Pesticide Regulation

2020
EVALUATION REPORT

Program Evaluation Division

OFFICE OF THE LEGISLATIVE AUDITOR
STATE OF MINNESOTA

Program Evaluation Division

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OLA
OFFICE OF THE LEGISLATIVE AUDITOR
STATE OF MINNESOTA • James Nobles, Legislative Auditor

March 2020

Members of the Legislative Audit Commission:

The Minnesota Department of Agriculture regulates the sale, distribution, and use of pesticides in the state of Minnesota.

We found that the Minnesota Department of Agriculture has implemented most of the recommendations from the Office of the Legislative Auditor's 2006 *Pesticide Regulation* report. However, we found room for continued improvement and make several recommendations, including that the department better document certain registration decisions, improve communication with those who make pesticide-misuse complaints, and monitor for all high-risk pesticide-related chemicals in groundwater and surface water.

Our evaluation was conducted by Sarah Delacueva (project manager), Will Harrison, and Lucas Lockhart. The Minnesota Department of Agriculture cooperated fully with our evaluation, and we thank them for their assistance.

Sincerely,

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THE GREAT SEAL OF THE STATE OF MINNESOTA
L'ETOILE DU NORD
1858

Summary
Pesticide Regulation

Key Facts and Findings:

- The Minnesota Department of Agriculture (MDA) regulates pesticides in the state of Minnesota. (p. 9)
- Of the ten recommendations that the Office of the Legislative Auditor (OLA) made in its 2006 *Pesticide Regulation* report, MDA has fully implemented eight and partially implemented two. (pp. 11-12)
- MDA has developed criteria for when it will conduct a "special registration review" prior to registering a pesticide product, as OLA's 2006 report recommended. (p. 19)
- MDA does not maintain adequate documentation to support its decisions to issue special local need registrations. (p. 25)
- MDA does not require annual training or reexamination as a condition of license renewal for certain commercial and noncommercial pesticide applicators. (p. 36)
- MDA has ensured that waste-pesticide disposal opportunities are available statewide. (pp. 43-44)
- From 2012 to 2018, MDA investigated an average of 109 pesticide-misuse complaints per year. (p. 52)
- In the complaint files we reviewed, MDA's written communication with complainants often lacked important details or was difficult to understand. (pp. 56-58)
- MDA has taken some actions to protect pollinators, but other protective measures require legislative action. (pp. 72-73)
- MDA has dramatically expanded its water-quality monitoring program over the last decade. (pp. 83-84)
- Limitations to MDA's laboratory methods prevent it from analyzing certain pesticides, including three commonly sold pesticide active ingredients or breakdown products that are both high risk and toxic to humans or aquatic life. (p. 84)
- MDA has developed a process for evaluating best management practices and has revised some practices as a result. (pp. 100-102)

Key Recommendations:

- MDA should better document its registration decisions when reviewing special local need registrations. (pp. 24-27)
- MDA should impose more robust annual requirements for license renewal for commercial and noncommercial pesticide applicators. (p. 38)
- MDA should improve the clarity of the laboratory result cover letters and final closure letters it sends to those who make pesticide-misuse complaints. (p. 59)
- The Legislature should revisit the recommendations made in recent state reviews of pollinator health. (p. 73)
- MDA should continue or resume its efforts to test for all high-risk pesticide-related chemicals that are toxic to humans or aquatic life. (p. 86)

MDA has fully implemented most of OLA's 2006 recommendations. However, we found areas for continued improvement.

OFFICE OF THE LEGISLATIVE AUDITOR **MARCH 2020**

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Report Summary

Pesticides are substances or mixtures of substances used to prevent, repel, kill, or otherwise control pests. They are used in both agricultural settings (to protect crops from insects or weeds) and nonagricultural settings (to fight diseases, protect golf courses and gardens, and control pest infestations in homes, among other things).

Pesticides can harm human health or the environment, particularly when used improperly. Pesticide labels are legally enforceable and bear detailed use and safety instructions designed to mitigate the risks of the pesticide. Pesticide regulation involves developing or evaluating label restrictions and using inspections to ensure that pesticide dealers, users, and others follow label requirements.

The Minnesota Department of Agriculture (MDA) regulates pesticide use in Minnesota. Its responsibilities include registering pesticide products for use in Minnesota, licensing and certifying pesticide applicators, enforcing pesticide regulations through inspections and investigations, and monitoring Minnesota's waters for pesticide contamination.

MDA did not always fully document its decisions to register pesticide products for a "special local need."

MDA has made efforts to improve its pesticide regulation program since 2006.

The Office of the Legislative Auditor (OLA) evaluated pesticide regulation in 2006 and made several recommendations to MDA.[1] This evaluation followed up on—but was not limited to—the recommendations from the 2006 report. We found that MDA fully implemented eight of ten recommendations from the 2006 report. The department has partially implemented two others, though room for improvement remains.

MDA needs to improve its documentation when approving products for "special local need" registration.

When MDA registers a pesticide product for use in Minnesota, it generally accepts the label approved by the U.S. Environmental Protection Agency.[2] In some instances, Minnesota-specific conditions warrant use of a product (for example, to protect a crop or to control a pest) that is not reflected on the federal label. In these cases, product manufacturers (called registrants) can apply for "special local need" registrations.

Since OLA released its 2006 report, MDA has made several improvements to its process for reviewing and approving special local need registrations. However, our file review of special local need registrations revealed that MDA did not maintain evidence that it considered each application with respect to five criteria established in state law.[3] We recommend that MDA consider each of the criteria and document its determination, as well as the evidence it used to make that determination.

MDA does not require certain pesticide applicators to take a workshop or examination on an annual basis.

In order to use certain, more toxic pesticides (known as restricted-use pesticides), pesticide applicators must be licensed or certified by MDA. Different types of pesticide applicators have different licensing and renewal conditions.

Licensed applicators who apply pesticides for hire (commercial applicators) or on behalf of their employer (noncommercial applicators) must renew their licenses annually. By law, in order to renew their licenses, these applicators must take an examination, attend a workshop, or meet "other requirements" determined by the

[1] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006).

[2] If a product contains a new active ingredient or has undergone a label change allowing a new use (such as for a new crop), MDA conducts a more detailed review, as OLA recommended in 2006.

[3] *Minnesota Statutes* 2019, 18B.27, subd. 2(a).

commissioner that ensure ongoing competence in the field.[4]

For some license specialties, MDA requires an examination or workshop attendance every two or three years, rather than every year, and it does not impose "other requirements." We recommend that MDA impose more robust annual requirements for license renewal for commercial and noncommercial pesticide applicators.

MDA has expanded access to waste-pesticide disposal opportunities.

OLA's 2006 report found that the residents of about one-third of Minnesota's counties did not have waste-pesticide collection sites available to them. MDA has since entered into cooperative agreements with counties or regional organizations that establish locally run collection opportunities for *nonagricultural* pesticides in all 87 counties. Seventy-four counties are covered by agreements for the collection of *agricultural* pesticides.

Statutes require that MDA "designate a place that is available at least every other year" for residents of the counties that are not covered by cooperative agreements for agricultural waste-pesticide disposal.[5] MDA accommodated these 13 counties, located mostly in northwestern Minnesota, by hosting five one-day collection events in 2016 and six events in 2018. The locations were selected in consultation with each of the target counties, and they were advertised to all residents in the region.

MDA's written communications with citizens alleging pesticide misuse are often unclear or incomplete.

When an individual submits a formal complaint to MDA alleging that the pesticide from a neighboring property or field drifted onto their property, the department may conduct a pesticide-misuse investigation. MDA investigated an average of 109 complaints of pesticide drift or other misuse each year from 2012 to 2018.

Complaint investigations often involve taking vegetation or other samples from the complainant's property and testing them for pesticide residues. In the complaint files we reviewed, MDA routinely sent letters explaining those results, but the boilerplate language the department used was unclear.

In the files we reviewed, MDA consistently sent final case-closure letters to the complainants. This shows improvement over its practice at the time of OLA's 2006 report. However, most of these letters lacked important details. We recommend that MDA improve its written correspondence with those who make pesticide-misuse complaints by using clear language and ensuring that all important details are included.

MDA's written communications with respect to pesticide misuse-complaints need improvement.

Pesticides can be detrimental to pollinators.

While the Legislature did not act on a 2006 OLA recommendation to require notification of beekeepers prior to pesticide applications, it did amend statutes to provide compensation for pesticide-related bee kills.

Since our last evaluation of pesticide regulation, a number of state agencies have studied the effect of pesticides—particularly neonicotinoid insecticides—on pollinators. They have found that pollinators—which have important benefits—can be negatively impacted by pesticide exposure. MDA studied the issue at the direction of the Legislature and made recommendations for department action as well as legislative action. A committee formed by Governor Dayton also made many recommendations related to pollinator protection.

MDA has taken a number of actions based on its own report, including reviewing the labels of neonicotinoid products and developing best management practices for

[4] *Minnesota Statutes* 2019, 18B.32, subd. 4; 18B.33, subd. 5; and 18B.34, subd. 4.

[5] *Minnesota Statutes* 2019, 18B.065, subd. 2a(a).

their use. The Legislature has not addressed changes to law recommended in the reports.

We recommend that the Legislature revisit the recommendations in the relevant state reports and consider whether to take further action to protect pollinators.

MDA uses monitoring results to suggest improved pesticide-use practices.

While MDA's analytical capacity has increased over time, it does not monitor for a handful of toxic pesticide-related chemicals.

MDA monitors groundwater supplies as well as surface water (streams, rivers, and lakes) for pesticide contamination. The number of samples tested and the number of chemicals for which MDA tests have increased significantly over time.

In 2018, MDA tested water-quality samples for 155 distinct pesticide ingredients or breakdown products. The list of chemicals analyzed included many of the pesticide ingredients sold most commonly in Minnesota. However, there were three pesticide-related chemicals for which MDA did not test that were both commonly sold and have medium-to-high toxicity to humans or aquatic life.

MDA's laboratory has explored the feasibility of analyzing these chemicals in the past. We recommend that MDA renew its efforts to find ways to monitor for these chemicals.

Despite MDA's increased monitoring, the percentage of results that exceeded recommended maximum limits for drinking water has remained stable over time. In addition to exceedances, MDA tracks instances of pesticide concentrations that *approach* recommended limits. It uses this information to determine which pesticide chemicals require mitigating action.

When MDA determines that a pesticide requires mitigation (because it is detected frequently or in large concentrations), it develops "best management practices" (BMPs). BMPs are voluntary practices, designed in partnership with agricultural experts, with the goal of mitigating the impacts of a pesticide. MDA has developed 21 BMPs for various pesticides.

Not long after the release of OLA's 2006 report, MDA developed a process for evaluating BMPs. Its evaluation efforts have resulted in revisions to multiple BMPs.

Summary of Agency Response

In a letter dated March 16, 2020, Minnesota Department of Agriculture Commissioner Thom Petersen stated that most of OLA's key recommendations were "constructive" and that MDA would implement them "as scientific technology and financial resources allow." He added that MDA had begun implementing some minor recommendations that would help the department better regulate pesticides, and that it would work with the Legislature to provide additional clarity regarding others. Commissioner Petersen also noted that OLA made a recommendation for the Legislature to address pollinator protection. He said that MDA looks forward to being "a fact-based resource" for the Legislature, should it consider further policy making related to pollinator protection.

The full evaluation report, *Pesticide Regulation*, is available at 651-296-4708 or:
www.auditor.leg.state.mn.us/ped/2020/pesticide2020.htm

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Chapter 6: Monitoring and Best Practices

Introduction

Pesticides benefit society in many ways, by controlling pests that damage crops or cause disease, among other things. However, pesticides are toxic by design, and can harm human health and the environment when used improperly. Federal and state pesticide regulations help mitigate the harmful effects of pesticides and ensure their proper use.

In April 2019, the Legislative Audit Commission directed the Office of the Legislative Auditor (OLA) to evaluate pesticide regulation at the Minnesota Department of Agriculture (MDA). OLA last evaluated MDA's pesticide-regulation activities in 2006.

In our evaluation, we addressed the following questions:

- **How well does the Minnesota Department of Agriculture meet federal and state requirements for the registration of pesticide products, as well as the licensing and permitting of pesticide applicators, dealers, and facilities?**

- **To what extent does the Minnesota Department of Agriculture enforce pesticide regulations?**

- **To what extent does the Minnesota Department of Agriculture have reasonable processes for monitoring the use and environmental effects of the state's pesticide-regulation activities?**

- **How well is the state following the recommendations in the Office of the Legislative Auditor's 2006 *Pesticide Regulation* report, including the recommendation to improve access to waste-pesticide disposal across the state?**

To conduct this evaluation, we interviewed numerous stakeholders, including legislators, legislative staff, and many staff within MDA's Pesticide and Fertilizer Management Division. We interviewed representatives from the U.S. Environmental Protection Agency as well as pesticide drift victims, pollinator advocates, and organizations representing people licensed or certified to apply pesticides.

We reviewed state and federal laws related to pesticide regulation as well as scientific literature on the benefits and risks of pesticide usage. We conducted two file reviews: one related to MDA's approval of a specific type of pesticide product registration, and another related to the department's investigation of pesticide-misuse complaints.

We analyzed several MDA datasets related to pesticide product sales, applicator licensing, and enforcement inspections. We also analyzed water-quality monitoring data that MDA submits to a federal online database.

We limited the scope of our evaluation to only certain activities of MDA's Pesticide and Fertilizer Management Division. We did not explore that division's incident clean-up or emergency response work, nor did we evaluate its activities related to fertilizer management. We also did not evaluate the pesticide-related activities

conducted by other MDA divisions, such as the Laboratory Services Division or the Food and Feed Safety Division (which conducts a limited number of inspections to determine whether pesticide residues exist on food products or animal feed).

This report is organized into six chapters. Chapter 1 provides an overview of pesticides and how they are regulated. In Chapter 2, we discuss MDA's process for registering pesticide products for use in Minnesota. In Chapter 3, we discuss the department's activities related to permitting, licensing, and certifying pesticide storage facilities, pesticide dealers, and pesticide applicators, as well as the department's efforts to ensure the safe disposal of waste pesticides. Chapter 4 focuses on MDA's inspection and enforcement efforts, including the work the department does to investigate complaints of pesticide misuse. Chapter 5 examines the impact of pesticides on pollinators. In Chapter 6, we discuss MDA's efforts to detect pesticides in Minnesota's surface water and groundwater through water-quality monitoring, as well as MDA's development and evaluation of "best management practices." We also discuss MDA's *Minnesota Pesticide Management Plan.*

Chapter 1: Background

Pesticides serve an important function: protecting agricultural crops, gardens, and homes, among other things, from damaging pests. However, pesticides are inherently toxic and have the potential to harm human health and the environment, particularly if used improperly. In this chapter, we give an overview of pesticides and their uses, as well as how they are regulated by the federal government and the State of Minnesota. We also discuss the Office of the Legislative Auditor's 2006 *Pesticide Regulation* evaluation report, and explain how the Minnesota Department of Agriculture, which regulates pesticide use in Minnesota, has responded to the recommendations made in that report.

Overview of Pesticides

In the U.S. and around the world, people use pesticides to manage their pest problems. Pests include weeds, insects, and rodents, as well as mold, mildew, algae, and other nuisance growths. There are many types of pesticides. Herbicides control weeds and unwanted vegetation, insecticides repel or kill insects, and fungicides prevent the growth of molds and mildew. In addition, many household cleaners—such as bleach and disinfectants—kill and prevent the spread of bacteria.

Pesticide Terminology

Pesticides are substances or mixtures of substances intended to prevent, destroy, repel, or otherwise control certain forms of plant or animal life that are considered to be pests. The term encompasses both pesticide active ingredients and pesticide products.

Pesticide active ingredients are the specific chemical ingredients used to control pests.

Pesticide products are specific combinations of pesticide active ingredients and other ingredients, packaged for sale under a particular name.

A particular pesticide product contains a mixture of active and inactive ingredients.[1] Pesticide active ingredients are the specific chemical or biological agents that kill, repel, or otherwise control the pests for which the product is marketed.[2] For example, the active ingredient of the lawn care product Roundup is glyphosate, which is a chemical that controls both broadleaf weeds and grasses. A single pesticide active ingredient, such as glyphosate, may appear in hundreds of different pesticide products with different names. The box at right shows the number of products and ingredients sold in Minnesota in 2017.

In 2017, there were

5,721

pesticide products sold in Minnesota, containing

697

active ingredients.

[1] In this report, we generally use the term "pesticide active ingredient" or simply "active ingredient" when we discuss the chemicals that make up pesticides. We use "pesticide product" when we are discussing specific products. We use "pesticide" when we are speaking broadly and the distinction between pesticide active ingredients and products is less important.

[2] The remaining ingredients in a pesticide product are inactive ingredients that help make the active ingredient more effective; they might, for example, help carry the active ingredient or allow it to stick to the intended surface.

Pesticide Uses and Application

Pesticide products are sold for either general or restricted use. Anyone can purchase and use *general-use* pesticide products, which include many lawn care products and household cleaners, among other things. On the other hand, *restricted-use* pesticide products may be purchased and used only by individuals who are certified as "pesticide applicators." Pesticide products earn the restricted-use designation due to their toxicity. In some cases, the same active ingredient may be sold both as part of a general-use pesticide product and as part of a restricted-use pesticide product, depending, for example, on the concentrations or intended uses.

Pesticides have many uses, both agricultural and otherwise.

Pesticide Application

When someone uses a pesticide product, they are said to "apply" that pesticide or to be making a "pesticide application."

"Pesticide applicators" are people who are licensed or certified by the state to apply restricted-use pesticide products.

People apply pesticides for many purposes, including the management of undesirable organisms in agricultural crops, in urban lawns and gardens, on golf courses, in forests, along highways and railroads, and even inside buildings. Landowners or managers may apply or have pesticides applied for them on a regular schedule to prevent pests. Alternatively, they may apply pesticides in reaction to a particular pest problem once it has arisen.

Pesticide products can be formulated and applied in a number of ways. Some pesticide products are liquids that are sprayed or poured on the target area. Pesticide products may also take the form of gel, dust, or solid bait, among other things. Agricultural pesticides can be applied widely through aerial application (often referred to as "crop dusting") or with the use of special motorized farm equipment.[3] For more targeted pest removal needs (both agricultural and otherwise), pesticide applicators might use a hand-held or backpack sprayer, place solid bait, or apply a gel using a syringe.

Pesticide Benefits and Risks

Pesticides have benefits and risks that must be balanced. While pesticides improve crop yields and help contain certain diseases, they are also toxic by nature and may have negative effects on human health and the environment.

The benefits and risks of pesticides are numerous and well documented.

Benefits

Worldwide, around 85 percent of the pesticides produced are used in the agricultural industry to control weeds or insects.[4] Weeds aggressively compete with cultivated

[3] Pesticides can also, less commonly, be mixed with water and delivered to fields through an irrigation system, a process known as chemigation.

