announcements about BMPs and other concerns are communicated to pesticide dealers and commercial applicators by mail and on the MDA and UMN websites. Related articles and information are distributed through the [MDA's PFMD Update](#) and [UMN's Crop News](#). Information is also disseminated through newsletters, press releases, and other conventional and social media outlets.

Education and outreach activities also included presenting to and engaging with a diverse set of stakeholders through multiple venues including:

- Minnesota Crop Protection Retailers Short Course (keynote address, booth)
- Private and commercial pesticide applicator training and recertification workshops held annually across the state
- FieldWatch program training for crop growers, beekeepers, and pesticide applicators
- Training sessions given by pesticide dealers for their technical and sales staff
- Farmfest (booth)
- Organic Conference (booth)
- MN Fruit and Vegetable Expo (booth)
- Emerging Farmers Conference (booth)
- MN Ag Expo (booth)
- International Sugarbeet Institute Tradeshow (booth)
- UMN Field Day, Carver County (presentation)

The MDA worked with the MDH to implement Source Water Protection Plans and the accompanying education and outreach needed to protect public drinking water supplies from the impacts of agricultural crop production in Wellhead Protection Areas. The MDA also worked in cooperation with the Department of Natural Resources (DNR) regarding their aquatic pesticide program to ensure the proper use of pesticide products.

Education and Promotion Team

The Education and Promotion Team (EPT) is a component of the PMP. Membership and purpose are designed to:

1. Assist with the review and design of educational and promotional activities.
2. Promote BMPs and provide education about how the use of BMPs will prevent, minimize, reduce, and eliminate sources of water resource degradation, including through demonstration projects.
3. Identify opportunities for cooperation among state agencies, representative EPT organizations, pesticide registrants and other interested parties, including opportunities for joint grant-writing.

The EPT is comprised of a core team drawn from those agencies and organizations directed in MINN. STAT. 103H to participate in BMP promotion and demonstration. The core team establishes the agenda for subsequent meetings of the full team, which is designed to engage participation of additional members from a variety of stakeholder groups. The core and full membership of the EPT met four times in 2023-2024 to coordinate BMP messaging and awareness of emerging pesticide water quality issues. The EPT also focused on education of its members. The full team meetings were held in January 2023 and January 2024. At the 2023 meeting, a guest speaker from the UMN Extension presented information on “Protecting Your Family: Home, Lawn & Garden and Farm Pesticides.” MDA staff presented information about proposed changes to the federal atrazine label and the MDA’s neonicotinoid BMPs and outreach efforts. At the 2024 meeting, presentations included an overview of the Minnesota Agricultural Water Quality Certification Program (MAWQCP), and EPA’s proposed mitigation measures for listed species, along with an update on new laws related to pesticides and treated seed. In addition, an overview of the MDA’s water monitoring activities and data was presented at both meetings.

Integrated Pest Management

The MDA continues to provide leadership in promoting Integrated Pest Management (IPM) for the control of insect, disease, and weed pests through implementation of several programs. IPM is a decision-making process that utilizes all available pest management strategies, including cultural, physical, biological, and chemical control to prevent economically damaging pest outbreaks. These programs are coordinated and prioritized based on the current state of science and an understanding of where integrated management is currently feasible. The MDA encourages adoption of IPM through its BMPs and has established an [IPM webpage](#) to promote and provide IPM information. Additionally, the MAWQCP now offers an [IPM endorsement](#) for certified producers.

Several water quality concerns related to pesticide use can be mitigated through implementation of IPM principles, which are incorporated into pesticide BMPs. IPM is also a component of National Pollution Discharge and Elimination System (NPDES) permits for several pesticide use patterns involving direct or indirect applications to water. Permit coverage from the MPCA for such use patterns became a requirement in April 2012.

In addition, the MDA received an EPA grant, “Protecting Pollinators with IPM in Minnesota,” in 2019 which funded education and outreach efforts concerning protecting pollinators. Under this grant the MDA produced three videos focused on pollinators that continue to be used in applicator trainings/recertifications and other education and outreach activities. Other activities conducted under this grant included conducting field days, creating online content, and distributing educational material. While these efforts focus primarily on pollinators, many of the practices being promoted will also help in protecting water quality.

Pesticide Management Areas and Pesticide Monitoring Regions

Pesticide Management Areas (PMAs) are areas with similar characteristics in which BMPs may be promoted and evaluated. Boundaries of the PMAs also define the MDA's Pesticide Monitoring Regions (PMRs) (Figure 1, Appendix A). The PMAs and PMRs continued to be used in the 2023-2024 biennium planning to establish goals, objectives, and priorities for BMP promotion and evaluation, water resource monitoring (as described in the Evaluation Activities section of this report), pesticide usage and use practices surveys, and in modeling exercises to predict potential leaching and runoff potential.



Figure 1. Boundaries of the MDA's Pesticide Management Areas and Pesticide Monitoring.