[4] Ki-Hyun Kim, Ehsanul Kabir, and Shamin Ara Jahan, "Exposure to pesticides and the associated human health effects," *Science of the Total Environment* 575, (2017): 526.

crops for sunlight, water, and nutrients, reducing crop quality and yield. Insects can seriously damage plant tissues (both above and below ground) through their chewing, sucking, or boring to gain sustenance or shelter. Pesticides reduce losses that may result from weeds or insects, and help improve the quality of agricultural products. Pesticides, therefore, play an important role in food security. For example, one study estimated that without pesticides, the yields of Minnesota's corn crops would decrease by 53 percent and the state's soybean and sugar beet yields would fall by two-thirds. The authors of the study calculated that the yield reductions would cost Minnesota growers $5.6 billion in lost revenue.[5]

The nonagricultural benefits of pesticides are numerous. Pesticides are crucial in controlling diseases spread by ticks, mosquitos, rodents, and other pests. Pesticides are used to prevent the proliferation of pests in many products we depend on; they are used in the production of refrigerators, paint, carpet, and food-packaging materials, among other things. Pesticides help maintain the functionality and aesthetic appeal of golf courses, sports fields, and public parks, as well as lawns and ornamental gardens. The owners and managers of lakeside property use aquatic pesticides to control plants and other organisms that impact lake ecosystems. Pesticides also help protect homes and other structures from damage caused by termites and control building infestations of other insects and rodents.

Example: Protecting Minnesota's Crops from Soybean Aphids

Soybean aphids are small insects that extract and feed on plant sap. They can also transmit viruses to soybeans and excrete a sugary substance that encourages the growth of dark mold. Aphids weaken the soybean plant, reducing yield.

When aphid populations reach certain thresholds, farmers can eliminate them by applying insecticides to the leaves of soybean plants. There are several pesticide active ingredients that may help control soybean aphids, and experts recommend rotating between them in order to prevent pesticide resistance.

Risks

In this section, we summarize the scientific research related to the effects of pesticides on human health and the environment.

Human Health

The human health risks associated with pesticide use have been the subject of countless scientific studies. While the findings of some studies were inconclusive and others varied in the degree of the negative health impacts they found to be associated with pesticide use, the overarching conclusion of the studies we reviewed is that pesticides—given their intentionally toxic natures—are inherently dangerous for humans.[6]

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[5] Nader Soltani, J. Anita Dille, Ian C. Burke, Wesley J. Everman, Mark J. VanGessel, Vince M Davis, and Peter H. Sikkema, "Potential yield loss in corn, soybean, dry bean and sugar beet due to weed interference in North America," *Weed Technology* 32, no. 6 (2018): 750; and Weed Science Society of America fact sheet, http://wssa.net/wp-content/uploads/Corn-soybean-drybean-and-sugarbeet.pdf, accessed December 19, 2019.

[6] Given our lack of medical expertise, we relied on the conclusions drawn in 16 peer-reviewed papers in which the researchers synthesized the results of multiple (sometimes hundreds) other scientific studies. The articles we reviewed examined many different pesticide active ingredients, diseases, and exposed populations.

People become exposed to pesticides through skin contact, eye contact, inhalation, and by drinking contaminated water or eating contaminated food. The risk that a particular pesticide poses depends on the toxicity of the ingredients, the type of exposure, and the characteristics of the exposed individuals or populations, as well as the frequency and amount of exposure. A single encounter with a low dose of a given pesticide may cause little or no damage to a healthy human. However, acute exposure—exposure to a large enough dose—can result in "acute pesticide poisoning." Acute exposures can result in nausea, headaches, skin and eye irritation, and in some cases, even death.

Chronic exposure to pesticides have been linked to many health conditions. Pesticides are particularly dangerous for agricultural workers and their families, who are the most likely to encounter pesticides both repeatedly and in large concentrations. Chronic exposure to pesticides also poses a considerable threat to pregnant women and small children, who are affected more strongly than other adults would be from the same exposure.

Studies have shown that pesticides increase the risk of many types of diseases, including various cancers. In one article, which synthesized 452 different studies to evaluate the relationship of pesticides to 43 different diseases, researchers found that there were a considerable number of reports showing a positive association between pesticides and cancer.[7] Across the various studies we reviewed, researchers discussed the links between pesticide exposure and increased incidences of leukemia; non-Hodgkin's lymphoma; and cancer of the brain, bladder, colon, lung, and prostate, among others.[8] As one researcher summarized, "most of the pesticides used worldwide can affect the normal cellular metabolism in one way or other."[9]

Example: The Impact of Chlorpyrifos on Fetal Development

Chlorpyrifos is one of the world's most commonly used pesticides, both for agricultural crops like corn, soybeans, broccoli, and apples, and in nonagricultural, such as golf courses. Chlorpyrifos is an insecticide that works by attacking insects' nervous systems.

In 2000, the U.S. Environmental Protection Agency banned most household uses of chlorpyrifos. The timing of the ban allowed researchers at Columbia University to study and compare two groups of pregnant women, one that was exposed to household chlorpyrifos during pregnancy and one that was not. They found strong evidence of the pesticide's neurodevelopmental impacts—the children exposed to chlorpyrifos in the womb tended to be smaller, have poorer reflexes, and had a higher risk of developing attention deficit hyperactivity disorder (ADHD) and other developmental disorders later in life.

— Xindi Hu, "The Most Widely Used Pesticide, One Year Later - Science in the News," 2018.

[7] Sara Mostafalou and Mohammad Abdollahi, "Pesticides: an update of human exposure and toxicity," *Arch Toxicol* 91 (2017): 582-583.

[8] See, for example, Mostafalou and Abdollahi, "Pesticides: an update of human exposure and toxicity," 582-583; Michael R.C. Alavanja, "Pesticide Use and Exposure Extensive Worldwide," *Review of Environmental Health* 24 no. 4 (2009): 2; Akash Sabarwal, Kunal Kumar, and Rana Singh, "Hazardous effects of chemical pesticides on human health—Cancer and other associated disorders," *Environmental Toxicology and Pharmacology* 63, (2018): 103-104; and K.L. Bassil, C. Vkil, M. Sanborn, D.C. Cole, J.S. Kaur, and K.J. Kerr, "Cancer health effects of pesticides," *Canadian Family Physician* 53 (2007): 1707.

[9] Sabarwal, et. al., "Hazardous effects of chemical pesticides on human health—Cancer and other associated disorders," 111. Metabolic changes contribute to the development of many forms of cancer.

Studies also presented evidence that pesticides may be associated with elevated incidences of reproductive issues and birth defects, neurological disorders, and many other health conditions.[10] One article acknowledged the difficulties in conducting large-scale studies to determine the causes of human health problems, but concluded that "the statistical associations between exposure to certain pesticides and the incidence of some diseases are compelling and cannot be ignored."[11]

Environment

In addition to the human health risks posed by pesticide use, research shows that pesticides also represent a threat to the environment. Pesticides can impact the air, soil, and water, as well as nontarget animals and plants in the ecosystems impacted by pesticide applications.[12]

Airborne pesticide pollution may occur through pesticide drift—pesticides that drift off target during application because of wind conditions, or due to human error. Pesticides may also contaminate the air through post-application volatilization, in which pesticides rise into the air after application, sometimes as a result of changing temperatures. Soil contamination is another issue; pesticides can cause the decline of beneficial microorganisms in the soil.[13] Without these organisms, the soil cannot hold onto the nutrients that plants need to grow.

Pesticide chemicals may leach into groundwater or run off into surface water. While waterbodies adjacent to cropland are the most likely recipients of pesticide residues, waterbodies may also be contaminated through pesticide drift or contaminated rainfall. Surface water contamination poses a threat to aquatic ecosystems and wildlife of all kinds. According to one study, "pesticides have been demonstrated to contribute to the decline of non-target organisms, such as bees, birds and aquatic biodiversity, fueling the global biodiversity crisis."[14]

Another risk associated with pesticide use is pesticide resistance, in which a pest evolves to withstand the methods used to control it. Resistance is a serious issue that

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[10] See, for example, Virginia Zaunbrecher, Dale Hattis, Ron Melnick, Susan Kegley, Timothy Malloy, and John Froines, *Exposure and Interaction: The Potential Health Impacts of Using Multiple Pesticides* (Los Angeles, 2016): 8; and Mostafalou and Abdollahi, "Pesticides: an update of human exposure and toxicity," 549.

[11] Kim, et. al., "Exposure to pesticides and the associated human health effects," 532.

[12] See, for example, Christos A. Damalas and Ilias G. Eleftherohorinos, "Pesticide Exposure, Safety Issues, and Risk Assessment Indicators," *International Journal of Environmental Research and Public Health* 8, (2011): 1411; and Md. Wasim Aktar, Dwaipayan Sengupta, and Ashim Chowdhury, "Impact of pesticides use in agriculture: their benefits and hazards," *Interdisciplinary Toxicology* 2, no. 1 (2009): 5.

[13] Aktar, et. al., "Impact of pesticides use in agriculture: their benefits and hazards," 5.

[14] Ralf B. Schäfer, et al., "Future Pesticide risk assessment: narrowing the gap between intention and reality," *Environmental Sciences Europe* (2019): 1.

could intensify negative impacts of pesticides on human health and the environment. Pests develop resistance through the basic evolutionary processes. When a farmer applies a pesticide that kills most, but not all, of the targeted pest, the resistant individuals survive and reproduce. As pests develop resistance to a specific pesticide, it takes more and more of the same pesticide product to protect crops. The increased pesticide use is not only more expensive for the farmer, but exposes nearby humans and the environment to greater amounts of the active ingredient, potentially increasing adverse affects.

Example: Pesticide Resistance in Palmer Amaranth

Palmer amaranth is a prolific weed that can grow an inch or more a day and achieve heights of nearly ten feet. In the Southern U.S., cotton growers have battled the weed for years, and isolated cases have been reported in Minnesota since 2016. Palmer amaranth crowds out crops, competes for moisture and nutrients from the soil, and has a tough stem that can damage farm equipment.

Palmer amaranth poses a particular problem because it has developed resistance to the glyphosate pesticides that have traditionally been the primary method for controlling the weed. Cotton farmers now use a combination of pesticides, as well as manual techniques such as tilling and pulling weeds by hand to control the weed. While this approach has been successful, it has tripled the cost of controlling weeds in cotton.

Overview of Pesticide Regulation

Given the risks associated with pesticide use, it is important that pesticide products are regulated in a way that mitigates the negative consequences that may result from using pesticides inappropriately.

Federal and State Laws

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs the sale and use of pesticides in the U.S. The U.S. Environmental Protection Agency (EPA) is responsible for implementing FIFRA.[15]

Federal Pesticide Regulation

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs the sale and use of pesticides in the U.S.

The U.S. Environmental Protection Agency (EPA) is responsible for implementing FIFRA.

EPA regulates the sale and use of pesticides through pesticide product registration and labeling. Pesticide labels are more extensive than a typical product label. They can be quite lengthy and contain detailed instructions regarding who may use a pesticide, how often they may use it, and under what circumstances the pesticide can be used. Instructions, restrictions, and warnings contained on pesticide product labels vary from one product to the next and are designed to mitigate any environmental and health risks associated with the pesticide. Unlike most other types of product labels, pesticide labels are legally enforceable. Using a pesticide product in a manner inconsistent with its label is considered a violation of federal law. We discuss the federal pesticide registration process in Chapter 2.

[15] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, sec. 136-136y (2018).

The U.S. Environmental Protection Agency delegates the enforcement of pesticide law to the states.

While EPA controls which products are federally registered and what information must be included on pesticide product labels, the agency generally delegates the authority to enforce label requirements to states.[16] States have their own pesticide regulation laws, which must be consistent with FIFRA and may impose additional restrictions on pesticide use. Minnesota statutes assign responsibility for enforcing pesticide laws to the Minnesota Department of Agriculture (MDA).[17]

Minnesota Department of Agriculture

According to Minnesota statutes, the commissioner of agriculture "has the sole regulatory authority over the terrestrial application of pesticides, including, but not limited to, the application of pesticides to agricultural crops, structures, and other nonaquatic environments."[18] The Pesticide and Fertilizer Management Division within MDA conducts the vast majority of the department's pesticide-related activities.[19] The division consists of 112 staff, about one-third of whom are dedicated to fertilizer management or other activities.[20] In addition to the administrative and field staff based in St. Paul, the Pesticide Fertilizer and Management Division has monitoring and enforcement staff that work out of Mankato, Rochester, St. Cloud, and several other areas around the state.

> The [Minnesota] Department of Agriculture is the lead agency for the regulation of pesticides.
>
> **— *Minnesota Statutes* 2019, 18B.03, subd. 1**

MDA's Pesticide and Fertilizer Management Division conducts numerous activities related to pesticide regulation. Exhibit 1.1 shows the organization of the Pesticide and Fertilizer Management Division. The Pesticide Non-Point Section approves registration for pesticide products and develops "best management practices." The Monitoring and Assessment Unit collects water samples for the purposes of assessing pesticide contamination. The Inspection and Enforcement Section is responsible for inspections and investigations. Finally, the Operations Section houses the Licensing and Certification Unit.

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[16] EPA has cooperative agreements with all states other than Wyoming (in which EPA staff conduct enforcement activities).

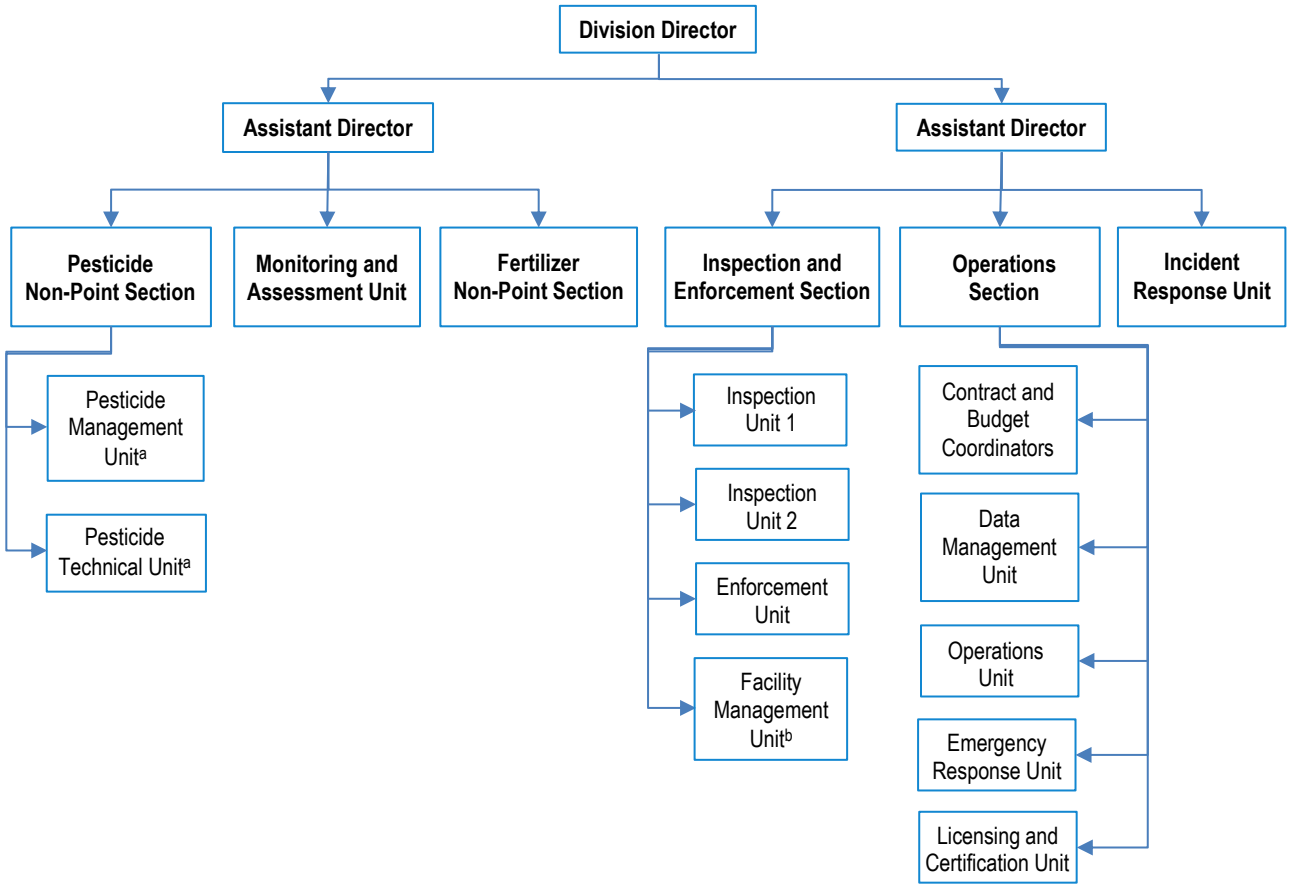
[17] *Minnesota Statutes* 2019, 18B.03, subd. 1.

[18] *Ibid*. The Department of Natural Resources has authority over aquatic pesticide use.

[19] The Pesticide and Fertilizer Management Division does not conduct its own laboratory analyses; it sends water-quality monitoring samples and pesticide-residue samples to MDA's Laboratory Services Division. It also does not conduct food-safety inspections to determine whether pesticide residues exist on food products or animal feed. To the extent that MDA does this, it is the responsibility of the Food and Feed Safety Division. We did not evaluate either of these divisions.

[20] We did not evaluate MDA's fertilizer-related activities.

Exhibit 1.1: The Pesticide and Fertilizer Management Division is organized into several units and sections.



NOTES: The exhibit shows the structure of the Pesticide and Fertilizer Management Division. It excludes the Minnesota Agricultural Water Quality Certification Program. The manager of this program reports to the division director, but the staff do not have regulatory responsibilities related to pesticides. The Minnesota Department of Agriculture has several other divisions not represented, including the Food and Feed Safety Division and the Laboratory Services Division, among others.

[a] The Pesticide Management Unit handles all types of pesticide product registration. The Pesticide Technical Unit is responsible for conducting special registration reviews of certain pesticide products prior to registration. We discuss these activities further in Chapter 2. The Pesticide Technical Unit is also responsible for the development of "best management practices," which we discuss in Chapter 6.

[b] The Facility Management Unit is responsible for issuing permits for bulk pesticide storage facilities. It also coordinates the disposal of waste pesticides.

SOURCE: Office of the Legislative Auditor.

Update to 2006 Evaluation

In 2006, the Office of the Legislative Auditor (OLA) released *Pesticide Regulation*, an evaluation of the Minnesota Department of Agriculture's activities related to pesticides.[21] This evaluation is—in part—a follow-up to that report. In the coming chapters, we evaluate the extent to which the state has implemented that report's recommendations. The findings in this report that relate to the 2006 recommendations are highlighted in call-out boxes similar to the one at left.

UPDATE TO 2006 REPORT

In its 2006 *Pesticide Regulation* report, OLA made ten recommendations to MDA.

RECOMMENDATIONS LARGELY IMPLEMENTED

Overall, MDA has taken action to satisfy all of OLA's 2006 recommendations.

The Minnesota Department of Agriculture has fully implemented most of the Office of the Legislative Auditor's 2006 recommendations.

As we explain in more detail throughout this report, MDA fully satisfied eight of the ten recommendations that OLA made in 2006. For the remaining three recommendations directed to MDA, the agency has made improvements, but some issues remain.

The Legislature has not acted on the one recommendation OLA made for statutory change. We discuss this recommendation further during our discussion of pesticide impacts on pollinators in Chapter 5. Exhibit 1.2 shows all of OLA's 2006 recommendations and indicates the extent to which they have been implemented.

Exhibit 1.2: The Minnesota Department of Agriculture has fully implemented most of the Office of the Legislative Auditor's 2006 recommendations.

Recommendation	Responsible Party	Implementation Status
MDA should develop criteria for when it will review pesticide product information in more detail before registering products.	MDA	Fully Implemented
MDA should ensure that state supplemental labels for pesticide products are complete and contain language that complies with state and federal requirements.	MDA	Partially Implemented
MDA should develop and implement a consistent approach to monitor urban pesticide use biennially, as required by state statute.	MDA	Fully Implemented
MDA should ensure that waste-pesticide disposal options exist in areas of the state that lacked them in 2006.	MDA	Fully Implemented
When investigating allegations of pesticide misuse, MDA should change its procedures for collecting application records by specifying when to require inspectors to examine records in person.	MDA	Fully Implemented

Continued on next page.

[21] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006).

Exhibit 1.2: The Minnesota Department of Agriculture has fully implemented most of the Office of the Legislative Auditor's 2006 recommendations (continued).

Recommendation	Responsible Party	Implementation Status
MDA should improve its written communications with complainants.	MDA	Partially Implemented
MDA should evaluate the consistency and effectiveness of all of its enforcement actions.	MDA	Fully Implemented
The Legislature should require land managers to provide advance notice about pesticide applications toxic to bees when nearby beekeepers request notification, and it should require MDA to evaluate whether similar requirements should extend to comparably risky applications.	Legislature	Not Implemented
MDA should increase its water monitoring activities to include surface water sites in sensitive urban areas and, at a minimum, test the samples taken from these areas for nonagricultural pesticides.	MDA	Fully Implemented
MDA should immediately develop and carry out a plan for evaluating the implementation and effectiveness of its best management practices.	MDA	Fully Implemented
MDA should revise the *Minnesota Pesticide Management Plan* to better address issues of urban pesticide use, aquatic pesticides, and product registration.	MDA	Fully Implemented

NOTE: "MDA" is the Minnesota Department of Agriculture.

SOURCE: Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006), 101.

Chapter 2: Pesticide Registration

Most pesticide products must be registered with the U.S. Environmental Protection Agency (EPA) before they are sold, distributed, or used in the U.S. Such pesticide products must also be registered with the Minnesota Department of Agriculture (MDA) in order to be distributed or used in Minnesota. In this chapter, we discuss EPA's registration process. We also explain MDA's process for approving pesticide products for use in Minnesota.

Federal Product Registration

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires pesticide products and active ingredients distributed or sold in the U.S. to be registered with EPA.[1] FIFRA and other federal laws lay out requirements for EPA's registration process. For example, FIFRA requires that EPA's registration of a product be based on an evaluation of scientific data and an assessment of the benefits and risks associated with using the product.[2] Additionally, the Federal Food, Drug, and Cosmetic Act requires EPA to set pesticide tolerances—which are the maximum permissible level of pesticide residue—for pesticides whose uses are likely to result in residue on food or animal feed.[3] EPA must also ensure that any pesticide registration it approves is unlikely to jeopardize the continued existence of any species on the endangered species list or adversely modify critical habitat for those species, as required by the Endangered Species Act.[4]

As part of deciding whether to register a pesticide product, EPA analyzes data and conducts different risk assessments to evaluate potential risks to human health and the environment. Some of the risks EPA considers include potential groundwater contamination, risks to endangered and threatened species, and the potential for endocrine disruption effects.[5] Once EPA has completed its risk assessments, these assessments undergo a peer review by scientific experts. Before making a final registration decision, EPA also considers the availability of alternative pesticides and the adequacy of measures to mitigate any risks it has identified. Once registered, EPA must review pesticide product registrations every 15 years in accordance with federal law.[6]

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[1] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, sec. 136a(a) (2018). Not all substances that are defined as pesticides under federal law are required to be registered. For example, certain nitrogen stabilizers are not required to be registered. Additionally, EPA can issue exceptions—such as emergency exemptions—for those substances that are usually required to be registered.

[2] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, sec. 136a(c) (2018).

[3] Federal Food, Drug, and Cosmetic Act, 21 *U.S. Code*, sec. 346a(a)-(b) (2018).

[4] Endangered Species Act, 16 *U.S. Code*, sec. 1536(a)(2) (2018).

[5] Endocrine disruption can affect humans or wildlife. It may result in adverse developmental, reproductive, neurological, or immune effects.

[6] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, sec. 136a(g)(1)(A)(iv) (2018).

A pesticide label is not just a sticker on a product container.

Pesticide product labels can be very long and include extremely technical language. For example, the label for the product Dual Magnum Herbicide is 50 pages long.[a] Labels are required to include certain information, such as the product's name, its ingredients, descriptions of hazards associated with the product, first aid instructions, and worker protection information.

Labels also include detailed directions for each approved use of the product. These directions vary depending on factors such as the target pest, the application method, and to what the pesticide will be applied (for instance, a plant, animal, or building).

[a] The Dual Magnum Herbicide label can be found at http://www.syngenta-us.com/current-label/dual_magnum.

As discussed in Chapter 1, when EPA registers a pesticide product, it issues a product label. The label describes the ways in which the product may be used. Failure to follow the directions and requirements on a label is a violation of federal law. The box to the left provides more information on product labels.

The U.S. Environmental Protection Agency has registered numerous pesticide active ingredients that are banned by other developed countries. Further, its established "maximum residue limits" are less strict than the standards adopted by many countries.

Pesticide regulations vary across the world. Countries regulate different pesticides and establish different acceptable thresholds for pesticides in drinking water and in food products. We reviewed a number of studies comparing pesticide regulations around the world and found that the U.S. pesticide standards are more lax than those adopted by the European Union, as well as those created by the World Health Organization and United Nations.[7]

The EPA has registered for agricultural use 72 pesticide active ingredients that are banned in the European Union.[8] More than one-quarter of the 1.2 billion pounds of agricultural pesticides used in the U.S. in 2016 contained active ingredients that the European Union prohibits. The differences in approved pesticides reflect the differing priorities that the U.S. and the European Union consider when registering pesticide products. As shown in the box to the right, the European Union registration process emphasizes safety of humans and the environment over the benefits

European pesticide registration standards place a greater emphasis on safety.

European Union	United States
The European Commission approves pesticide active ingredients for which it has been demonstrated that "they **do not have any harmful effect** on human or animal health or **any unacceptable effects** on the environment."[a]	EPA registers pesticide products that generally will not cause "any unreasonable risk to man or the environment, **taking into account the economic, social, and environmental costs and benefits** of the use of any pesticide."[b]

[a] European Parliament, Council of the European Union, regulation 1107/2009.

[b] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, sec. 136(bb) and 136a(a) (2018).

[7] In the 1960s, the World Health Organization and the United Nations Food and Agriculture Organization collaborated to develop the "Codex Alimentarius" or "food code," which is a set of standards for the purpose of facilitating international trade. In present day, standards are determined by a committee of 189 member nations or organizations.

[8] Nathan Donley, "The USA lags behind other agricultural nations in banning harmful pesticides," *Environmental Health* 18, no. 44 (2019): 3. The list of pesticides the European Union has banned includes, among others, some neonicotinoid pesticides (which we discuss in Chapter 5), as well as some pesticides commonly found in Minnesota water monitoring (discussed in Chapter 6). The U.S. also allows the use of 17 and 11 pesticide active ingredients banned (or in the process of being phased out) in Brazil and China, respectively.

of the pesticide. This is in contrast with FIFRA, which allows EPA to consider the benefits of the pesticide active ingredient, even if it is harmful.[9]

Not only does the U.S. allow the use of more pesticide active ingredients than the European Union, but it often has less rigorous standards for acceptable concentrations of individual pesticides. "Maximum residue limits" are the upper limits for the concentration of a pesticide in food or animal feed. Maximum residue limits can vary internationally, and the European Union often has the strictest standards. Exhibit 2.1 shows how the U.S. limits compare with the European Union limits and the Codex Alimentarius international food standards with respect to the allowable concentrations of different pesticide active ingredients that can be found on an apple. The U.S. limits for certain pesticides (with respect to apples) are equal to or even lower than the European Union standards. More often, however, the U.S. maximum residue limit is higher. In the case of the pesticide ingredient malathion, the U.S. maximum limit was 400 times the European limit.[10]

States have the right to ban or restrict the use of pesticide products that the U.S. Environmental Protection Agency has approved.

While U.S. pesticide regulations may be considered lax compared to some international standards, individual states can implement stricter standards if they so choose. There are three ways that a state can restrict a pesticide product beyond the requirements of the federal label.

1. A state's legislature may enact laws banning certain pesticides. For example, Hawaii has enacted a statutory ban of the active ingredient chlorpyrifos.

2. A state's pesticide-regulating agency may review EPA's registration decisions and decline to approve a particular pesticide product for use in that state. In 2019, the state of California's Department of Pesticide Regulation canceled the registration of the vast majority of chlorpyrifos products.[11]

3. A state's pesticide-regulating agency may approve a pesticide product for use in the state with additional label restrictions. For example, the state could allow only certain application methods (such as ground versus aerial application), adjust acceptable rates of application based on local conditions, or implement a cutoff date after which the product cannot be applied, among other things.

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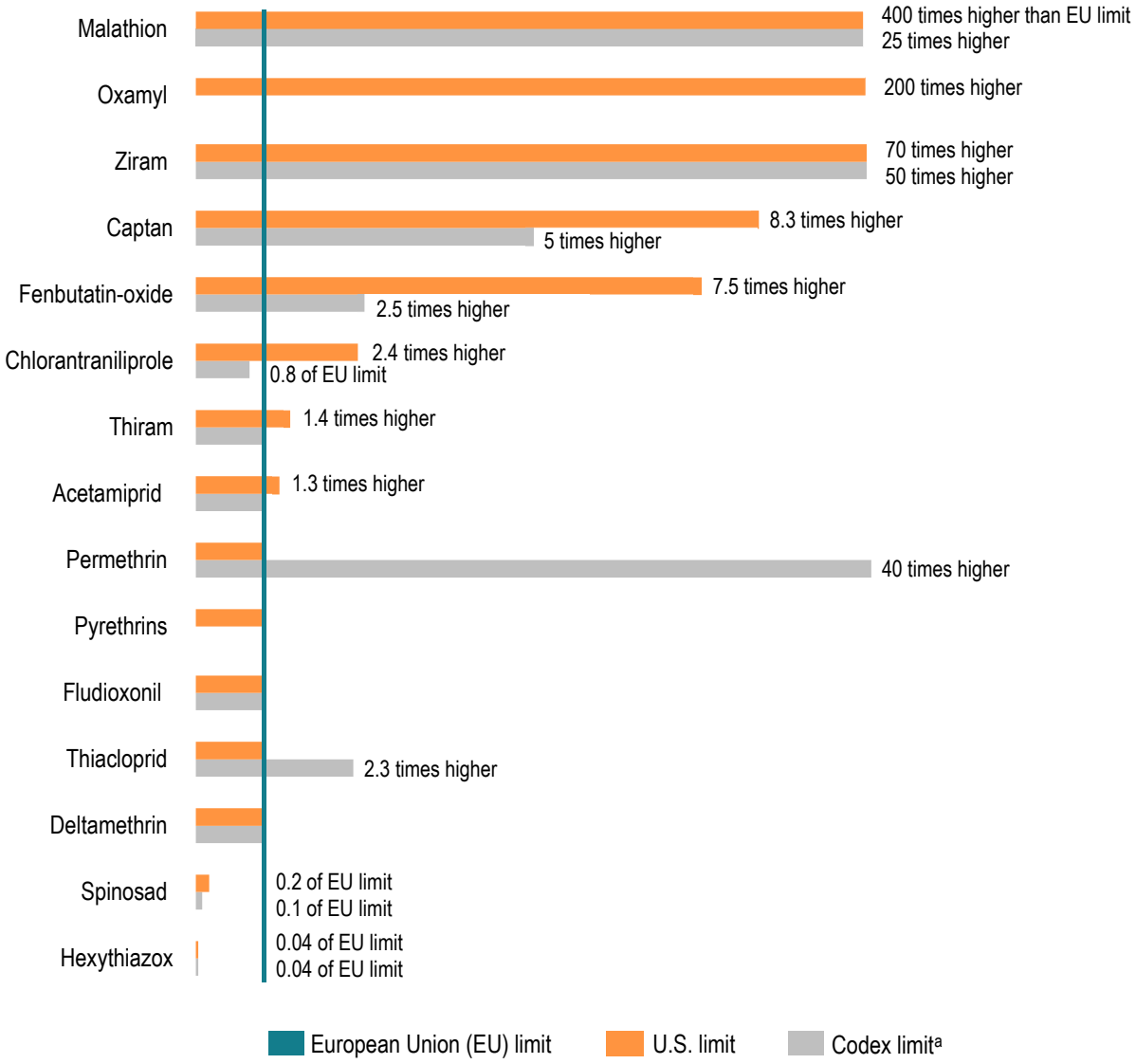
[9] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, secs. 136(bb) and 136a(a) (2018).

[10] We based the analysis shown in Exhibit 2.1 on data presented in Caroline E. Handford, Christopher T. Elliot, and Katrina Campbell, "A Review of the Global Pesticide Legislation and the Scale of Challenge in Reaching the Global Harmonization of Food Safety Standards," *Integrated Environmental Assessment and Management* 11, no. 4 (2015): 527. The authors reported that they randomly selected the pesticides they presented as examples of differing maximum residue limits for apples.

[11] EPA was poised to ban chlorpyrifos due to the risks the chemical poses to the cognitive development of infants and children. However, the agency reversed course in 2017, allowing the active ingredient chlorpyrifos products to remain on the market. In early 2020, it was reported that Corteva Agriscience, the nation's largest producer of chlorpyrifos, would discontinue production of the pesticide. Brady Dennis, "Trump has kept this controversial pesticide on the market. Now its biggest manufacturer is stopping production," *The Washington Post,* February 6, 2020, https://www.washingtonpost.com/climate-environment/2020/02/06/trump-kept-this-controversial-pesticide-market-now-its-biggest-manufacturer-is-stopping-production/, accessed March 11, 2020.

Exhibit 2.1: The U.S. maximum residue limits for pesticides on apples were generally higher than international comparison standards.



NOTES: Different pesticides have different maximum residue limits, which makes comparison difficult. For example, the U.S. limit for thiacloprid is 0.3 parts per million, while its limit for captan is 25 parts per million. We standardized the maximum residue limits for each of the above pesticide active ingredients by dividing each U.S. and Codex standard by the corresponding European Union limit, which was generally the most conservative. Some pesticides had U.S. limits dramatically higher than European standards, as indicated by the numbers at the end of those columns. The apple is just one example; different commodities have different maximum residue limits.

[a] "Codex" refers to Codex Alimentarius international food standards, which are standards developed by the World Health Organization and the United Nations Food and Agriculture Organization to facilitate international trade of food commodities. Codex Alimentarius does not have established standards for oxamyl and pyrethrins.

SOURCE: Office of the Legislative Auditor, analysis of data presented in Caroline E. Handford, Christopher T. Elliot, and Katrina Campbell, "A Review of the Global Pesticide Legislation and the Scale of Challenge in Reaching the Global Harmonization of Food Safety Standards," *Integrated Environmental Assessment and Management* 11, no. 4 (2015): 527.

According to an EPA staff member, most states accept EPA's decisions and register EPA-approved products for use in their state without further review. As we discuss in the following sections, MDA conducts additional reviews of the active ingredients in certain EPA-registered pesticide products.

Minnesota Product Registration

State statutes require a pesticide product to be registered in Minnesota in order for it to be distributed, sold, or used in the state.[12] Most pesticide products are registered through MDA's standard product registration process, which covers product uses that have been approved by EPA. In certain situations, MDA conducts a more thorough review—known as a special registration review—of applications for standard product registration. There are three other ways a pesticide product might be approved for use in Minnesota: (1) special local need registration, (2) experimental use registration, and (3) emergency exemption. Exhibit 2.2 shows the different types of registrations in Minnesota. In this section we focus on MDA's standard pesticide product registration, including special registration reviews, and special local need registrations.

Exhibit 2.2: There are different ways to register a pesticide product in Minnesota.

Registration Type	Description
Standard	MDA registration of an EPA-registered pesticide product that allows EPA-approved uses of the product: • Products meeting certain criteria undergo a **special registration review** process to determine whether the product should be registered and, if so, whether they should be registered with additional conditions
Special local need	Generally allows a *use* of an already registered product that is not allowed by its EPA registration; manufacturer must demonstrate a "local need" that differs from the conditions under which the product was approved by EPA; may allow use of a pesticide product that is not registered with EPA; in some instances used to *restrict* use of a product registered by EPA
Experimental use	Allows limited use of an unregistered pesticide product for experimental purposes; may also be used to demonstrate new uses for an already registered product
Emergency exemption[a]	Allows uses of a pesticide product that are not already allowed by EPA to address an emergency situation in which (1) no effective registered pesticides are available; (2) no feasible alternative control practices are available; and (3) the situation involves a new pest, significant risk to human health or the environment, or will cause significant economic loss

NOTES: "EPA" is U.S. Environmental Protection Agency. "MDA" is the Minnesota Department of Agriculture.

[a] Technically, this is an exemption from the requirement for a product to be registered rather than a type of registration in itself; we listed this as a registration in this exhibit for simplicity's sake.

SOURCE: Office of the Legislative Auditor.

[12] *Minnesota Statutes* 2019, 18B.26, subd. 1. There are some exceptions to this requirement, such as instances where a company ships a pesticide from one of its facilities to another and uses the pesticide only to create a pesticide product that is registered in Minnesota. Additionally, *Minnesota Statutes* 2019, 18B.26, subd. 1(c), generally allows a previously registered pesticide product to be used in the state for two years after the last year for which it was registered.

Standard Product Registration

Each year, pesticide producers—referred to as "registrants"—submit applications to MDA to register every pesticide product they plan to sell in Minnesota for use in Minnesota during that year. MDA's Pesticide Management Unit is responsible for registering these pesticide products.