Evaluation Activities

The foundation of the MDA's evaluation efforts for pesticides and water quality is an annual Water Quality Monitoring Report. The MDA has a statutory requirement to "determine the impact of pesticides on the environment, including the impacts on surface water and groundwater" (MINN. STAT. 18B.04). Additionally, the review of non-MDA monitoring data and BMP evaluation efforts contribute to the MDA's understanding of how best to prevent water quality impacts from pesticides. The Pesticide Management Plan Committee (PMPC), which helps the MDA make informed decisions regarding common detection pesticides in groundwater and pesticides of concern in surface water, provides diverse input on the implementation of the PMP and in assessing the appropriateness of evaluation activities. Other efforts – like identification of health and environmental toxicity reference values, development of laboratory methods, and pesticide use surveys – contribute to the MDA's PMP evaluation activities.

MDA Monitoring Program and Annual Water Quality Monitoring Report

The Groundwater Protection Act and the Pesticide Control Law contain references to the need for evaluation of groundwater or surface water for pesticides and pesticide breakdown products, and the PMP acknowledges this need. With over three decades of monitoring data, the MDA operates one of the few programs with sufficient long-term data to evaluate changes in water quality over time.

As in previous years, the [MDA monitoring program](#) collected groundwater and surface water samples from sites throughout the state in the 2023-2024 biennium. The MDA's overall approach for groundwater and surface water monitoring is described in program work plans, along with special projects, analytical methods, and monitoring of private drinking water wells and precipitation. The complete data report and related information, including annual groundwater and surface water monitoring design and work plan documents, are available on the [MDA's Water Monitoring Reports and Resources webpage](#).

Groundwater sampling is generally conducted in shallow monitoring wells where vulnerable soils serve as an indicator for potential losses of pesticides through leaching to groundwater. In southeast Minnesota, naturally occurring springs and private wells are sampled in lieu of monitoring wells given the difficulty of installing and effectively sampling groundwater monitoring wells in karst geology. Annually, the MDA samples approximately 141 monitoring wells, 13 springs, and 13 domestic wells for its ambient groundwater monitoring program. Since 2014, the MDA has also collected pesticide samples from domestic wells in areas of the state where groundwater is vulnerable to impacts from pesticides using Clean Water Funds.

Starting in 2016, Phase 1 of the Private Well Pesticide Sampling (PWPS) Project sampled approximately 5,700 domestic drinking water wells in 50 counties with vulnerable groundwater resources and significant agricultural row crop production across the state. In 2021, Phase 2 of the PWPS Project began targeting areas previously sampled between 2016 and 2018 to perform testing for cyanazine degradates which were not analyzed for in samples prior to 2019. From 2019 through 2023, the MDA tested 3,928 wells. The MDA also evaluated [point-of-use water treatment systems](#) as part of the PWPS project and shared the results with homeowners so they can make informed decisions regarding water treatment options.

Surface water sampling continues to use the tiered monitoring approach that began in 2007, which combines a mixture of periodic grab sampling throughout the state and automated sampling in specific, representative watersheds. In 2022, 550 sample collection events occurred at 55 tiered river/stream locations. Additionally, the MDA analyzed pesticide water quality samples collected from 49 lakes in 2022 through the National Lake Assessment. In addition, to supplement ongoing MDA water quality monitoring efforts, the MDA and USGS partnered to initiate a pilot study in 2022 using polar organic chemical integrative sampler (POCIS) technology. The POCIS study focused primarily on two neonicotinoid insecticides, clothianidin and imidacloprid, and served to confirm their presence in streams and subsurface drainage tile during the 21 days collection period. In 2023, the MDA collected 947 samples from 56 tiered river/stream locations, 49 samples from four rainfall monitoring locations, six samples from one lake, and 54 samples from 25 wetlands.

The MDA continues to report monitoring results on an annual basis to facilitate review by all stakeholders, and to inform refinement and implementation of MDA programs. In addition, results are shared with the MDH and MPCA for comparisons to drinking water and surface water health and environmental standards and guidance. Results are also shared with the EPA. The report is also the focus of data review by the Pesticide Management Plan Committee.

Additionally, the Groundwater Protection Act directs the MDA to review relevant pesticide-related water quality monitoring data in Minnesota. The MDA routinely obtains and reviews water quality pesticide data from the National Water Quality Monitoring Council (NWQMC) [Water Quality Portal](#). The Water Quality Portal is a cooperative service sponsored by U.S. Geological Survey (USGS), the EPA, and the NWQMC. It serves as a repository for data collected by over 400 state, federal, tribal, and local agencies. The MDA's ambient pesticide monitoring data is also publicly available through the Water Quality Portal.

Interagency Collaboration in Water Quality Data Collections and Analysis

Memoranda of agreement between state agencies continue to be implemented for both groundwater and surface water monitoring. These agreements establish the cooperative basis for sharing monitoring location infrastructure, access, and sample collection and processing. The MDA conducted cooperative projects in 2023-2024 that included groundwater, lake, and wetland pesticide water quality monitoring for pesticides.

In 2021, the MDA and MDH entered into an interagency agreement to facilitate sharing of location data associated with pesticide samples. The agreement formalized MDA and MDH roles in assessing pesticide data as it relates to public and private wells. Important water quality data is shared with the MDH and the MPCA and is evaluated in the context of drinking water and surface water body assessment activities. This information is routinely reviewed in the evaluation of pesticide impacts to state water resources.