Pesticide Registrant

A pesticide registrant is a pesticide producer that registers one or more pesticide products for use.

In most cases, the Minnesota Department of Agriculture effectively "rubber stamps" the registration decisions made by the U.S. Environmental Protection Agency.

To register a new pesticide product in Minnesota, pesticide registrants submit an application form to MDA along with fees, the product's EPA-approved label, and safety information on the product.[13] MDA's approach to reviewing product registration applications for new pesticide products is fairly limited, unless the pesticide product qualifies for MDA's "special registration review process" (described in the next section).

MDA's standard product registration process involves (1) making sure all required documents have been submitted, (2) ensuring the submitted documents are complete and the appropriate fees have been paid, and (3) entering data from the application into MDA's database. When MDA registers a pesticide product, it generally accepts the label approved by EPA. Once registered, a pesticide product may be sold or used in Minnesota until its registration expires on December 31 of the year for which it is registered.

MDA's process for *renewing* pesticide product registrations is less involved than its process for registering new pesticide products. In October of each year, MDA sends each registrant a form that includes a list of the registrant's currently registered pesticide products. The registrant then indicates on this form the products it wants to reregister for the following year and submits the appropriate fees. The registrant is not required to resubmit certain materials, such as the pesticide product label or safety information on the product.

MDA reported that the number of pesticide products registered in Minnesota has increased gradually from nearly 12,300 in 2010 to almost 14,300 in 2019. While MDA

[13] The fees include an application fee and a surcharge to pay for MDA's waste-pesticide program, and they vary depending on whether the product is an agricultural or nonagricultural product. The total fee for agricultural pesticide products is $400 (including a $350 application fee and a $50 surcharge), while the fee for nonagricultural products is $475 (including a $350 application fee and a $125 surcharge). Additionally, pesticide registrants may be required to pay annual gross-sales fees for certain nonagricultural pesticide products based on the gross sales for that product during the previous year. Registrants must also pay a surcharge fee to fund the Agricultural Chemical Response and Reimbursement Account (ACRRA) fund.

does not formally track the number of applications for standard product registration that it rejects, staff explained that there are very few of these.[14]

Special Registration Reviews

While MDA's standard registration process does not include an in-depth review of most pesticide products, the department does conduct "special registration reviews" of products that meet certain criteria.[15]

The Minnesota Department of Agriculture conducts "special registration reviews" before approving certain pesticide products for standard registration.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA develop criteria for when it will review pesticide product information in more detail before registering pesticide products.

RECOMMENDATION FULLY IMPLEMENTED

MDA has developed criteria for when it will conduct a "special registration review" prior to registering a product.

In response to a recommendation from the Office of the Legislative Auditor's 2006 *Pesticide Regulation* report, MDA developed criteria for determining which pesticide products would undergo additional review prior to registration.[16] In 2007, MDA adopted the following criteria for when it will conduct a "special registration review":[17]

- A pesticide product contains an active ingredient not previously registered for use in Minnesota.
- A previously registered pesticide product's label has changed to allow a new use, such as a new application method or use on an additional crop.
- An active ingredient was added to EPA's annual registration work plan, which is the federal agency's list of new active ingredients and new uses for existing active ingredients.
- MDA has detected (through its water-quality monitoring) an active ingredient that appears (1) frequently in groundwater or (2) in surface water concentrations approaching or exceeding water-quality standards.

MDA divides its special reviews into three "tiers" depending, in part, on which of the above criteria a product meets. We discuss the tiers and the characteristics of their reviews in the sections below.

[14] MDA staff estimated that there were fewer than ten such cases over the last five years. They further explained that MDA had rejected these applications because they were for products that had been bundled together without first going through EPA's registration process.

[15] Special registration reviews are not their own form of registration. They provide information that informs the other registration processes described in this chapter.

[16] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006), 28.

[17] Minnesota Department of Agriculture, *Minnesota Pesticide Management Plan* (St. Paul, 2007), 27.

Tier I Reviews

Tier I reviews can be considered a step in the standard registration process, described above. MDA conducts a Tier I review for every product registration submitted to the state involving (1) a new active ingredient or (2) a new use for a previously registered pesticide product. Once MDA staff complete the review, they typically route the product registration application back to the standard registration process.[18]

MDA staff explained that for these reviews, MDA collects and reviews all of the documentation EPA used in its registration process, which often includes more than 1,000 pages of human health, ecology, and water protection data. As part of its review, MDA consults with experts at the University of Minnesota Extension regarding the likely extent of the pesticide product's use in Minnesota. MDA may also contact the product manufacturer if needed. MDA staff told us that in reviewing EPA's registration materials, the department makes its own determination of whether (1) EPA identified all relevant human health and environmental risks, and (2) EPA's label restrictions are sufficient to mitigate those risks.

MDA staff told us that the department generally receives and reviews between two and ten registration applications per year that need to go through the full Tier I special registration review process, and that the reviews take one-to-two months to complete. MDA has published the results of 37 Tier I reviews on its website since 2012.[19]

Tier II and Tier III Reviews

Unlike Tier I reviews, which are a step in the standard registration process, Tier II and Tier III reviews are research projects that are not related to the registration of a particular pesticide product. As indicated above, MDA decided in 2007 to consider for review pesticide active ingredients that the department flags for additional scrutiny based on its water-quality monitoring. The special registration review program has evolved, however, to address issues that come to the department's attention in other ways as well. For example, past review topics have arisen because of an increase in complaints about a product or a legislative mandate. MDA staff assemble possible review topics and the commissioner prioritizes them.

The distinction between Tier II and Tier III is one of complexity. MDA explained that Tier II reviews focus on a single pesticide active ingredient or pest, and that they take from six months to one year to complete. MDA has completed Tier II reviews on a total of three topics: insecticides used to treat bedbugs, the pesticide ingredient

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[18] If MDA determines, through the special registration review, that a product's EPA-approved label will not sufficiently mitigate risks for use in Minnesota, the department explores options such as (1) imposing additional use restrictions as a condition of registration or (2) not registering the product.

[19] MDA staff reported that the department "screens" many more active ingredients than it ultimately reviews. In 2019, MDA screened nearly 100 active ingredients listed on EPA's annual registration, as well as nearly 900 new product labels submitted through the Minnesota standard registration process, to determine whether they would have substantial impacts on human health or the environment in Minnesota. MDA thoroughly reviewed a pesticide active ingredient and summarized its findings on its website only when (1) a registrant had attempted to register a product containing the active ingredient in question, and (2) the new use would likely result in a substantial increased use in Minnesota. For example, if a product registered in Minnesota had a label change to allow use on citrus, MDA would not review its active ingredient for that new use because Minnesota farmers do not grow a substantial amount of citrus.

dicamba, and insecticides used to treat emerald ash borer. Tier III reviews have a broader focus on a class of active ingredients or uses and can take more than a year to complete. MDA has conducted Tier III reviews on two topics: the pesticide ingredient atrazine and the effect of neonicotinoid pesticides on pollinators.

The Minnesota Department of Agriculture in-depth reviews have resulted in additional restrictions on two pesticide active ingredients.

While the purpose of Tier II and Tier III reviews is not necessarily to evaluate the label of a specific pesticide product, the resulting reports may recommend use restrictions for all products containing a particular active ingredient. When EPA registers a pesticide product, it imposes label requirements that the agency believes will mitigate any adverse effects it identified. MDA staff told us that they further restrict a product's use in the state if the department identifies issues unique to Minnesota. Thus far, MDA has imposed additional label restrictions on products containing two pesticide active ingredients: dicamba and isoxaflutole.[20]

Dicamba is an herbicide used to control broadleaf weeds on a variety of crops, as well as on golf courses and lawns.

Dicamba products have long been registered by EPA, but prior to 2016, they were approved only for preplant application to soybeans. In 2016, EPA approved certain dicamba products for *postemergence* application to dicamba-tolerant soybeans.

MDA conducted its initial review of dicamba in response to numerous dicamba drift complaints that it received during the 2017 growing season. As a result, MDA shortened the application season for the new dicamba products. The intention was to prohibit use after the point at which nontolerant soybeans had entered the reproductive stage (and would thus be more susceptible to dicamba drift).

Postemergence dicamba products now bear a "special local need" label (discussed later in this chapter), stating that it is unlawful to apply after June 20.

Isoxaflutole is another broadleaf herbicide, which MDA reviewed due to surface water and groundwater concerns. As a result, MDA prohibited isoxaflutole use in specified counties. Use is also prohibited near certain waterbodies and in areas where certain soil conditions exist in conjunction with high water tables. These restrictions are explained in a "Minnesota Product Bulletin," which is referenced within the standard EPA-approved label.

[20] The isoxaflutole restrictions predate MDA's existing special registration review process. However, the ingredient was initially reviewed and restricted via a commissioner's order in response to surface water and groundwater concerns, similar to the concerns that might precipitate a Tier II or Tier III review today.

Special Local Need Product Registration

FIFRA allows states to register a pesticide product for a use not covered by its standard pesticide product registration if that use will fulfill a "special local need."[21] A special local need is defined as an existing or imminent pest problem in a particular state (such as Minnesota) that cannot be addressed by a product that is registered with EPA.[22] While special local need registrations typically expand the use of a registered product, states may not approve a pesticide product that EPA has previously denied, suspended, or canceled. Additionally, the registration must comply with requirements for the maximum amount of pesticide residue allowed by EPA on a food or animal feed. In this section, we first provide background information on special local need registrations. We then discuss MDA's process for reviewing supplemental labels for these products as well as its process for documenting its special local need registration decisions.

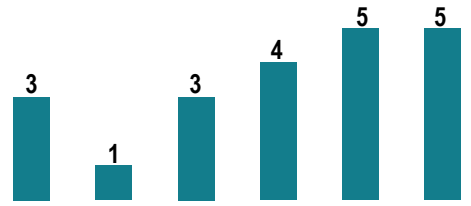
Special Registration Review vs. Special Local Need Registration

Special registration reviews are additional reviews that some pesticide products undergo as part of Minnesota's standard registration process.

Special local need registration is a separate registration process that generally expands the allowable uses of a product in Minnesota beyond those described on the EPA-approved product label.

Between January 2014 and September 2019, MDA reviewed and made decisions regarding 26 special local need product registration applications. These 26 applications requested (1) a new special local need registration, (2) the reissuance of an existing special local need registration, or (3) the transfer of a special local need registration from one product to another product with the same composition.[23] Of the 26 applications, MDA approved 21 (81 percent).[24] Roughly two-thirds of the special local need registrations *expanded* the allowable use of the pesticide product. The registrations, for example, allowed for changes in application rates, techniques, or equipment, or allowed the use of a pesticide on an additional crop or animal. The remainder of the approved applications resulted in additional *restrictions* to pesticide products containing dicamba as an active ingredient.

MDA has issued an increasing number of special local need product registrations in recent years.



[21] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, 7 *U.S. Code*, sec. 136v(c) (2018).

[22] 40 *CFR,* sec. 162.151 (2020).

[23] MDA often issues special local need registrations for more than one year. The registrant, however, must pay an annual fee to renew registration of the special local need registration. The 26 applications described above do not include such renewals, as they do not involve an extensive review of the special local need. This number also does not include six special local need registration applications that were pending as of September 27, 2019.

[24] These 21 special local need registrations were not necessarily for *different* pesticide products; in some cases, the *same* pesticide product had multiple registrations over the period we reviewed.

In contrast to standard product registrations, MDA conducts a more intensive evaluation of special local need registration applications, which includes reviewing additional application materials. Such applications consist of (1) an MDA application form; (2) an EPA application form; (3) an application fee of $150; (4) a letter of support from the registrant; (5) a letter of support from a qualified expert, such as a professor; (6) a copy of the special local need supplemental label; and (7) a copy of the current EPA standard registration label. In addition, some applications may include data on the efficacy of the pesticide product and/or data used to determine whether the proposed use of the pesticide product will comply with maximum pesticide residue limits. Applications may also include letters of support from a commodity group, such as the Minnesota Soybean Growers Association.

Supplemental Labels

Part of MDA's responsibility in reviewing special local need registration applications is to ensure that "supplemental labels"—additional labels describing how the product's allowed uses in Minnesota differ from those on the standard, EPA-approved label—comply with state and federal laws. In 2006, OLA noted that MDA did not often change the proposed special local need supplemental labels that registrants submitted with their special local need registration applications.[25] The 2006 evaluation also identified instances where the final supplemental label that MDA approved was either missing information or later needed to be corrected by EPA.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA ensure that special local needs supplemental labels for pesticide products are complete and contain language that complies with state and federal requirements.

RECOMMENDATION PARTIALLY IMPLEMENTED

While MDA has taken steps to improve its process for reviewing special local need pesticide registration labels, we noted consistency issues.

According to MDA staff, the department has taken several steps in response to OLA's recommendation. For example, MDA has incorporated a process for more thoroughly reviewing the supplemental labels and ensuring that they are complete, include accurate details, are consistent with EPA guidelines, and include instructions that are understandable to applicators. Further, MDA has established expiration dates for special local need registrations, which means that registrants must reapply to MDA if they wish to renew an expiring special local need registration.[26] MDA staff explained that MDA generally limits the registration's effective period to five years or less.[27]

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[25] Office of the Legislative Auditor, *Pesticide Regulation*, 29-30.

[26] As part of its implementation of expiration dates, MDA conducted a review of all existing special local need registrations in 2013 to determine whether a special local need still existed.

[27] In our review of special local need registration files, we found that this was generally true. In fact, 52 percent of special local need registrations we reviewed were effective for one year or less.

MDA also regularly makes changes to supplemental labels submitted as part of special local need registration applications. We reviewed files for all 21 special local need registrations that MDA approved since 2014. As part of our file review, we noted that MDA made changes to 13 supplemental labels—62 percent of the special local need registrations it approved. For ten of these labels, we considered the changes to be substantive, meaning the change was not simply correcting a typo or asking the registrant to add an expiration date to the label. This represents a departure from 2006, when OLA noted that MDA rarely made such changes. The box to the right provides an example of changes MDA made to a supplemental label.

Example: Corrections to a Special Local Need Pesticide Product Supplemental Label

One of the special local need registrations included in our file review allows pesticide applicators to use the pesticide product Dual Magnum Herbicide to control weeds during the production of carrots.

In its review of the initial supplemental label submitted with the registration application, MDA noted that language describing the growth stages at which the pesticide could be applied to carrots for postemergence application did not comply with EPA guidance; the registrant corrected the label accordingly.

While the Minnesota Department of Agriculture has improved its process for reviewing supplemental labels for special local need registrations since 2006, consistency issues remain.

Through our review of special local need registration files, we observed some consistency issues. In particular, we found that five labels for restricted-use pesticide products contained language stating that the products could be used only by "certified applicators *or persons under their direct supervision*." While this language is required by federal law for all standard labels for restricted-use products, state statutes require that restricted-use pesticides be applied only by licensed or certified pesticide applicators—it does not allow for people under the supervision of a licensed or certified applicator to use such pesticides.[28] For three of the five labels, MDA requested that the registrants add language stating that Minnesota law prohibits unlicensed and uncertified persons under the supervision of licensed or certified applicators from applying restricted-use pesticides. However, MDA did not require this change for the other two labels. We encourage MDA to continue to improve its process for reviewing supplemental labels.

Restricted-Use Pesticide Products

Restricted-use pesticide products are products that may be purchased and used only by individuals who are licensed or certified as "pesticide applicators." Pesticide products earn the restricted-use designation due to their toxicity.

[28] 40 *CFR*, sec. 156.10(j)(2)(i)(B); and *Minnesota Statutes* 2019, 18B.30(a).

The Five Determinations for Special Local Need Registrations

1. The pesticide's composition warrants the proposed claims for the pesticide.
2. The pesticide's label and other material required to be submitted comply with [federal and state law].
3. The pesticide will perform its intended function without unreasonable adverse effect on the environment.
4. The pesticide will not generally cause unreasonable adverse effects on the environment when used in accordance with label directions.
5. A special local need for the pesticide exists.

— *Minnesota Statutes* 2019, 18B.27, subd. 2(a)

Documentation

In reviewing applications for special local need registrations, Minnesota statutes require MDA to issue a registration if it can make all of five determinations, listed in the box at left.[29]

The Minnesota Department of Agriculture does not maintain adequate documentation to support its decisions to issue special local need registrations.

In the 21 special local need registration files we reviewed, we found MDA's documentation of its decisions to be lacking. The department often failed to retain documentation showing that it had made the five determinations required by law. Through our file review, we determined whether MDA had considered each of the five determinations. We found that seven files (33 percent) were missing evidence showing that MDA had considered all the determinations.[30] Exhibit 2.3 shows how frequently these files were missing evidence showing MDA's consideration of each of the determinations required by law.

Furthermore, even for files that contained evidence that MDA had *considered* a determination, it was often unclear what MDA's *decision* for the determination had been or what its reasoning was for making the determination. MDA staff told us that, while MDA does consider each of the determinations as part of its review of these applications, it does not always create a record documenting its decision for each determination. MDA staff said, for example, it might not create such a record if it feels that the determination has obviously been met. MDA staff further stated that MDA's approval of the special local need registration and notification to EPA of the registration serves as an indication of MDA's decision that the registration meets the requirements set by the determinations.

We noted some instances where it appeared that the file contained insufficient *evidence* to support a determination. For example, three special local need registrations that were issued for the same pesticide product for each year from 2017 to 2019 contained insufficient evidence that there was a special local need in Minnesota. This was despite the fact that two of the registrations contained evidence that MDA considered the determination. These files contained letters of support explaining the need for the special local need registration that were written only by the registrant. For most special

[29] *Minnesota Statutes* 2019, 18B.27, subd. 2(a).

[30] Not every determination is relevant to every special local need product registration application. For example, for the seven dicamba cases, the determination that the product's composition warrants claims made about the product were not applicable. This is because MDA's decision to issue these special local need registrations was based on an MDA decision that the product needed additional *restrictions*, rather than a request by the registrant to expand the use of a product. In such cases, we did not consider the aforementioned information to be missing.

Exhibit 2.3: Many special local need product registration files did not have evidence that the Minnesota Department of Agriculture considered one or more of the five determinations required by state statute.

Determination	Number of Files Missing Evidence	Percentage of Files Missing Evidence
Missing one or more of the five determinations	7	33%
The pesticide's label and other materials required to be submitted comply with [federal and state law].	6	29
The pesticide will perform its intended function without unreasonable adverse effect on the environment.	5	24
The pesticide will not generally cause unreasonable adverse effects on the environment when used in accordance with label directions.	5	24
The pesticide's composition warrants the proposed claims for the pesticide.	4	19
A special local need for the pesticide exists.	2	10

NOTE: We reviewed files for special local need registrations the Minnesota Department of Agriculture (MDA) issued between January 2014 and September 2019.

SOURCES: Office of the Legislative Auditor, analysis of the Minnesota Department of Agriculture's special local need product registration application files; and *Minnesota Statutes* 2019, 18B.27, subd. 2(a).

local need registrations, MDA receives letters of support in which an expert (such as professors who specialize in pest management) or an organization representing applicators' interests (such as a commodity group) explain why the product is necessary to combat a specific issue. It is problematic that the only evidence in the files of a special local need—the fifth determination—was coming from the registrant, which was a company located in a different state that stood to benefit financially from the special local need registration.

The lack of evidence supporting a special local need for the registrations of this pesticide product was particularly concerning for the third year (2019) we reviewed. This is because the application for that year included a request to extend use of the product to address a new pest not included in earlier special local need registrations for the product.[31]

We asked MDA to explain what evidence it used to determine whether there was a need to manage the new pest in Minnesota. MDA staff explained that they had determined there was a special local need because the newly added pest was "known" to be a hazard for the crop in question and the pesticide product was the only product available for managing the pest. However, MDA did not gather evidence demonstrating the need to control for this pest before issuing the registration.

[31] The files for the first two years (2017 and 2018) we reviewed included uses that had previously been approved by MDA through earlier special local need registrations. While the file for this third year did not include evidence supporting a determination that there was a *need* in Minnesota to control for the new pest, it did contain evidence showing that MDA had considered whether the product *was effective* for the new pest.

RECOMMENDATION

The Minnesota Department of Agriculture should better document its decisions when reviewing special local need registration applications.

Given that MDA is statutorily required to consider specific criteria and make five determinations before issuing special local need registrations, it should document how it makes these determinations. This documentation should make the department's determinations clear and describe the evidence it used to make each determination. Beyond protecting MDA in the event that its registration decisions are questioned, such a practice would provide transparency and continuity should a person who originally conducted a review leave MDA.

MDA could consider doing this by combining information from two types of documents we saw in some files. A few of the files we reviewed contained notes summarizing MDA's review of the application. While these provided some evidence that MDA considered the determinations, it was not always clear which notes were meant to apply to which determination or what MDA's decision was for the determination.

Other files contained documents with a list of the five determinations along with checkboxes indicating MDA's decision for each one. However, these checklists included little information demonstrating how or why MDA made its determinations. We suggest that MDA combine these two approaches into one document that includes a clear indication of the department's decision for each of the five determinations along with an explanation of the evidence it used to support that decision. Additionally, MDA should retain all documents—including final copies of forms and letters, and summaries of relevant communications—related to each special local need registration to support its decisions.


THE GREAT SEAL OF THE STATE OF MINNESOTA
L'ETOILE DU NORD
1858

Chapter 3: Pesticide Storage, Sales, Application, and Disposal

The Minnesota Department of Agriculture (MDA) performs a variety of functions related to issuing pesticide-related licenses and permits. These activities can be viewed in the context of the "life cycle" for a pesticide product, as illustrated by the diagram below.

MDA issues permits to facilities that store large quantities of pesticides, and it issues licenses to retailers who sell certain types of pesticide products. Additionally, pesticide applicators applying restricted-use pesticide products must obtain the appropriate applicator license or certification based on the types of pesticide applications they make. When a person or company has pesticides that they no longer wish to use, MDA is responsible for ensuring that they have access to a waste-pesticide disposal site. We discuss each of these activities further in this chapter.

Pesticide Storage

State laws require facilities that store large amounts of pesticides to obtain a bulk pesticide storage permit from MDA. Statutes require facilities to obtain a permit if they store *liquid* bulk pesticide products in containers of 500 gallons or more for more than ten consecutive days.[1] MDA's administrative rules require facilities to obtain a permit if they store a *dry* bulk pesticide in an amount of 100 or more pounds in an individual container.[2] MDA's Facility Management Unit is responsible for issuing permits to bulk pesticide storage facilities.

Minnesota had

324

active pesticide storage facility permits in 2018.

There were 324 active pesticide storage facility permits as of December 31, 2018. Unlike other licenses we discuss in this chapter, bulk pesticide storage permits do not expire. However, a facility must be repermitted each time it changes ownership or undergoes a "substantial alteration."[3] In 2018, MDA issued 35 permits to construct new pesticide storage facilities, transfer

[1] *Minnesota Statutes* 2019, 18B.14, subd. 2(a).

[2] *Minnesota Rules*, 1505.3010, subps. 3-4; 1505.3020, subp. 1; and 1505.3040, subp. 5, published electronically in 2017. Facilities that repackage pesticide products must apply to the U.S. Environmental Protection Agency (EPA) in order to obtain a permit for these activities. While MDA is not involved in issuing these permits, it does conduct inspections of these permits as part of a cooperative agreement with EPA.

[3] *Minnesota Statutes* 2019, 18B.14, subd. 2(a) and 2(d); and *Minnesota Rules*, 1505.3040, subps. 2 and 4, published electronically in 2019. *Minnesota Statutes* 2019, 18B.01, subd. 30a, defines substantial alteration as "(1) changing the capacity of a safeguard; (2) adding storage containers in excess of the capacity of a safeguard as required by rule; or (3) increasing the size of the single largest storage container in a safeguard as approved or permitted by [MDA]."

ownership of an existing facility, or substantially alter an existing facility.[4] MDA's goal is to inspect bulk storage facilities every five years.

Pesticide storage facilities must meet requirements for storing bulk pesticides, regardless of whether they are required to obtain a permit.

State statutes require facilities that store "bulk" pesticides—defined as pesticides stored in an individual container in amounts of 56 or more gallons or 100 or more pounds—to meet certain requirements, as defined in rule.[5] This requirement applies to facilities that are not required to have a permit, such as facilities that store pesticides in containers of 56 gallons or more but less than 500 gallons and farmers who store bulk pesticides for their own use. The box to the right provides an example of some of these requirements.[6] Examples of facilities that may store bulk pesticides include companies that produce pesticide products and retailers who sell pesticide products.

Example: Pesticide Storage Facility Requirements

Liquid pesticide storage containers must be stored in a secondary containment area—commonly referred to as a dike—to contain pesticides should the contents of the storage container be emptied. These secondary containment areas must have a minimum capacity of 110 percent of the largest pesticide container (if located inside) or 125 percent of the largest container (if outside). They must also have liquid-tight construction and must not contain an unplugged drain or underground plumbing in their floors.

Pesticide Sales

MDA is responsible for licensing pesticide dealers—which are retailers that sell certain pesticides. It is also responsible for collecting pesticide sales data for agricultural and nonagricultural pesticides. We discuss each of these responsibilities below.

Pesticide Dealers

Retailers who sell pesticides must have an MDA-issued pesticide dealer license to sell bulk pesticides, restricted-use pesticides, or agricultural pesticides to end users.[7] Dealer

[4] The Facility Management Unit that oversees pesticide storage facility permits also issues fertilizer permits. In 2018, it issued a total of 49 permits, including 10 pesticide-only permits, 14 fertilizer-only permits, and 25 permits for both pesticides and fertilizer.

[5] *Minnesota Statutes* 2019, 18B.01, subd. 4; and 18B.14, subd. 2(c).

[6] *Minnesota Rules*, 1505.3080, published electronically in 2017.

[7] *Minnesota Statutes* 2019, 18B.31, subd. 1(a); and 18B.316, subd. 1(a). Bulk pesticides are pesticides held in an individual container in amounts of 56 or more gallons or 100 or more pounds. Restricted-use pesticides are pesticides that can be purchased and used only by licensed or certified pesticide applicators. EPA classifies pesticides as restricted-use pesticides due to their toxicity. Agricultural pesticides are pesticides EPA has identified as being intended for agricultural use. Such products have specific information on their product labels indicating that they can only be used in accordance with agricultural worker protection requirements established by EPA.

licenses expire annually on January 31. MDA's Licensing and Certification Unit is responsible for issuing licenses to pesticide dealers.

The Minnesota Department of Agriculture issued 790 pesticide dealer licenses for 2018.

Of the pesticide dealer licenses that MDA issued for February 1, 2018, to January 31, 2019, 48 (6 percent) were new licenses while 742 (94 percent) were renewals of an existing license.[8] The box to the right shows the types of pesticides that dealers reported selling.[9] Dealers can sell multiple types of pesticide products.

Types of pesticides sold by licensed pesticide dealers, 2018

Type	Dealers N	Dealers %
Agricultural pesticides	770	97%
Restricted-use pesticides	701	89
Bulk pesticides	598	76

NOTE: Numbers and percentages are approximate.

Pesticide dealers must also comply with various requirements. For example, pesticide dealers may sell restricted-use pesticide products only to licensed or certified pesticide applicators. Pesticide dealers must also maintain records of all restricted-use pesticide sales and all agricultural pesticide sales.[10] MDA staff explained that MDA's Inspection Unit ensures that pesticide dealers meet these requirements by reviewing restricted-use pesticide sales records. MDA inspectors also may follow up with pesticide applicators who purchased restricted-use pesticides to make sure that the person who actually applied the pesticides had the required license or certification.

Pesticide Sales Data

MDA collects annual sales data from pesticide dealers and pesticide registrants.[11] We analyzed these data for 2010 through 2017, as shown in Exhibit 3.1.[12] In 2017, there were 697 pesticide *active ingredients* sold as part of 5,721 different *pesticide*

Pesticide sales reporting responsibility

Pesticide dealers annually report sales of agricultural pesticide products.

Pesticide registrants annually report sales of nonagricultural pesticide products.

[8] Analysis based on data from MDA's Licensing Information System. These numbers do not include licenses that were issued for the February 1, 2018, to January 31, 2019, licensing year, but were never active during this time period.

[9] These numbers are approximate because they represent the types of pesticide products a pesticide dealer reported selling at the time MDA provided us with data; it is possible that they reflect changes in the reported category that occurred between 2018 and June of 2019.

[10] *Minnesota Statutes* 2019, 18B.316, subd. 5; and 18B.37, subd. 1.

[11] As discussed in Chapter 2, a pesticide registrant is a pesticide producer that registers one or more pesticide products for use in the state of Minnesota.

[12] MDA's pesticide sales data have limitations that may impact the accuracy of our analysis. For example, MDA does not always receive sales reports for nonagricultural pesticide products. This means that MDA's data and our analysis may underreport total sales of pesticide products, types of pesticide products, or pesticide active ingredients.

products.[13] About 5 percent of these products were classified as restricted-use products, while the remaining 95 percent were classified as general-use products. Agricultural products made up about 37 percent of all products sold. In total, about 337 million pounds of pesticide products were sold in 2017.

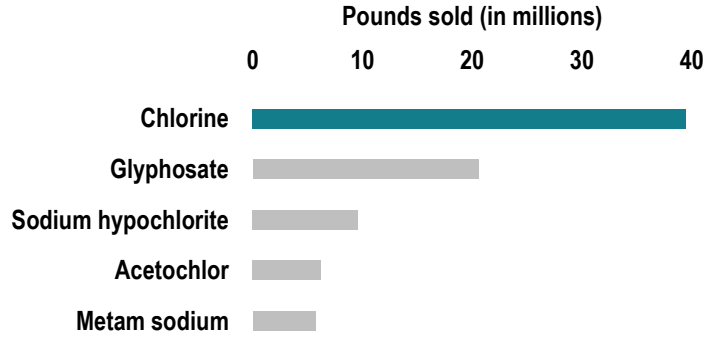
Exhibit 3.1: The percentage of all pesticide products sold from 2010 through 2017 that were classified as restricted-use has remained relatively constant.

Type of Sales	2010	2011	2012	2013	2014	2015	2016	2017
Number of pesticide active ingredients sold	673	672	685	691	669	715	715	697
Pesticide products sold								
Number	5,992	6,138	6,311	6,299	5,884	6,217	6,244	5,721
General-use share	95%	95%	95%	95%	95%	95%	95%	95%
Restricted-use share	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**
Agricultural share	31%	31%	31%	31%	32%	33%	34%	37%
Nonagricultural share	69%	69%	69%	69%	68%	67%	66%	63%
Total pounds of pesticide products sold (in millions)	318	307	376	353	361	380	347	337

NOTES: MDA's pesticide sales data have limitations that may impact the accuracy of our analysis. For example, MDA does not always receive sales reports for nonagricultural pesticide products. This means that MDA's data and our analysis may underreport total sales of pesticide products, types of pesticide products, or pesticide active ingredients.

SOURCE: Office of the Legislative Auditor, analysis of pesticide sales data from the Minnesota Department of Agriculture's Licensing Information System database.

In 2017, chlorine was the most-sold pesticide active ingredient in terms of pounds sold.



We also analyzed the amounts of individual pesticide active ingredients sold in Minnesota in 2017. As shown in the box at left, Minnesota consumers purchased 39.5 million pounds of chlorine in 2017, making it the most sold active ingredient. Chlorine is a disinfectant and algaecide used in commercial swimming pools, industrial applications, municipal water supplies, and sewage and waste management.

[13] These numbers do not include seeds treated with pesticides—such as neonicotinoids—since EPA has determined such seeds are "treated articles" and not pesticide products. However, it does include pesticide products sold in the state for use in producing treated seeds. Since seeds might be treated in another state and sold in Minnesota—or vice versa—the amount of pesticides sold in Minnesota to treat seeds may not correspond with the amount of treated seeds used in Minnesota.

Nonagricultural Pesticide Sales

Minnesota statutes require MDA to "monitor urban and rural pesticide use on a biennial basis."[14]

The Minnesota Department of Agriculture has satisfied the 2006 recommendation to monitor nonagricultural pesticide use through its pesticide sales database.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA develop and implement a consistent approach to monitoring nonagricultural pesticide use to comply with state statutes.

RECOMMENDATION FULLY IMPLEMENTED

MDA monitors nonagricultural pesticide use.

In response to a recommendation made by the Office of the Legislative Auditor in 2006, MDA evaluated eight different approaches for monitoring nonagricultural pesticide use.[15] Based on that assessment, MDA updated its pesticide product registration database to allow it to track sales of nonagricultural pesticide products and pesticide active ingredients.[16]

Using this information, MDA has released annual sales reports, which it has generally made available to the public on its website.[17] These sales reports present the pounds sold for each of the top 50 pesticide active ingredients used in nonagricultural pesticide products. MDA reported that chlorine was the most sold nonagricultural pesticide product in 2017, given that its sales were predominately for nonagricultural uses.

MDA's nonagricultural sales reports also present the total pounds of nonagricultural pesticide product sold by 11 different categories. For example, MDA reported that in 2017 the most-sold category of nonagricultural products in terms of pounds of product sold was "disinfectants and sanitizers," of which about 27.5 million pounds were sold. Exhibit 3.2 shows sales for each of the 11 different categories, as reported by MDA.[18]

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[14] *Minnesota Statutes* 2019, 18B.064. While statutes refer to "urban" and "rural" pesticide use, we use the terms "nonagricultural" and "agricultural" in this report when referring to monitoring use of pesticide products. This is because all pesticide products are classified as either agricultural or nonagricultural; products are not categorized by whether they are for urban or rural use. The classification of whether a pesticide is "agricultural" or "nonagricultural" is assigned to specific *pesticide products* based on their intended use. Some pesticide active ingredients—such as glyphosate and "2,4-D"—are used in both agricultural and nonagricultural products, and would thus appear on both lists.

[15] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006), 77. Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *An Assessment of Methods for Monitoring Urban Pesticide Use in Minnesota* (St. Paul, 2007).

[16] Using nonagricultural pesticide *sales* as a proxy for nonagricultural pesticide *use* is imperfect. MDA acknowledges that not all pesticides sold in Minnesota will be used during the same year they were sold, and some may never be used in Minnesota. Additionally, products purchased elsewhere may be used in Minnesota. Despite these limitations, monitoring nonagricultural pesticide sales has advantages over other approaches MDA considered. MDA determined that the approach is relatively consistent over time and requires relatively few resources now that MDA's Licensing Information System database has been restructured.

[17] Prior to OLA's February 2019 inquiries about this statutory requirement, the most recent nonagricultural pesticide sales report MDA had posted on its website was for 2009. As of February 14, 2019, annual sales reports and data were available for 2006 through 2017.

[18] Minnesota Department of Agriculture, *Non-Agricultural Pesticide Sales 2017*, (St. Paul).

Exhibit 3.2: "Disinfectants and sanitizers" were the most-sold type of nonagricultural pesticide product in 2017.

Nonagricultural Pesticide Product Type	Pounds Sold	Definition of Pesticide Type
Disinfectants and sanitizers	27,532,611	All professional and homeowner use of disinfectant and sanitizer products
Miscellaneous	20,296,051	Products that do not fit into any other category: Examples include aquatic-use products, professional mosquito control products, anti-fouling paints applied to boats, and certain antimicrobial products used in industrial settings; examples of antimicrobial uses include water treatment in sewage and wastewater systems, pulp and paper mill systems, and commercial and industrial water cooling systems
Wood preservatives	4,006,426	Products that protect wood from decay by fungus and insects
Turf and ornamental	759,802	Professional-use turf and ornamental products and products used on golf courses
Pool, spa, and hot tub	690,320	Products used in swimming pools, spas, and hot tubs (except disinfectants and sanitizers)
Industrial, right-of-way, and forestry	306,479	Products used in industrial areas, products used along highways and power line rights-of-way, and products used as part of forest management
Garden and lawn	290,576	Products generally used by homeowners on lawns and gardens
Structural	52,462	Products used in and around structures by professional applicators, such as exterminators
Home	43,727	Products used in the home by homeowners, including mosquito repellants
Animal care	30,189	Products used for the care of livestock and household pets
Vertebrate control	30,117	Products include avicides, rodenticides, piscicides, and animal repellents

SOURCE: Minnesota Department of Agriculture, *Non-Agricultural Pesticide Sales 2017* (St. Paul).

Pesticide Applicators

MDA is responsible for enforcing regulations governing how pesticides may be applied and who may apply them. These responsibilities include licensing and certifying pesticide applicators based on the types of pesticide applications they make. It also includes educating pesticide applicators. Additionally, MDA is responsible for ensuring that pesticide-related educational opportunities are provided to employees in certain settings. We discuss these responsibilities in more detail below.

Applicator Licensing and Certification

In order to purchase and use restricted-use pesticide products, pesticide applicators must obtain the appropriate license or certification depending on the type of pesticide application they intend to make.[19] Exhibit 3.3 shows the four types of pesticide applicator licenses and certification available to applicators, along with the number of each type of license or certification MDA issued in 2018.

Pesticide Application

When someone uses a pesticide product, they are said to "apply" that pesticide or to be making a "pesticide application."

"Pesticide applicators" are people who are licensed or certified by the state to apply restricted-use pesticide products.

Exhibit 3.3: In Minnesota, there are four types of licensed or certified pesticide applicators.