BMP Evaluation

There are a range of options available to evaluate the adoption and effectiveness of pesticide BMPs. Rates of BMP adoption can be measured through surveys (farmer, applicator, and dealer) and other means such as field audits, direct interviews (including FANMAP), and focus groups. BMP effectiveness can be measured through plot and small watershed scale projects where specific pesticide use practices can be correlated with water monitoring and pest control data. Many of these options carry a relatively high cost if they are to be conducted in a meaningful manner; therefore, the actual implementation of options has been tied directly to the availability of funding and other resources. At a minimum, a sufficient level of groundwater and surface water monitoring is conducted at key locations in Minnesota to determine concentration trends over time to evaluate, at a broad level, the need for additional protective actions. Furthermore, while adoption of pesticide BMPs can lead to reductions in pesticide impacts and decreased movement to Minnesota groundwater and surface water, other factors, such as weather, cropping patterns, weed resistance, and use of alternative pesticides are also important considerations.

The MDA conducted trend analysis on long-term monitoring data to evaluate BMPs for select pesticides in groundwater in the 2023-24 biennium. The MDA monitoring data indicates that in some regions of Minnesota the concentration of degradation products from some widely used herbicides are increasing in groundwater; however, concentrations generally remain low compared to human health reference values. Trend analysis of data for the common detection pesticides (acetochlor, atrazine, metolachlor, metribuzin, and alachlor) and their degradates show some regions displaying no trend while others display an increasing or decreasing trend in concentrations and detection frequency. In recent years, Minnesota pesticide sales data have shown an increase in sales of several widely used herbicides, including acetochlor, atrazine, and metolachlor, which is important to consider in evaluating the effectiveness of BMPs. The increase in use was, in part, driven by weeds developing resistance to glyphosate and producers looking to alternative herbicides. Alachlor use, in contrast, ended in 2016, and the concentrations and detection frequency of alachlor degradation products in groundwater has since been decreasing in several regions of the state. Alachlor BMPs are no longer being promoted since it is no longer in use.

As with groundwater, the MDA conducted trend analysis on long-term monitoring data to evaluate BMPs for select pesticides in surface water in the 2023-24 biennium. In surface water, trends show steady or decreasing acetochlor and atrazine concentrations and detection frequency, with increasing trends noted only for atrazine

in northwest Minnesota. While detections of chlorpyrifos in a surface waterbody are rare, detections above a state water quality standard have occurred (see Response to Water Quality Impairments Section). For the first time since 2004, chlorpyrifos was not detected in surface water in 2022 or 2023. In 2022 and 2023, the EPA restricted the allowable uses for chlorpyrifos by revoking tolerances for all food and feed crops. Chlorpyrifos use, however, is likely to increase again in 2024 since use on food and feed crops has been approved by the EPA again.

In addition to trend analysis in surface water, the MDA has been conducting additional analyses and field studies to evaluate detections and BMPs for clothianidin and imidacloprid in surface water. Clothianidin and imidacloprid are neonicotinoid insecticides that were designated as surface water pesticides of concern in 2020. Water quality BMPs for these insecticides were published in February 2023 which focused on their use in agriculture, including their use as seed treatments. To better understand the contribution of seed treatments to detections, the MDA evaluated the timing of clothianidin and imidacloprid detections in surface water. The MDA documented an annual relationship between the detection frequency and concentrations of these insecticides in streams and rivers and the planting of corn and soybean in Minnesota, which suggests crop seed treatments are an important source of clothianidin and imidacloprid in surface waters (see [Detection Patterns of Neonicotinoid Insecticides in Minnesota Rivers and Streams 2018-2022](#) for details). The MDA is also continuing to evaluate the impacts of seed treatments on water quality as part of the Nicollet County Drainage Demonstration Project by analyzing subsurface tile water samples for pesticides, including neonicotinoids.

BMP evaluation in the 2023-34 biennium also involved reviewing the results of the MDA's biennial surveys of pesticide usage and use practices. Every two years the MDA conducts surveys in cooperation with the USDA National Agricultural Statistics Service (NASS) to capture information about corn, soybean, wheat, and hay pesticide use practices. These surveys are further described in the "Pesticide Use Information" section of this report.

Pesticide Management Plan Committee

The Pesticide Management Plan Committee (PMPC) provides informed diverse comments to the commissioner of agriculture on significant water quality evaluation activities and decisions, such as whether to determine that a pesticide meets the statutory definition of "common detection" for groundwater or the PMP's definition of a "surface water pesticide of concern." The committee's structure and process preserve the commissioner's statutory authority to make such determinations while engaging important stakeholders in the process of reviewing and commenting on water quality, pesticide use, climatic and other data. The PMPC membership includes the MPCA, DNR, and MDH along with a representative from industry, farmers and farm organizations, environmental groups, UMN Extension, a tribal representative, and other technical experts. The PMPC meets at least one time per calendar year.

The PMPC met in September 2023 and June 2024 to discuss recent and historical MDA pesticide water quality monitoring data for groundwater, surface water, and private wells, in addition to other elements of MDA's pesticide management activities related to water quality. Topics at the 2023 meeting included discussion of 2022 water monitoring data and the MDH's development of human health-based guidance values. The 2024 meeting included discussion of the 2023 water monitoring data and new ways the MDA is exploring to make the monitoring data more interactive and accessible. The PMPC meeting agenda and notes are available on the MDA's website.

According to the statutory authority under which the PMPC was created and is convened (MINN. STAT. 15.0597), the PMPC expires every two years and must be re-established. Therefore, in 2024, the MDA will seek applications for the PMPC for the 2024-2025 biennium.

Standards Development

The MDH is responsible for developing or reviewing health risk standards or guidance for pesticides (and other contaminants) in groundwater and the MPCA is responsible for developing or reviewing regulatory standards or other risk guidance (e.g., benchmarks) for pesticides and other contaminants in surface waters. Both agencies are active participants in PMP implementation and are members of the PMPC. Both are fully informed regarding MDA monitoring efforts and results.

Human Health – In the 2023-2024 biennium, the MDA consulted with the MDH on the review and prioritization of drinking water guidance for a limited number of pesticides to be addressed under the MDH’s Health Risk Limits program for fiscal years 2023 and 2024. Additionally, the MDA consulted with the MDH regarding pesticide drinking water risk assessments under the MDH’s Contaminants of Emerging Concern program and to develop rapid assessment values for new analytes added to the monitoring list.

Aquatic Life – Pesticide concentrations in surface water are compared to the EPA aquatic life benchmarks and the MPCA surface water standards. The MDA annually requests surface water standards from the MPCA for pesticide contaminants detected which do not have MPCA established values. The MDA also sends requests to the EPA seeking additional aquatic life benchmarks for new laboratory analytes and newly detected pesticides, as needed. During the 2023-2024 biennium, the MDA shared data on the occurrence and concentration of pesticide contaminants in surface water with the MPCA.

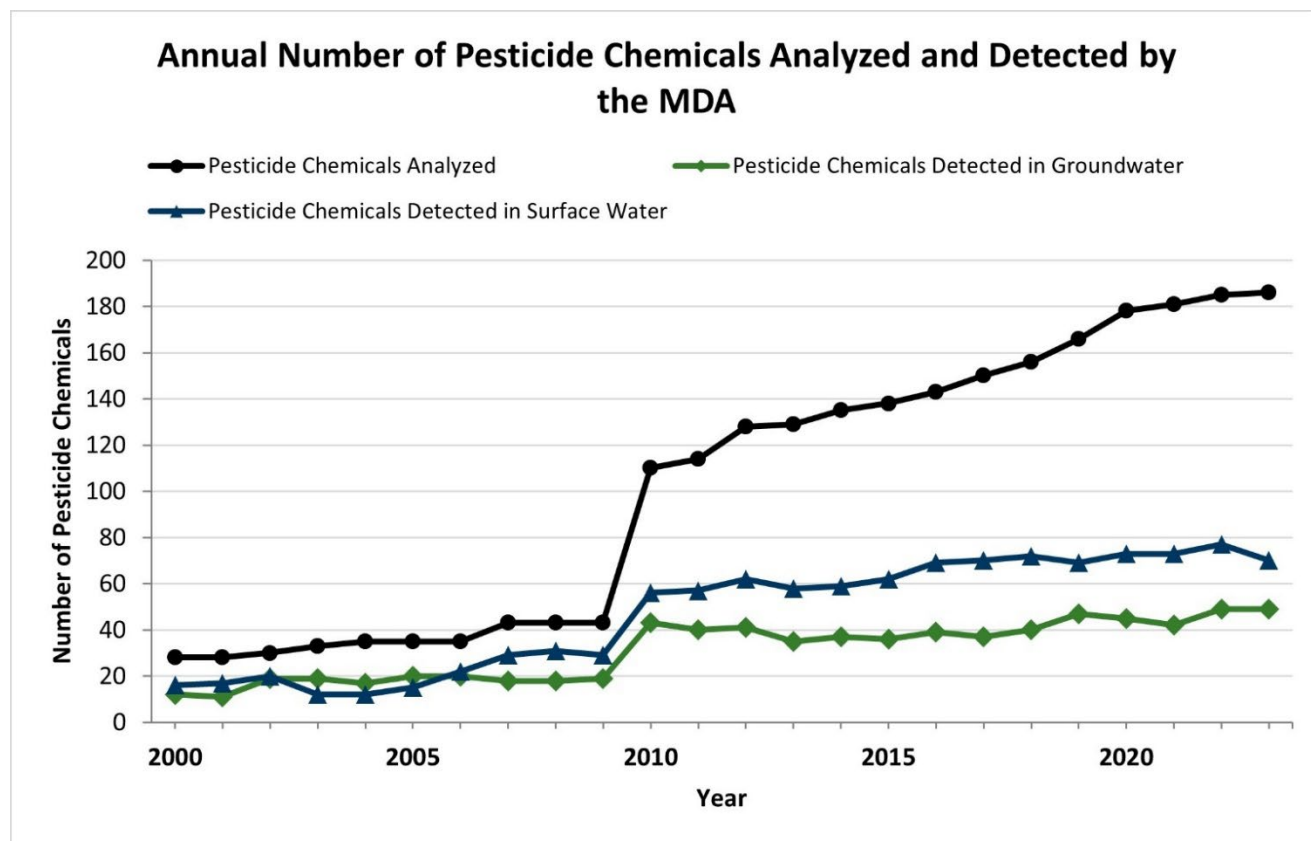
MDA Laboratory Analysis for Pesticides and Pesticide Breakdown Products