Type	Number in Effect in 2018	Description	Certification Requirements
Commercial applicator license	8,850	Allows a person to apply pesticides "for hire"; applicators can become certified in one or more license categories, such as field crop pest management, aerial application, turf and ornamentals, seed treatment, and mosquito control, among others	• Proof of financial responsibility • $50 application fee • Initial: closed-book exam • Annual renewal: exam, workshop attendance, or other requirements
Noncommercial applicator license	3,395	Allows a person to apply pesticides as part of their job or on land owned or managed by their employer; applicators can be certified in most of the same categories as commercial applicators; example: Minnesota Department of Transportation staff certified as noncommercial applicators apply pesticides as part of the state's roadside management efforts	• $50 application fee ($10 for qualifying government employees) • Initial: closed-book exam • Annual renewal: exam, workshop attendance, or other requirements
Structural pest control license	1,358	Allows a person to apply pesticides on or in structures; example: exterminators are certified structural applicators who treat homes and businesses for termites and other pests	• Proof of financial responsibility • $50 application fee • Initial: closed-book exam • Annual renewal: exam, workshop attendance, or other requirements
Private applicator certification	16,657[a]	Allows a person to apply pesticides to lands or sites that they own, rent, or manage for the production of an agricultural commodity; example: farmers and their families who are certified as private applicators can apply pesticides on their own crops	• $10 application fee • Minimum of three hours of training • Open-book examination • Renewal every three years

[a] Private pesticide applicator certifications expire on March 1 of the third year after they were initially issued; this is the number of private applicator certifications in effect between March 1, 2018, and February 28, 2019.

SOURCES: Office of the Legislative Auditor, analysis of applicator license and certification data from the Minnesota Department of Agriculture's Licensing Information System database and its private applicator database; and *Minnesota Statutes* 2019, 18B.32, 18B.33, 18B.34, and 18B.36.

[19] *Minnesota Statutes* 2019, 18B.30(a); 18B.32, subd. 1(b); 18B.33, subd. 1(b); 18B.34, subd. 1(a); and 18B.36, subd. 1(a).

Applicator Licenses

A person must apply to MDA to obtain a commercial, noncommercial, or structural applicator license. As part of the initial application, a person must complete an application form, pay a fee, and pass an examination or equivalent measure.[20] The content of the examination depends on how the pesticide applicator intends to use pesticides—which is covered by different license *categories* within each license *type*. For example, the examination is different for commercial applicators who intend to use airplanes to apply pesticides than it is for commercial applicators who plan to use aquatic pesticides. The Licensing and Certification Unit is responsible for issuing licenses to commercial, noncommercial, and structural pesticide applicators.[21]

Applicator licenses expire on December 31 each year.[22] In order to *renew* a commercial or noncommercial license, applicators must complete an application form and pay a fee. In addition, state statutes say that,

> a person must apply to the commissioner to renew a noncommercial applicator license. The commissioner may renew a license subject to reexamination, attendance at workshops approved by the commissioner, or other requirements imposed by the commissioner to provide the applicator with information regarding changing technology and to help assure a continuing level of competence and ability to use pesticides safely and properly.[23]

The Minnesota Department of Agriculture does not require annual training or reexamination as a condition of license renewal for certain commercial and noncommercial applicators.

MDA requires all commercial and noncommercial pesticide applicators to attend a workshop or retake the examination as part of the renewal process for their second year of licensure. However, after this, the frequency with which applicators must attend a workshop or retake the examination may be less than once per year, depending on the category of license they wish to renew.

Some categories—including the "structural" category for noncommercial applicators and the "general aerial" category—require that the applicator attend a workshop or retake the examination every year. All other categories, however—such as the "aquatic" category and the "vertebrate pest control" category—require applicators to retake the examination or attend a workshop every two or three years. Exhibit 3.4 shows how frequently MDA requires workshop attendance or reexamination for each of the categories.

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[20] *Minnesota Statutes* 2019, 18B.32, subds. 3 and 6; 18B.33, subds. 4 and 7; and 18B.34, subds. 4-5.

[21] MDA also issues licenses to structural pesticide applicator *companies* that employ licensed structural pesticide applicators. We did not review the department's process for issuing these licenses.

[22] *Minnesota Statutes* 2019, 18B.32, subds. 2(a)(1); 18B.33, subd. 3(1); and 18B.34, subd. 2(1).

[23] *Minnesota Statutes* 2019, 18B.34, subd. 4(a). *Minnesota Statutes* 2019, 18B.32, subd. 4(a); and 18B.33, subd. 5(a), establish similar (though differently worded) requirements for structural and commercial applicators.

Exhibit 3.4: The Minnesota Department of Agriculture does not require commercial and noncommercial pesticide applicators to annually attend a workshop or pass an examination, as required by statutes.

Category	MDA-Required Workshop or Retest Frequency[a]	Approximate Number of 2018 Licenses with this Category[b]	Category Description
Core	N/A[c]	12,245	Basic principles of pesticide regulation and application; required for all licensed applicators
General aerial	1 year	367	Pesticide application with an aircraft
Structural[d]	1 year	10	Using pesticides on, in, under, or around structures
Agricultural pest control	2 years	23	Applying pesticides to farm buildings and farm animals
Anti-microbial	2 years	32	Applying pesticides to HVAC ventilation systems or cooling towers; using pesticides for indoor mold mitigation and remediation
Aquatic	2 years	411	Applying pesticides to surface water or other areas where water is present to control aquatic organisms or plants
Food processing[d]	2 years	13	Applying pesticides to food processing areas
Mosquito and black fly control	2 years	1,192	Using pesticides for mosquito and black fly control
National areas, forestry and right-of-way	2 years	2,319	Applying pesticides to forested areas, rights-of-way (such as roads and utilities), and natural areas (such as buckthorn removal)
Sewer root control	2 years	8	Using pesticides for root control in sewer lines
Soil	2 years	39	Applying pesticides to soil
Stored grain and fumigation	2 years	108	Applying fumigants and other pesticides to stored grain, processed grain, other commodities, and facilities
Turf and ornamental	2 years	5,310	Applying pesticides to nonagricultural areas or for ornamental production; includes applications to lawns, parks, athletic fields, golf courses, nurseries, greenhouses
Vertebrate pest control	2 years	789	Using pesticides for vertebrate pest control, including as repellents
Wood preservative	2 years	40	Applying chemical wood preservatives to lumber, such as utility poles, fence posts, structural lumber, and railroad ties
Field crop pest management	3 years	3,698	Applying pesticides to agricultural crops
Seed treatment	3 years	875	Applying insecticides and fungicides to seed

[a] MDA requires all pesticide applicators to attend a workshop or retake the examination to renew their license for their second year of licensure; the frequencies presented in this table represent MDA's requirements to renew licenses after the second year. The required workshop or examination frequencies for some categories do not comply with state statutes, which require annual examination or workshop attendance. *Minnesota Statutes* 2019, 18B.33, subds. 3(1) and 5; and 18B.34, subds. 2(1) and 4.

[b] A person must hold a license with more than one category, meaning that the sum of this column is greater than the total number of licenses issued. These numbers are approximate because they represent the categories in which a licensee was certified at the time MDA provided us with data; it is possible that they reflect category changes that occurred between 2018 and June of 2019.

[c] Applicators meet the workshop or retesting requirement by attending a workshop for any other category.

[d] These categories are only for noncommercial applicators, who cannot perform these applications for hire.

SOURCE: Office of the Legislative Auditor, analysis of Minnesota Department of Agriculture's Licensing Information System database.

Because applicator licenses expire on December 31 each year, applicators must renew their licenses annually. However, MDA does not require commercial or noncommercial applicators to attend a workshop or retake an examination on an annual basis. Statutes do allow MDA to renew licenses on the basis of applicants meeting "other requirements," but MDA staff told us that the department does not impose additional requirements beyond workshop attendance or reexamination. Staff explained that MDA's interpretation is that "other requirements" could mean "no requirements." While this may be a technically correct interpretation of the law, we think it could lead to ineffective oversight of licensed applicators.

RECOMMENDATION

The Minnesota Department of Agriculture should impose more robust annual requirements for license renewal for commercial and noncommercial applicators.

MDA staff told us that the technology, laws, and policies related to pesticide application do not change every year. As a result, they said that annual renewal reexaminations or workshops are not practical. If MDA is unable or unwilling to require reexamination or workshop attendance for every licensed applicator on an annual basis, it should consider exercising its discretion to establish "other requirements" that would require fewer resources, while still providing some ongoing education for applicators. MDA could, for example, assemble an annual update on relevant changes to pesticide application technology and require applicators to review the update before submitting their license renewal application.

MDA could also work with the Legislature to clarify the law and establish a clear set of annual renewal requirements that are both feasible and accomplish the goal of ensuring that pesticide applicators keep up-to-date with pesticide-related technology and regulations.

The Minnesota Department of Agriculture has not ensured that applicators have "proof of financial responsibility" prior to licensing structural pest control and commercial applicators, as required by law.

Minnesota statutes state that structural and commercial applicator licenses "may not be issued unless the applicant furnishes proof of financial responsibility."[24] Statutes further state that documentation may take the form of "(1) proof of net assets equal to or greater than $50,000 or (2) a performance bond or insurance of a kind and in an amount determined by the commissioner."[25] However, MDA does not collect proof of financial responsibility from applicants before issuing either commercial or structural applicator licenses. Instead, it requires applicants to self-report on the application form how they meet the statutory requirement (through liability insurance, a net asset statement, or a performance or surety bond). MDA randomly selects a sample of commercial and structural applicators for annual audits in which it requires applicators to provide proof of financial responsibility. However, this does not meet the statutory requirements

[24] *Minnesota Statutes* 2019, 18B.32, subd. 5; and 18B.33, subd. 6.

[25] *Minnesota Statutes* 2019, 18B.32, subd. 5; and 18B.34, subd. 6.

because (1) the proof provided as part of these audits is provided *after* the license has already been issued, and (2) not all commercial and structural applicator license holders participate in these audits.

MDA staff told us that MDA does not keep a record of the exact number of audits it conducts of commercial and structural pesticide applicators each year. They explained that they use MDA's Licensing Information System to randomly select 400 applicators—which includes animal waste technicians in addition to commercial and structural pesticide applicators.[26] We asked MDA how many applicators were unable to furnish sufficient proof of financial responsibility in recent years. MDA explained that it did not record this number for 2014 to 2017, but that there were two such commercial applicators in 2018 and no such applicators in 2019.

RECOMMENDATION

The Minnesota Department of Agriculture should collect—and verify the adequacy of—documentation of financial responsibility prior to issuing a license to a commercial or structural pesticide applicator.

As noted above, MDA's audit process indicates that during the last two years, few structural and commercial applicators have failed to maintain the required financial responsibility required of these licenses. However, by not requiring all such applicators to provide proof of their financial responsibility prior to issuing these licenses, MDA is not complying with state statutes. Additionally, those few applicators who cannot demonstrate financial responsibility put themselves and the people for whom they work at risk. Proof of financial responsibility is meant to cover instances where pesticide applications have negative results, such as causing property damage or harm to a person. Failure to meet financial responsibility requirements could mean the applicator is unable to cover the costs of correcting any negative outcomes associated with a pesticide application.

Private Applicator Certification

In contrast with the commercial, noncommercial, and structural applicators discussed in the previous section, private pesticide applicators are typically farmers applying restricted-use pesticides to their own land.[27] In addition to requiring an examination, Minnesota statutes require that "the commissioner shall prescribe certification requirements and provide training that meets or exceeds United States Environmental Protection Agency standards to certify private applicators…."[28] MDA's administrative rules state that a private applicator is considered certified if he or she completes a state-approved certification program, consisting of either "[1] a home study course; [2] a

[26] Animal waste technicians are not pesticide applicators; they are licensed applicators who manage or apply manure for hire. This means that not all of the 400 applicators MDA audits are pesticide applicators.

[27] Private applicator certification allows an applicator to apply restricted-use pesticides "(1) as a traditional exchange of services without financial compensation; (2) on a site owned, rented, or managed by the person or the person's employees; or (3) when the private applicator is one of two or fewer employees and the owner or operator is a certified private applicator or licensed as a noncommercial applicator." *Minnesota Statutes* 2019, 18B.36, subd. 1(a).

[28] *Minnesota Statutes* 2019, 18B.36, subd. 2(b).

pesticide training session; [3] a personal interview by the commissioner; or [4] a written or oral exam."[29] In order to obtain private pesticide applicator certification, MDA requires an individual to submit an application form to the University of Minnesota Extension, pass an open-book examination, and pay a certification fee.

Statutes governing private applicator certification do not explicitly address the *renewal* of private pesticide applicator certification.[30] In compliance with the aforementioned administrative rules, and in the absence of statutes addressing renewal, MDA requires private pesticide applicators to either attend a recertification workshop or retake the private applicator examination, which both have a fee of $75. Private pesticide applicators must satisfy this requirement every three years to maintain their certification.

Pesticide Applicator Education

MDA is responsible for pesticide applicator training manuals, examinations, and workshops. Minnesota statutes require MDA to oversee the development of training manuals and examinations.[31] Additionally, statutes require MDA to "develop, implement or approve, and evaluate…innovative educational and training programs addressing pesticide concerns" in consultation with educational institutions, including the University of Minnesota Extension and the Minnesota State Colleges and Universities system.[32] These programs must cover a variety of topics, such as water-quality protection, endangered species protection, worker protection, applicator safety, pesticide disposal, and pesticide drift.

MDA hires other entities (typically the University of Minnesota) to develop pesticide applicator training *manuals*. MDA writes the specific questions that appear on the various pesticide applicator *examinations*. MDA and experts from the University of Minnesota evaluate the examinations for quality and accuracy.

MDA staff explained that the department approves, but does not create, the content of pesticide applicator license *workshops* offered to pesticide applicators for license renewal. These workshops are developed by other organizations, such as the University of Minnesota or organizations representing different industries that use pesticides, such as nurseries, landscapers, or aerial applicators. MDA staff attend each workshop to provide information on Minnesota's pesticide applicator license requirements. They also check pesticide applicator attendance and ensure that applicators stay for the full duration of the workshop.

In a recent review of MDA's pesticide-related activities, EPA described the department's pesticide applicator licensing, certification, and training program as "robust." It commended the department for ensuring that applicators take examinations in both general pesticide application and specific application categories. It also commented that

[29] *Minnesota Rules*, 1505.0980, subp. 1, published electronically September 17, 2013.

[30] *Minnesota Statutes* 2019, 18B.36.

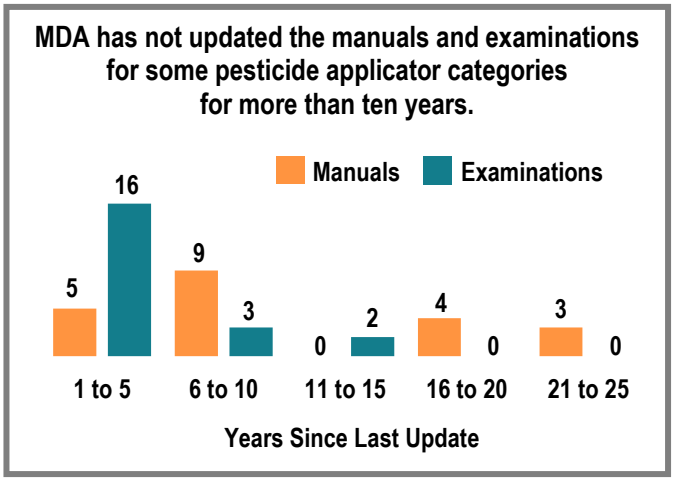
[31] *Minnesota Statutes* 2019, 18B.305, subd. 2.

[32] *Minnesota Statutes* 2019, 18B.305, subd. 1.

MDA's recertification workshops were an "effective" way of providing applicators with up-to-date information and to enhance compliance with federal and state law.[33]

Regardless of who actually creates these educational materials, MDA is responsible for their content and making sure they are up-to-date. State statutes require MDA to "continuously revise and update pesticide applicator training manuals and examinations."[34]

The Minnesota Department of Agriculture does not adequately document its process for ensuring that pesticide applicator training manuals and examinations are up-to-date.



The pesticide training manuals for seven of the pesticide applicator categories have not been updated in more than fifteen years.[35] Similarly, according to MDA, two of the pesticide applicator examinations were last updated more than ten years ago (in 2007), as shown in the box to the left.

When we discussed this finding with MDA, staff explained that while some manuals and examinations may not have been *updated* recently, MDA staff regularly *review* manuals and examinations to make sure the information they contain is still accurate and relevant. They explained that for some pesticide applicator categories—such as the "sewer root control" category—the relevant pesticide products and pesticide application techniques have not changed recently, meaning the manual and examination do not need to be updated. We were unable to confirm whether these manuals or examinations are up-to-date because there was no indication of when they were last reviewed. We were also unable to confirm whether MDA's efforts to review pesticide manuals and examinations are adequate as MDA has not maintained documentation of these reviews.

RECOMMENDATION

The Minnesota Department of Agriculture should ensure that pesticide applicator training manuals and examinations are current and document its efforts to keep them up-to-date.

[33] Tinka G. Hyde, Division Director, Land and Chemicals Division, U.S. Environmental Protection Agency, letter to Josh Stamper, Director, Pesticide and Fertilizer Management Division, Minnesota Department of Agriculture, *Fiscal Year 2018 Federal Insecticide, Fungicide, and Rodenticide Act Performance Partnership Grant No. BG537218 – Year-end report.*

[34] *Minnesota Statutes* 2019, 18B.305, subd. 2.

[35] MDA staff explained that—at the time of publication—it was in the process of updating manuals for three of the categories with manuals that have gone more than 15 years without revision.

While it is unclear exactly what the statute means when it requires MDA to "*continually* revise and update" training manuals and examinations, part of that process should include regularly reviewing manuals to identify any changes that need to be made.[36] MDA should ensure its pesticide applicator training manuals and examinations are up-to-date. It should also document its process for reviewing these manuals and examinations in order to demonstrate its efforts to meet the requirement to "continually revise and update" training manuals and examinations.

Railroad Employee Training

MDA has additional educational responsibilities beyond those for licensed and certified pesticide applicators. These responsibilities related to pesticide training for certain railroad workers. Minnesota statutes require that MDA provide "annual pesticide safety outreach opportunities" for railroad employees "in coordination with common carrier railroad companies operating in the state."[37] Statutes also require that common carrier railroad companies provide annual pesticide safety training to employees.[38]

The Minnesota Department of Agriculture has not met statutory requirements related to providing training and pesticide safety outreach opportunities to railroad employees.

MDA staff reported that MDA had not coordinated with common carrier railroads to provide pesticide safety outreach opportunities, as required by law. MDA staff said that it is unclear to them exactly what type of pesticide safety outreach opportunities statutes require MDA to coordinate. Staff further explained that, over the past year, they have communicated with railroad companies and employee unions to better understand what assistance MDA might provide to the railroads, but it remains unclear what annual pesticide safety outreach opportunities might be helpful. MDA staff also indicated that MDA does not have a process for ensuring that railroad companies provide annual pesticide safety training to railroad employees, as required by law.