The Clean Water Fund appropriations that the MDA received beginning in 2010 have allowed the MDA to upgrade equipment and add staff, thereby expanding its analytical capabilities. In 2010, with funds from the Clean Water Fund and the Environmental and Natural Resources Trust Fund, the MDA more than doubled the number of analytes in its water quality monitoring program from around 45 to 110. Since then, the MDA’s analytical methods have continued to improve, and, as of 2024, the MDA is able to analyze water samples for 185 pesticides and degradates.

The MDA both added and removed analytes from the water quality monitoring program in the 2023-2024 biennium. One new pesticide analyte, fluindapyr (fungicide), was added in 2023. In 2024, the MDA Laboratory added fluzaindolizine (nematicide), prothioconazole desthio (degradate of the fungicide prothioconazole), and pyroxasulfone M3 (degradate of the herbicide pyroxasulfone) to the LC MS/MS method. Four analytes were also removed from the monitoring list in 2024: Methoxychlor, 2,4,5-T, 2,4,5-TP, and carbofuran. None of the removed analytes have been registered in Minnesota since at least 2012 nor have they been detected in water in Minnesota since 2011.

The MDA Laboratory continues to benefit from an annual appropriation of Clean Water Funds which increases pesticide monitoring sample capacity and capability (Figure 2, Appendix B). As a result, Minnesota’s pesticide monitoring efforts are among the most comprehensive in the nation.

Figure 2. Number of pesticides/pesticide breakdown products analyzed and detected by the MDA in groundwater and surface water since 2000.



Pesticide Use Information

For the MDA and its stakeholders to evaluate the source of pesticide detections and concentrations in water resources, information on pesticide use is frequently needed or requested. To better document relationships between water quality and overall pesticide use, rates, and BMP adoption, the MDA continues to work with the USDA-NASS to collect information via phone surveys. Pesticide use and rate information is gathered on the four major crops in Minnesota: corn, soybeans, wheat, and hay. Thousands of farmers are surveyed each year to obtain information on active ingredients used, acres treated, and application rates. [Pesticide use and sales surveys](#) have been conducted since 2003. NASS also surveys pesticide use in crops through their [Agricultural Chemical Use Survey](#). In years that NASS surveys one of the four crops, the MDA forgoes its survey of that crop.

In the 2023-2024 biennium, the MDA shared and used data about pesticide use from multiple sources.

1. The MDA publishes sales data for pesticide active ingredients annually in a searchable [Pesticide Sales Database](#).
2. The MDA occasionally surveys farms in localized areas (several hundred acres) where community water supplies exhibit vulnerability to land use impacts or where other water quality concerns exist. Survey results are published by the MDA or other cooperators.
3. The MDA cooperates with the DNR on [aquatic pesticide permitting and practices](#); the DNR publishes an annual report on the use of aquatic pesticides permitted under its authority.
4. The MDA uses U.S. Geological Survey [Estimated Annual Agricultural Pesticide Use data](#) compiled as part of the Pesticide National Synthesis Project.

The MDA also conducted special registration reviews of new active ingredients and new uses of currently registered pesticides to gain a better understanding of label, compliance, enforcement, and non-target exposure issues associated with a product's registration or anticipated with its potential use.

Mitigation Activities

Education and Awareness

Educating and raising a pesticide users' awareness of environmental concerns is one of the most important activities necessary to protect the state's water resources from the potential for leaching and runoff of pesticides, and to mitigating observed impacts. For this reason, there is considerable overlap between prevention and mitigation activities. Those activities listed under "Prevention Activities," although not repeated in this section, may be considered important components of mitigation activities under the PMP.

BMP Development, Education/Outreach, and Evaluation

The development and promotion of pesticide BMPs is both a prevention activity and a mitigation activity. See the "Prevention Activities" section of this report for background information on MDA BMPs. BMP evaluation activities also contribute to mitigating the impact of pesticides to water resources and are described the "Evaluation Activities" section of this report.

Registration Authority to Prevent Unreasonable Adverse Effects

As an outcome of an evaluation report on pesticide regulation conducted by the Office of the Legislative Auditor (March 2006), the MDA has increased its review of pesticide registrations. These reviews are an assessment of the status or potential impacts of a pesticide active ingredient or product that could lead to mitigation activities. The MDA conducted 46 special registration reviews since 2012. More information about these reviews is available on the [MDA's Pesticide Special Registration Reviews webpage](#). To prevent adverse effects of pesticides, the MDA investigated an average of 91 pesticide-misuse complaints per year from 2012 to 2023. In 2022, there were 115 misuse complaints, 25 of which were related to dicamba. In 2023, there were 54 investigations, six of which were related to dicamba.

Response to Water Quality Pesticide Impairments

As required by the federal Clean Water Act (Section 303(d)), the MPCA assesses all waters of the state and creates a list of impaired waters every two years. Minnesota's 2024 303(d) Impaired Waters List was approved by the EPA in April 2024 and includes 11 waterbodies in Minnesota that are impaired for currently registered pesticides (Table 1). The inclusion and removal of waterbodies from the Impaired Waters List results from the MPCA's assessment of the MDA surface water pesticide data compared to Minnesota water quality standards. The 2023 and 2024 MDA pesticide water quality data will be reviewed by the MPCA as part of the 2026 303(d) Impaired Waters List assessment process.

Table 1. Minnesota waterbodies impairments for currently registered pesticides

Pesticide	Impaired Waters List Year	Waterbody	County	Violation that Resulted in Impairment
Acetochlor	2016	Silver Creek	Carver	Chronic (3,600 ng/L) Minnesota water quality standard
Chlorpyrifos	2022	Bevens Creek	Carver	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2020	Double Lake	Cottonwood	Chronic (41 ng/L) Minnesota water quality standard
Chlorpyrifos	2016	Dry Weather Creek	Chippewa	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2020	Dutch Creek	Martin	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2018	Jack Creek	Jackson	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2018	Lac qui Parle River	Lac qui Parle	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2024	Shakopee Creek	Swift	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2014	Tamarac River	Marshall	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2020	Three Mile Creek	Lyon	Maximum (83 ng/L) Minnesota water quality standard
Chlorpyrifos	2020	Yellow Medicine River	Yellow Medicine	Maximum (83 ng/L) Minnesota water quality standard

Since 2014, eight waterbodies have been removed from the EPA 303(d) Impaired Waters List for currently registered pesticides. The Le Sueur River and Beauford Ditch were designated as impaired for acetochlor in 2008 and were removed from the EPA 303(d) Impaired Waters List in 2014. Seven Mile Creek was designated as impaired on the 2012 Impaired Waters List for chlorpyrifos and was removed in 2018. Grand Marais Creek was designated as impaired for chlorpyrifos on the 2014 Impaired Waters List, updated on the 2016 List, and was removed on the 2022 List. Beauford Ditch, Beaver Creek, Chetomba Creek, and Sleepy Eye Creek were designated as impaired for chlorpyrifos in 2018 and were removed in 2024. Removal from the EPA 303(d) Impaired Waters List followed several years of water quality monitoring without pesticide detections above the applicable standard.

The MDA developed a chlorpyrifos response plan to address chlorpyrifos impairments in Minnesota surface waters. This plan was approved by the Minnesota Pollution Control Agency and included activities such as:

- continued monitoring for chlorpyrifos and its degradate in surface waters;
- education and outreach to pesticide applicators and crop producers through mailings, articles, meeting presentations, and other means; and,
- inspections of application practices and records.

The EPA revoked chlorpyrifos tolerances for food and feed uses in February 2022 in response to an order from the Ninth Circuit Court of Appeals. As a result, chlorpyrifos products with food and feed use would no longer be permitted for sale and distribution in Minnesota. In collaboration with the UMN, the MDA published an [article on alternatives to chlorpyrifos for the management of key Minnesota crop pests](#). Chlorpyrifos was taken off the market for a period of time after the US EPA removed all tolerances for food and feed. Then, tolerances were reinstated after the EPA's decision was challenged in court; however, this occurred after many manufacturers had already voluntarily canceled their products at the federal level. Minnesota conditionally registered products containing chlorpyrifos that still have federal registrations for 2024 and submitted applications to Minnesota. Conditions of the registration include that it is for 2024 only (expires on Dec. 31, 2024) and a copy of the MDA's Water Quality BMPs for Chlorpyrifos must accompany the sale of each chlorpyrifos product.

The MDA also developed a multi-year acetochlor response plan to address the acetochlor impairment in Silver Creek. This plan includes collaboration with dealers, Extension, and the Acetochlor Registration Partnership, among others, activities to raise awareness of the impairment and promote the MDA's Water Quality BMPs for Acetochlor through mailings, articles, field days, social media, local events/fairs, and UMN Extension events. Additionally, the MDA added two new monitoring sites in the Silver Creek watershed in 2024 to further evaluate acetochlor in surface water.

Other Pesticide-Related Environmental Activities

EPA Office of Pesticide Programs

In 2023-2024, MDA staff held membership on the State-FIFRA Issues Research and Evaluation Group, the Pesticide Operations and Management Working Committee, and the Environmental Quality Initiative (EQI) group of Association of American Pesticide Control Officials (AAPCO). These groups address issues concerning pesticide regulations, registration, and label language.

Regulating PFAS in Pesticides

In 2023, the Minnesota Legislature passed bills (SF 1955 and HF 2310) regulating pesticide products that contain intentionally added perfluoroalkyl and polyfluoroalkyl substances (PFAS). Beginning January 1, 2026, pesticide registrants will be required to indicate whether all registered pesticide products contain intentionally added PFAS. For products that do contain PFAS, additional data will be required. Registration of cleaning products that contain intentionally added PFAS and are registered as pesticides will be cancelled starting January 1, 2026, unless the product receives a "currently unavoidable use" exemption. Registration of all other pesticide and fertilizer products (pesticides, fertilizers, soil and plant amendments, and agricultural liming products) with intentionally added PFAS will be prohibited as of January 1, 2032, unless the product receives a "currently unavoidable use" exemption by the MDA (MINN. STAT. 18B.26 subd. 8).