RECOMMENDATION

The Legislature should either define "pesticide safety outreach opportunities" for railroad employees, or remove the requirement from statute.

We agree that statutes are unclear about what is meant by "pesticide safety outreach opportunities." For example, it is unclear whether these opportunities are meant to be different from the annual pesticide training that railroad companies are required to provide to employees.[39]

In order to allow MDA to better fulfill its statutory responsibilities, the Legislature should clarify what it means by "pesticide safety outreach opportunities." If these

[36] *Minnesota Statutes* 2019, 18B.305, subd. 2.

[37] *Minnesota Statutes* 2019, 18B.346, subd. 2(a).

[38] *Ibid*., subd. 2(b).

[39] *Ibid*., subd. 2.

opportunities are meant to be the same as the required annual training, the Legislature should amend *Minnesota Statutes* 2019, 18B.346, subd. 2, to specify that MDA must collaborate with railroad carriers to provide annual training. If the Legislature intended "pesticide safety outreach activities" to have another meaning, it should clarify that meaning in statute. Alternatively, the Legislature could consider amending statutes to relieve MDA of specific responsibilities related to railroad workers.

RECOMMENDATION

The Minnesota Department of Agriculture should ensure that common carrier railroad companies provide annual pesticide safety training to employees, as required by statute.

As the lead agency responsible for Minnesota's pesticide regulations, it is MDA's responsibility to enforce all pesticide regulations, including the requirement that common carrier railroads provide annual safety training. If MDA continues to have railroad-related pesticide responsibilities in statute, the department should renew its efforts to ensure that railroads are providing adequate training for their employees.

Waste-Pesticide Disposal

When consumers find themselves with leftover pesticide products, they must dispose of them according to label directions in order to protect the environment and human health.

In 2006, OLA reported that one-third of Minnesota's counties had declined to participate in MDA's waste-pesticide disposal program and were not providing their residents with a suitable location to dispose of agricultural waste pesticides.[40] Since that time, MDA entered into cooperative agreements with counties or regional government programs to provide disposal opportunities for nonagricultural pesticides, agricultural pesticides, or both. As a result of these efforts, *all* 87 Minnesota counties now provide collection of *nonagricultural* pesticides for residents (either directly or through a regional organization of counties). An EPA staff person we spoke with characterized MDA's waste-pesticide disposal program as "very strong," and said that MDA goes beyond what other states do.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA ensure that waste-pesticide disposal options exist in areas of the state that previously lacked them.

RECOMMENDATION FULLY IMPLEMENTED

MDA has ensured that waste-pesticide disposal options are available statewide.

Seventy-four counties are covered by a cooperative agreement for local collection of *agricultural* pesticides. These counties may serve their residents through either a permanent waste-collection center that is open regularly throughout the year, or a series of one-day drop-off events. In either case, the county or group of counties provides the space and staff to accept the pesticides from residents.

[40] Office of the Legislative Auditor, *Pesticide Regulation*, 68.

The Minnesota Department of Agriculture provides agricultural waste-pesticide disposal locations in regions of the state that have not contracted to provide collection locally.

Minnesota statutes require that MDA either contract with a county or a group of counties for nonagricultural and agricultural waste-pesticide disposal, or "designate a place that is available at least every other year" for people to dispose of their waste pesticides.[41] As such, MDA must provide agricultural waste-pesticide collection opportunities that are accessible to residents of the 13 counties that are not covered by cooperative agreements to locally provide agricultural pesticide collection.[42] To satisfy this requirement, MDA held a series of five collection events in 2016 and six events in 2018, with most taking place in northwestern Minnesota, as shown in Exhibit 3.5.

When we reviewed the locations of the events, we were initially concerned that none of the events were particularly near Cass County. Similarly, residents in parts of Lake of the Woods and Beltrami counties may have to travel a considerable distance to access an event. However, in choosing its locations, MDA satisfied the statutory requirement that it consult with "the person responsible for solid waste management and disposal in each county not under contract to determine an appropriate location."[43] The department requested comments from each county's solid waste department on the locations of its proposed events, and none expressed concerns.[44]

While some counties have not had their own MDA-hosted waste-pesticide collection event, residents throughout the region may participate in any MDA-hosted event. MDA advertises the events by sending direct mailings to all licensed and certified applicators in each of the counties in the region. MDA also publicizes the events by putting out news releases which are picked up by local media outlets throughout the region.

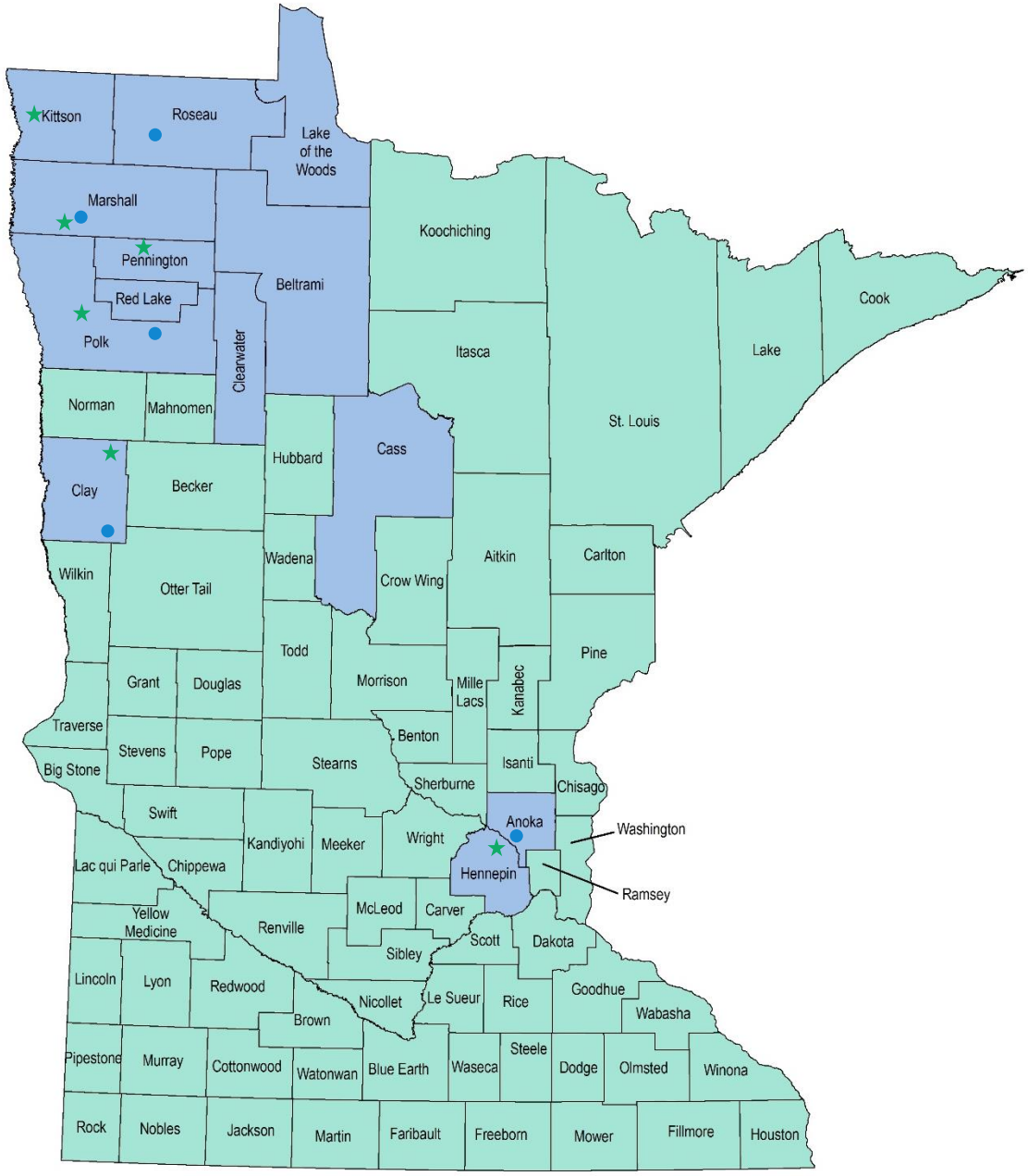
[41] *Minnesota Statutes* 2019, 18B.065, subds. 2a(a) and 2(b). The language allowing MDA to contract with a group of counties replaced an explicit requirement that MDA provide a place for waste-pesticide collection in *each county* of the state. *Laws of Minnesota* 2015, chapter 44, sec. 4.

[42] *Minnesota Statutes* 2019, 18B.065, subd. 2a(a).

[43] *Ibid.*

[44] Cass County has a very low rate of agricultural land usage (less than 3 percent). Similarly, Lake of the Woods and Beltrami counties have rates of agricultural land usage of 7 percent or lower. MDA staff suggested that local representatives in these areas may not have sought a collection event due to the low agricultural land usage. MDA's past collection events in all three counties had low participation.

Exhibit 3.5: The Minnesota Department of Agriculture has designated waste-pesticide collection sites across the state.



- Counties that provide local disposal of both agricultural and nonagricultural pesticides
- Counties that provide local disposal only of nonagricultural pesticides
- Approximate location of 2016 MDA-hosted waste-pesticide disposal event
- ★ Approximate location of 2018 MDA-hosted waste-pesticide disposal event

NOTES: "MDA" is the Minnesota Department of Agriculture. Residents in Northwestern Minnesota were invited to attend any MDA-hosted collection event. MDA advertises all collection events in the region through media outlets and sends direct mailings to all licensed and certified pesticide applicators residing in counties that do not collect agricultural pesticides locally.

SOURCE: Office of the Legislative Auditor.


THE GREAT SEAL OF THE STATE OF MINNESOTA
L'ETOILE DU NORD
1858

Chapter 4: Enforcement of Pesticide Regulations

Licensing individuals and companies to store, distribute, or apply pesticides is not enough to mitigate the risks associated with using pesticides. It is also important to ensure that companies and individuals adhere to federal and state pesticide regulations.

The Minnesota Department of Agriculture (MDA) is the agency with primary enforcement responsibility over pesticide regulation in Minnesota.[1] In this chapter, we discuss two aspects of MDA's enforcement efforts. First, we explain the department's inspection program, with a focus on its investigations of pesticide-misuse complaints. We then analyze pesticide violations and the enforcement actions that MDA takes when it discovers them.

Inspections and Investigations

MDA's Inspection Unit performs the bulk of the department's pesticide-related inspections.[2] The Inspection Unit has 15 agricultural chemical inspectors (including two supervisors) who are authorized under state law to visit and inspect farms; cooperatives; and facilities that use, store, handle, distribute, or dispose of agricultural chemicals, which include both pesticides and fertilizers.[3] Inspectors also annually conduct hundreds of "desk audits" of pesticide dealers to review the records, credentials, and reports that those entities are required to keep.

Inspection Visits

Facility inspections are visits to places where pesticides are stored, sold, or disposed of.

Pesticide-use inspections involve the observation of pesticide applicators applying a pesticide product.

Throughout this chapter, we use the term "inspection activities" when we are discussing in-person inspection visits *and* desk audits. However, much of our analysis focuses on MDA's pesticide inspection visits, most of which fall into two broad categories: (1) routine inspections of pesticide dealers, storage facilities, and applicators, among

[1] During the 2018 legislative session, legislators debated a bill that would have explicitly allowed the commissioner of agriculture to delegate certain pesticide regulation responsibilities to certain cities. While *Minnesota Statutes* 2019, 18B.01, subd. 2, and 18B.03, subd. 3, already grant MDA the authority to delegate "specific inspection, enforcement, and other regulatory duties…to officials of approved agencies" (including municipalities), MDA has not done so in part because it is unclear whether such a delegation would be allowable under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

[2] There are technically two inspection units that serve different geographic areas in the state; we refer to them collectively as the "Inspection Unit." MDA's *Incident Response Unit* also conducts inspections (1) in response to a new agricultural chemical spill, or (2) for the purposes of monitoring ongoing cleanup work associated with a major spill or a site that was contaminated by the build-up of many small chemical discharges over time. We excluded incident-related inspections from the analysis in this chapter.

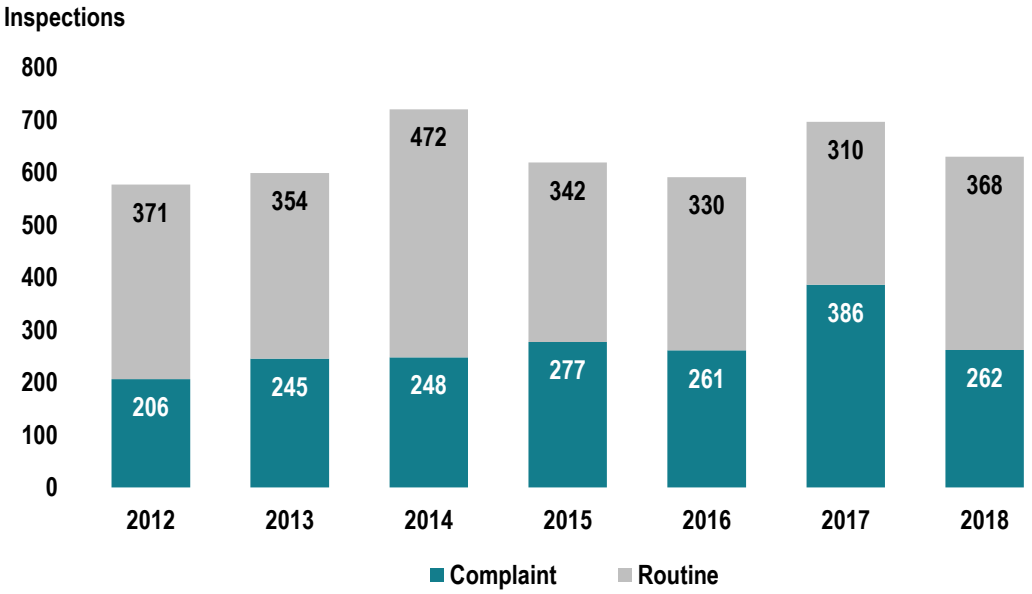
[3] *Minnesota Statutes* 2019, 18D.201, subd. 1(b).

others; and (2) investigations into complaints of pesticide misuse.[4] To learn about pesticide inspections, we analyzed data from MDA's Compliance Information System for the years 2012 through 2018.[5]

The Minnesota Department of Agriculture annually conducts hundreds of pesticide inspection visits.

As shown in Exhibit 4.1, the number of routine and complaint-driven inspection visits conducted by MDA from 2012 through 2018 has fluctuated, from less than 600 to more than 700 inspection visits per year. In all but one year since 2012, routine inspections constituted more than half of MDA's inspection visits. MDA staff said that the ratio of routine-to-complaint inspection visits varies based on the number of complaints received in a given year.

Exhibit 4.1: The Minnesota Department of Agriculture has conducted more than 575 routine and complaint inspections annually since 2012.



NOTE: The above exhibit excludes desk audits and a small number of reinspection visits.

SOURCE: Office of the Legislative Auditor, analysis of Minnesota Department of Agriculture's Compliance Information System, 2012-2018.

[4] The Inspection Unit also conducts a small number of "reinspections," which are return visits during which inspectors verify that certain violations have been remedied. Given the small number and the fact that reinspections could be related to either routine or complaint inspections, we excluded them from our analysis unless otherwise noted.

[5] On average, more than 80 percent of MDA's inspections have involved pesticides, with the remaining quarter focused on fertilizers. We excluded fertilizer inspections from the analysis in this chapter.

Routine Inspection Visits

MDA conducts hundreds of routine inspection visits every year for the purpose of checking compliance with pesticide regulations. Routine inspections are an important regulatory tool for MDA, which uses them to identify instances of noncompliance with state or federal law and to educate the inspected entities. Routine inspections are typically unannounced. According to MDA staff, inspectors generally attempt to visit inspected entities without advanced warning, but they will occasionally schedule an inspection visit when a site is very remote, they have been unable to gain access during their initial attempts, or for inspections conducted under MDA's federal authority.

There are many different types of routine inspections. MDA inspectors have different inspection protocols for different types of inspections, resulting in different inspection questions and activities for pesticide dealers, bulk storage facilities, and agricultural operations, among others.[6] Depending on the type of inspection, MDA staff will evaluate, for example, licensing, safety conditions, adherence to product label specifications, and the existence of incident response plans. Exhibit 4.2 describes the seven most common routine inspection types, which represented more than two-thirds of all routine inspection visits conducted in 2018.

The Minnesota Department of Agriculture prioritizes routine pesticide inspections in a reasonable manner.

Every year, MDA's Inspection Unit sets inspection priorities based on a combination of state and federal needs. MDA establishes goals for certain inspection types through its cooperative agreement with the U.S. Environmental Protection Agency (EPA).[7] EPA and MDA work together to create a workplan stating the number of inspections that MDA must conduct in certain areas (such as pesticide facility inspections to check compliance with certain federal regulations). MDA generally selects the specific facilities that will be visited by one of the department's five federally credentialed inspectors.[8] According to MDA staff, the department conducted 17 inspections under its federal authority in Federal Fiscal Year 2018.

MDA conducts most of its inspections, including the types listed in Exhibit 4.2, under its state authority.[9] When planning inspection work for various *facility* inspection types, MDA staff said they start with a list of facilities that are due for inspection. They prioritize inspections based on the seriousness of any problems the facility has had in the past, as well as how recently the facility has been inspected. They also prioritize inspections of new companies that have never been inspected.

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[6] The different inspection protocols reflect the distinct legal requirements that exist for inspected entities.

[7] EPA awards grants to states to help them do the work laid out in the cooperative agreement. For Federal Fiscal Year 2018, EPA awarded $630,946 to Minnesota to support its pesticide program.

[8] MDA staff explained that EPA occasionally assigns the inspection of a specific facility if there are known issues to investigate. For all federal inspections, MDA conducts the field inspection and then passes the case file on to EPA, which decides on the appropriate enforcement actions.

[9] *Minnesota Statutes* 2019, 18D.201, subd. 1(b).

Exhibit 4.2: The Minnesota Department of Agriculture's routine inspection visits cover a wide variety of actors and requirements.