In February 2024, the MDA submitted an [interim report on PFAS in pesticides \(PDF\)](#) to the Minnesota Legislature.

Pesticide Treated Seed Regulation

Pesticides from treated seed can enter water resources through leaching, surface runoff, or drift of dust from planting equipment. Regulations addressing the proper use, handling, and disposal of pesticide treated seed in Minnesota were passed in 2023 (MINN. STAT. 18B.075). These are in addition to other label requirements for pesticide treated seeds (MINN. STAT. 21.82 subd. 3). The MPCA regulates the disposal of waste treated seed and has published this [guidance for disposal of treated seed \(PDF\)](#).

In February of 2024, the MDA responded to a request by the EPA for comments and suggestions about pesticide treated seeds. The MDA presented data and information from the Minnesota Seed Regulatory Program, Surface Water Monitoring Program, and bee kill investigations to answer questions the EPA asked about treated seed use and whether further regulatory or administrative measures are appropriate to ensure the safe use of treated seed. Recommendations were included, covering the benefits of treated seed registration and reporting requirements, treated seed label consistency and enforcement, and the need for strengthening treated seed label language to protect surface water and pollinators.

Other MDA Pesticide Programs

The MDA has several pesticide-related programs designed to ensure the safe and proper use of pesticides and to reduce the risk from pesticides to human health and the environment. These programs address virtually every aspect of pesticide use and management in Minnesota. These include the following:

- Waste pesticide collection and empty pesticide container collection
- Pesticide applicator licensing and certification
- Permitting and inspection of pesticide storage and chemigation activities
- 24-hour emergency response to pesticide spills
- Environmental cleanup of contaminated pesticide sites and facilities
- Rapid cleanups to facilitate property transfers and development of rural brownfields through the Agricultural Voluntary Investigation and Cleanup (AgVIC) program
- Partial reimbursement of costs for environmental cleanup of pesticide releases through the Agricultural Chemical Response and Reimbursement Account (ACRRA)
- Pesticide use inspection to ensure compliance with pesticide labeling
- Pesticide misuse investigations
- Pesticide use data collection
- Enforcement of violations of pesticide law
- Pesticide related bee kill investigations
- Minnesota Agricultural Water Quality Certification Program to promote conservation practices that protect water quality

Activities Coordinated with Other State Agencies

Other state agencies have statutory responsibilities related to the protection of Minnesota's water resources. Inter-agency activities provide a forum for the discussion and coordination of many PMP-related issues. Some of these activities are mentioned elsewhere in this report and are included in the summary below. During 2023-2024:

- The MDA worked closely with other state commissioners and their staff through the Clean Water Council and other interagency workgroups on the quality and monitoring of groundwater and surface water.
- The MDA, MPCA, and MDH continued to cooperate on the implementation of agreements on groundwater and surface water monitoring. These agreements have been published as the *Integrated Ground Water Quality Monitoring Strategy* and the *Cooperative Surface Water Quality Monitoring System* signed by the commissioners of applicable agencies. The agreements represent the agencies' joint plan for conducting water quality monitoring on a statewide basis in Minnesota.
- The MDA continued to facilitate communications between the EPA's Office of Pesticide Programs and MDH toxicologists to obtain necessary data for establishment of drinking water and ecological guidance for assessment of pesticide impacts.
- The MDA continued to work with the MPCA on issues related to the development of surface water standards, and on improving coordination between surface water monitoring methods and MPCA's data needs for making surface water impairment decisions and implementation of its Watershed Restoration and Protection Strategies (WRAPS).
- The MDA participated in technical workgroups and science advisory panels convened by the MDH to address Environmental Public Health Tracking (EPHT) Program and related biomonitoring concerns. The biomonitoring component of the EPHT seeks to evaluate the feasibility of measuring contaminants, including pesticides, in human body fluids and tissues as an indicator of potential health impacts. The health tracking component explores the feasibility of establishing indicators of health outcomes by linking the presence of environmental chemicals, including pesticides, with chronic or acute health issues. The MDA also provides input on groundwater pesticide detections for MDH developed Groundwater Restoration and Protection Strategy Reports that are developed for specific watersheds.

The MDA participated in the Interagency Pollinator Protection Team which advises the governor and other agencies on pollinator policy and programs.

Conclusion

The PMP is a guidance document for the prevention, evaluation, and mitigation of occurrences of pesticides or their breakdown products in Minnesota groundwater and surface water due to non-point source pollution from the legal use of pesticide products. The MDA fully supports the PMP through coordinated implementation of prevention, evaluation, and mitigation efforts within the MDA and in cooperation with other state agencies, the University of Minnesota, industry groups, and other stakeholders. The MDA continued to fully support the PMP through the following activities.

- Prevention of water resource contamination with pesticide continues to be the focus of PMP implementation. The MDA has developed over 20 best management practices to mitigate the effects of pesticide use. The MDA continues to promote these BMPs through various education and outreach efforts to prevent contamination of water resources.
- The MDA continues to expand groundwater and surface water monitoring and surveying continues and has been expanded in critical areas. The MDA analyzed water samples for 185 pesticides and degradates in 2023.
- The “common detection” and “surface water pesticides of concern” pesticides continue to be analyzed for sales, use, and spatial and temporal trends in detection frequency and concentrations.
- Groundwater and surface water samples continue to be analyzed for additional pesticides and degradation products.
- MDA monitoring data is being managed, reported, and shared efficiently and effectively.
- The MDA actively promotes and evaluates the BMPs for pesticide use in the state. In addition, BMPs emphasize education and outreach activities for the five herbicides and three insecticides that are listed under the common detection status in groundwater or surface water pesticides of concern.
- The MDA has developed BMPs for additional pesticide issues of concern including pesticide safety and handling drift and pollinators.
- Where specific water quality pesticide concerns require enhanced education and outreach (e.g., in watersheds with impairments due to pesticides), the MDA has cooperated with other state agencies to mitigate impacts while enhancing prevention and evaluation efforts.

This report fulfills the MDA’s statutory requirement to provide a PMP biennial status report for the 2023-2024 biennium.

Appendix A. Pesticide Monitoring Regions

Table A 1. Description of the MDA's Pesticide Monitoring Regions (PMRs)

PMR Number	Region Name	Counties Included	Physical Characteristics
1	Northwest Red River	Kittson, Roseau, Marshall, Pennington, Red Lake, Polk, Norman, Mahnomon, Clay, Wilkin, Traverse, Grant	Glacial lakebed with high clay content soils 150 to 250 ft thick; gravel aquifers buried under clay; beach ridge deposits of sand and gravel; high-value agriculture of sugar beets and small grains
2	North Central	Lake of the Woods, Koochiching, Beltrami, Clearwater, Itasca	Mostly forested and bog; little agriculture in discontinuous areas; groundwater resources quite variable
3	Northeast	St. Louis, Lake, Cook, Carlton	Forested with shallow bedrock; agriculture is nearly non-existent
4	Central Sands	Becker, Hubbard, Cass, Crow Wing, Morrison, Wadena, Otter Tail, Todd, Douglas, Pope, Stearns, Benton, Sherburne, Kandiyohi	Large glacial outwash sand plains that are highly sensitive to surface activities; high-value potatoes and other crops; irrigated fields are common
5	East Central	Aitkin, Pine, Mille Lacs, Kanabec, Chisago, Isanti	Glacial outwash and lacustrine sands; low pH soils; generally poor cropping conditions; some irrigation; some potato production
6	West Central	Stevens, Big Stone, Swift, Chippewa, Lac Qui Parle, Yellow Medicine	Some areas of glacial outwash sand; thin and narrow alluvial aquifers; many buried sand aquifers; mix of corn and soybeans; thick glacial tills in some areas
7	Southwest	Lincoln, Lyon, Pipestone, Murray, Rock, Nobles	Aquifers consist of highly sensitive alluvial river valley deposits; fractured quartzite formations and well-protected deep cretaceous sediments; sufficient water supply is hard to come by; rural water systems are large and growing
8	South Central	Wright, Meeker, Renville, McLeod, Sibley, Nicollet, Le Sueur, Rice, Steele, Waseca, Blue Earth, Brown, Redwood, Cottonwood, Watonwan, Jackson, Martin, Faribault, Freeborn	A mix of glacial outwash sands; deep glacial tills, glacial lacustrine deposits; windblown silts, river valley deposits; and deep bedrock aquifers; sensitivity varies; accordingly, corn and soybeans; intensive agricultural production; most productive land in the state
9	Southeast Karst	Goodhue, Wabasha, Winona, Olmsted, Dodge, Mower, Fillmore, Houston	Karst geology that is highly sensitive to surface activities; shallow windblown silt and glacial till soils; springs, sinkholes, and disappearing streams; high-value trout streams; extremely shallow to very deep bedrock aquifers; some river valley alluvial deposits
10	Metro	Anoka, Ramsey, Washington, Dakota, Scott, Carver, Hennepin	Urban, suburban, and transitional areas; some irrigated farming; hobby farms; much farming conducted on leased land by relatively large farm operations; outwash sand and gravel to deep bedrock aquifers

Appendix B. Number of Pesticide Chemicals Analyzed and Detected

Table B 1. Number of pesticides/pesticide breakdown products analyzed and detected by the MDA in groundwater and surface water since 2000 (Tabular data for Figure 2)

Year	Number of pesticide chemicals analyzed	Number of pesticide chemicals detected in groundwater	Number of pesticide chemicals detected in surface water
2000	28	12	16
2001	28	11	17
2002	30	19	20
2003	33	19	12
2004	35	17	12
2005	35	20	15
2006	35	20	22
2007	43	18	29
2008	43	18	31
2009	43	19	29
2010	110	43	56
2011	114	40	57
2012	128	41	62
2013	129	35	58
2014	135	37	59
2015	138	36	62
2016	143	39	69
2017	150	37	70
2018	156	40	72
2019	166	47	69
2020	178	45	73
2021	181	42	73
2022	185	49	77
2023	186	49	70