Inspection Type	Examples of Entities Inspected	Examples of Items Evaluated	Number of 2018 Visits
Use inspection	• Licensed or certified applicator (an individual) during or after a pesticide application	• Proper licensing or certification of applicator • Label compliance • Proper use of personal protective equipment	44
Pesticide facility inspection (nonagricultural)	• Lawn care operations • Golf courses • Structural pesticide application companies • Right-of-way companies	• Pesticide applicator licenses • Application records • Pesticide storage areas • Mix-and-load areas • Backflow prevention devices • Pesticide container disposal management	44
Pesticide facility inspection (agricultural)[a]	• Agricultural cooperatives • Aerial applicators • Greenhouses • Nurseries • Forest operation sites	• Pesticide applicator licenses • Application records • Pesticide storage areas • Mix-and-load areas • Backflow prevention devices • Pesticide container disposal management	35
Pesticide facility inspection (bulk storage)	• Facilities that store pesticides in volumes greater than 500 gallons	• Bulk pesticide storage requirements • Secondary containment areas (dikes) • Load pads • Holding tank capacity, structural soundness, and proper labeling • Inventory and maintenance records • Incident response plans	25
Restricted-use pesticide field inspection	• Retailers that sell restricted-use pesticides	• Proper licensing of restricted-use pesticide dealer • Adequate record retention, including verification that restricted-use pesticides were sold only to licensed or certified applicators	36
Marketplace inspection	• Hardware/big-box stores • Janitorial suppliers • Pet supply stores • Pesticide distributors	• Pesticide and fertilizer product registrations (to determine whether products are registered in Minnesota) • Product labeling	31
Compliance assistance visit	• Any type of facility or applicator	• Nonregulatory visit to discuss proper pesticide storage, use, and disposal, with the goal of improving voluntary compliance with pesticide regulations	41

NOTES: This exhibit includes seven specific types of routine inspection visits that occurred most frequently in 2018. Inspectors also conducted many "general" inspections, which are used for a variety of miscellaneous inspection goals. There were nine additional inspection types conducted in smaller numbers in 2018, including, for example, inspections focused on worker protection standards and inspections related to specific priorities set by the U.S. Environmental Protection Agency.

[a] Agricultural *facility* inspections do not cover individual farmers. Farmers may be subject to use inspections when applying pesticides to their fields.

SOURCE: Office of the Legislative Auditor, analysis of the Minnesota Department of Agriculture's Compliance Information System, 2018.

Unannounced *pesticide-use* inspections require a different approach, since MDA does not know when and where applicators will be applying pesticides. MDA staff explained that inspectors may stop and conduct a pesticide-use inspection when they see an applicator spraying a field, for example. They said that when it is not possible to conduct an unannounced pesticide-use inspection, inspectors may contact commercial applicator companies in the morning and ask where their staff are working, so the inspector can drive to those sites to conduct pesticide-use inspections.

MDA staff said that the Inspection Unit's goal is to inspect dealers of restricted-use pesticides every three years and bulk pesticide storage facilities every five years.[10] MDA's routine inspection data from 2012 to 2018 show that the department inspected 136 entities (11 percent of all inspected entities) at least three times during the seven-year period. MDA has prioritized larger cooperatives and companies for repeat inspections. Roughly one-quarter of all routine pesticide inspection visits during this period were made to 38 entities. These entities all received at least eight inspection visits and some were subject to dozens of inspections of various types.

On the other end of the spectrum, about three-quarters of the 1,276 distinct entities MDA inspected between 2012 and 2018 were visited during only one year. MDA staff explained that many of the nonagricultural businesses the department regulates, such as lawn care companies, come and go quickly; companies may no longer exist three-to-five years after their first inspection.[11]

Complaint Investigations

We focused our review on MDA's investigation of pesticide-misuse complaints. Complaint investigations include inspections that MDA conducts in response to a formal complaint of pesticide misuse. Department staff told us that while someone could complain about issues such as an unlicensed person applying restricted-use pesticides, the majority of complaints MDA receives involve allegations of pesticide drift or other issues resulting from the application of a pesticide.

Complaint Investigation Process

When MDA receives a complaint of pesticide misuse, inspectors first decide whether the claim warrants investigation. According to Minnesota statutes, a complaint must be written and explain "with reasonable particularity" the grounds of the complaint.[12] MDA staff said, for example, if someone believes his or her fields were drifted on, but does not know by whom, MDA staff may determine that there is not enough information to warrant an investigation. MDA staff said that they may also decide not to investigate if too much time has passed between the alleged drift event and the

[10] While they did not mention frequency goals for other types of inspections, staff explained that some entities are inspected every year (and sometimes multiple times a year) because they have multiple operations and are subject to various inspection types. For example, an agricultural cooperative might, at different times, be subject to marketplace, bulk storage, pesticide-use, and safety inspections (among others), depending on the services it offers.

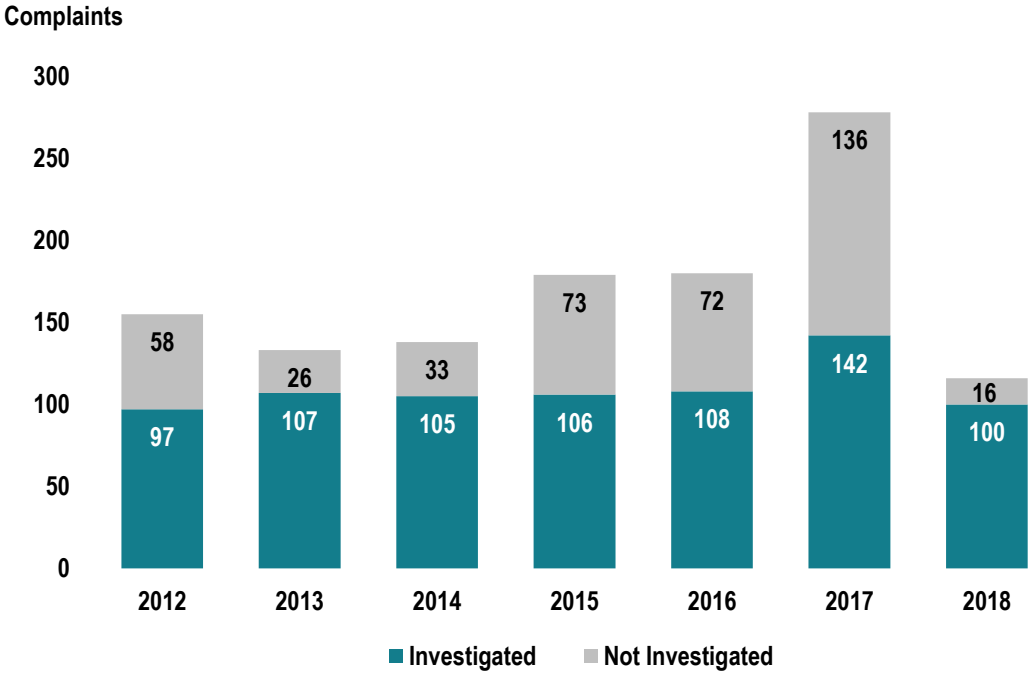
[11] We were unable to confirm the years for which entities were licensed or whether there were entities that were never inspected as this was beyond the scope of our evaluation.

[12] *Minnesota Statutes* 2019, 18D.201, subd. 3(a).

complaint; statutes require that inspection requests that allege damage to a crop or vegetation be submitted within 45 days of the pesticide application.[13]

Exhibit 4.3 shows the number of complaints that MDA received and investigated from 2012 to 2018.[14] During that period, MDA investigated an average of 109 complaints per year. The percentage of written complaints that MDA investigated ranged from 51 percent to 86 percent.

Exhibit 4.3: The Minnesota Department of Agriculture typically investigates more than 100 pesticide-related complaints each year.



NOTE: The number of complaints surged unusually high in 2017 due to the introduction of new dicamba herbicide products on the market.

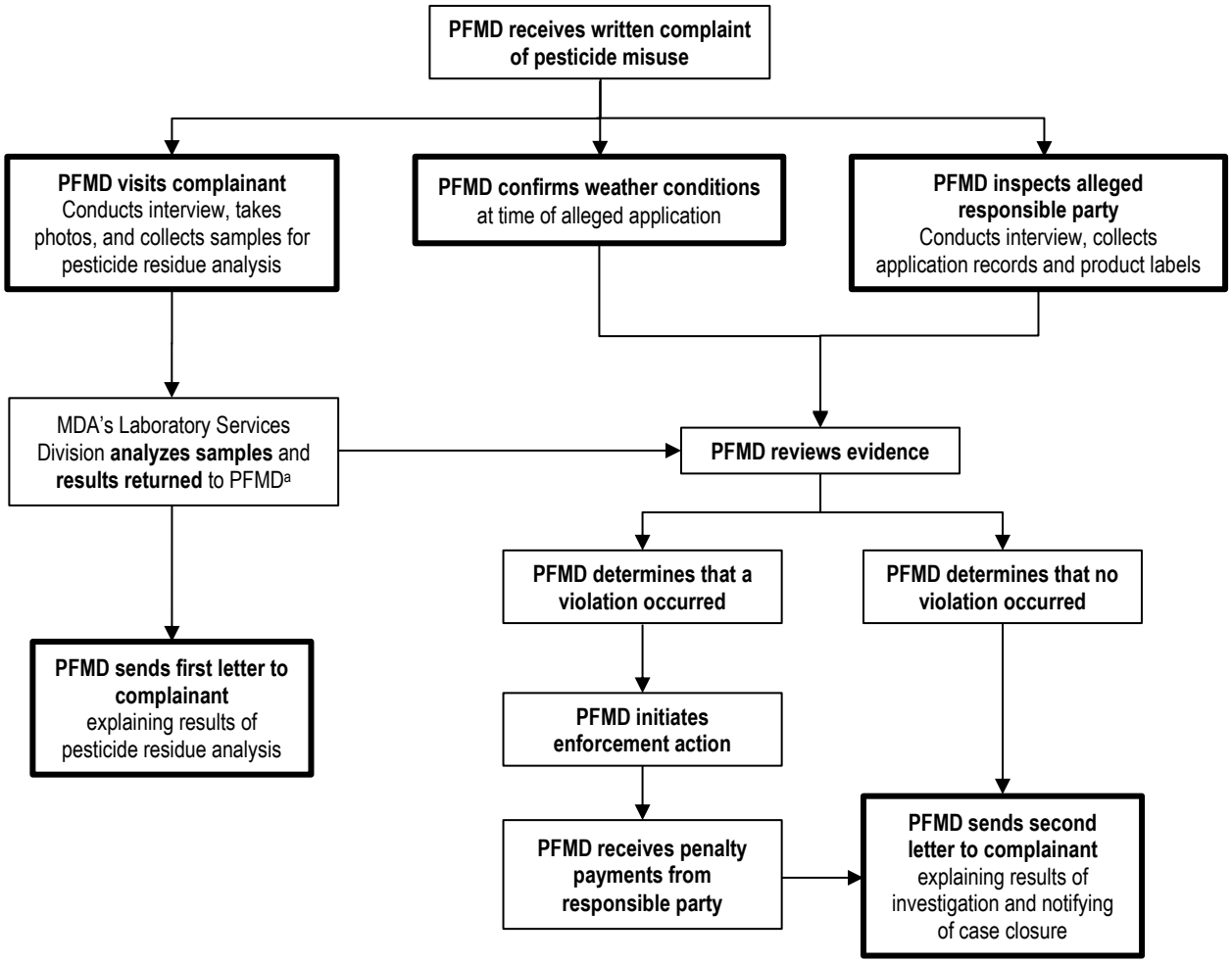
SOURCE: Office of the Legislative Auditor, analysis of Minnesota Department of Agriculture's Compliance Information System, 2012-2018.

Exhibit 4.4 shows the activities involved in a typical pesticide-misuse investigation. In explaining the steps of a typical investigation, we use the example of a complainant alleging that his or her property was drifted on when a pesticide applicator was spraying a neighboring field. While the details of complaints vary, this is a common scenario we can use to understand the investigation process.

[13] *Minnesota Statutes* 2019, 18D.201, subd. 3(a).

[14] This analysis includes all pesticide-related complaints—not just pesticide-misuse complaints.

Exhibit 4.4: Minnesota Department of Agriculture complaint investigations have many steps.



NOTES: "PFMD" is the Minnesota Department of Agriculture's Pesticide and Fertilizer Management Division. This flow chart gives a simplified illustration of typical pesticide-misuse investigations. Some investigations require the inspection of multiple possible responsible parties, or discussions with pesticide dealers, among other things.

[a] MDA's Laboratory Services Division is separate from the Pesticide and Fertilizer Management Division.

SOURCE: Office of the Legislative Auditor.

Typical pesticide-misuse complaints investigated by the Minnesota Department of Agriculture involve at least two inspection visits.

Once MDA has decided to conduct an investigation, inspectors typically start with a visit to the complainant. The inspector will interview the complainant about the incident including, for example, the complainant's observations of the pesticide application and the extent of the damage on the complainant's property. The inspector

also inspects and photographs the property, maps the relationship between the drifted-on area and the target field or structure, and collects samples of vegetation or swabs from solid surfaces for laboratory analysis.

Next, the inspector visits the pesticide applicator implicated in the complaint, otherwise known as the "responsible party." The inspector will interview the applicator about the details of the application, collect application records, and verify the pesticide product applied by, for example, collecting or photographing the product label. In addition, MDA staff typically verify the weather conditions at the time of the pesticide application.

After the inspection visits are complete and the samples are analyzed, MDA reviews the resulting information and determines whether the alleged pesticide drift actually occurred. As part of the investigation, MDA sends written communication to the complainant explaining the lab results, as well as the final conclusion of the investigation. If MDA identifies violations that merit financial penalties, MDA sends written notification to the responsible party explaining the nature of the violation and penalty amount.[15]

Complaint Investigation File Review

We conducted a file review in order to evaluate MDA's process for investigating pesticide-misuse complaints. We reviewed 41 files randomly selected from complaints made and investigated in 2017 and 2018 (17 percent of the 236 complaints made during this time period).

In the following sections, we discuss our findings related to MDA's collection of pesticide application records, the clarity of the department's communications with complainants, and the timeliness of investigations.

Our file review included…

41[a]	Complaint investigation files
48	Complaints (some files contained multiple complaints about the same incident)
48	Inspection visits to complainant properties
55	Inspection interviews to alleged responsible parties (if source of drift is unknown, MDA investigated multiple applicators)
7	Inspections of others, such as agricultural cooperatives or pesticide dealers

[a] Files were randomly selected from complaints investigated by MDA's Inspection Unit in 2017 and 2018.

[15] MDA inspectors may also issue corrective orders, either during the inspection of the responsible party or after the fact.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that when investigating allegations of pesticide misuse, MDA change its procedures for collecting application records by specifying when to require inspectors to examine records in person.

RECOMMENDATION FULLY IMPLEMENTED

MDA changed its procedures to require that inspectors attempt to collect application records in person under most circumstances.

Review of Application Records

In its 2006 report, the Office of the Legislative Auditor (OLA) recommended that MDA specify in its procedures when staff conducting pesticide-misuse investigations should collect pesticide application records in person.[16] Inspectors review pesticide application records to verify the product used and to check compliance with pesticide law. They check the records for completeness, as well as for information regarding the pesticide products applied, dates and times of application, and weather conditions at the time of application.

The Minnesota Department of Agriculture now requires that inspectors collect pesticide application records in person when feasible.

MDA's current standard operating procedures for pesticide-misuse complaint inspections indicate that inspectors should "collect appropriate application record(s) if records were maintained" as part of the applicator inspection visit.[17] MDA management confirmed that the department's expectation is that (1) inspectors conduct the applicator interview in person unless the applicator is transient or located out of state, and (2) application records are to be collected at that time.[18]

Not all files we reviewed were required to include application records.[19] When MDA investigated an applicator that was required to maintain records, the files showed evidence that MDA collected application records in person in all but one case. In one complaint we reviewed, MDA spoke with a Minnesota-based commercial applicator over the phone and then received the application record in an e-mail roughly four hours later. MDA staff said that in this case, the responsible party was located outside of the MDA investigator's territory and that the department felt it was

[16] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006), 64-65. The report noted that it was not uncommon for inspectors to ask responsible parties to fax application records to them, which raised concerns in cases in which the date of application was in question.

[17] Minnesota Department of Agriculture, "Standard Operating Procedure for Investigating Pesticide Misuse Complaints," February 2018, 12-13. Private applicators—farmers applying pesticides to their own fields—are required to maintain application records only when applying restricted-use pesticides. MDA staff explained that when they investigate private applicators, they record the applicator's recollection of the application details and collect whatever records the applicator has (such as handwritten notes) in person. They told us that if an applicator cannot recall the specific product he or she used, the inspector visits the applicator's agricultural cooperative or other retailer to collect label information for the products the farmer likely used. In the files we reviewed, we noted a handful of cases in which the inspector contacted retailers to get label information.

[18] Aerial applicators, for example, may be based in neighboring states; as such, inspectors may interview them over the phone instead of in person.

[19] MDA received some complaints for which no pesticide spraying seems to have occurred; no application record exists in such cases. In at least 13 of the cases we reviewed, the alleged responsible party was a private applicator.

appropriate to save time by conducting the inspection interview and record collection over the phone and by e-mail, respectively.

Communication with Complainants

Through our review of pesticide-misuse complaints, we evaluated the nature and clarity of MDA's written communication with citizens who have lodged complaints with the department. MDA's *Pesticide Drift* brochure is an example of written communication that MDA implemented in order to make the investigation process more transparent for complainants. The brochure is largely helpful in explaining the investigation process and the rights and responsibilities of both complainants and responsible parties. The brochure indicates that MDA will communicate results to the complainant at two points during the investigation: after laboratory analyses are complete and at the conclusion of the investigation.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA improve its written communications with complainants.

RECOMMENDATION PARTIALLY IMPLEMENTED

The files we reviewed showed that MDA consistently communicates with complainants, but that the content of the written communications needs improvement.

We reviewed both types of communications (laboratory results and closure letters) as part of our file review. We found that all of the files contained the communications. This represents an improvement; in its 2006 report, OLA found that more than one-quarter of the closure letters were missing from files.[20]

The first type of complainant communication we reviewed was the communication of pesticide-residue analyses results. After MDA's Laboratory Services Division has completed its analyses of any samples taken from the complainant's property, the Inspection Unit sends the complainant a laboratory report along with a cover letter.[21]

In the files we reviewed, the Minnesota Department of Agriculture's laboratory reports and accompanying cover letters were difficult to understand.

MDA uses standard templates for its laboratory results and the accompanying cover letter. The boxes on the next page show the boilerplate language of the cover letter and a set of example results.

[20] Office of the Legislative Auditor, *Pesticide Regulation*, 65.

[21] We found copies of these letters and reports in each of the 35 files we reviewed for which MDA's laboratory analyzed samples from the complainant's property. For a variety of reasons, MDA did not take or order the analysis of samples in each of the 48 complainant inspections we reviewed. Three cases did not involve pesticide drift. In seven cases, the inspection took place too long after the alleged application for a reliable analysis to occur. In two cases, the complainant withdrew the complaint.

Example: Laboratory Results Cover Letter

Dear [Complainant]:

Enclosed are the Residue Final Reports for the samples the Minnesota Department of Agriculture (MDA) obtained on [date]. Each sample has its own result.

Sample results may be listed in mg/kg (part per million), ug/kg (part per billion) or ND (no detect at either the detection limit or the method reporting limit (MRL) dependent upon the type of sample obtained. 1 ppm = 1,000 ppb.

The MDA uses these data to determine if there are residues of pesticide in/on porous materials like clothing/furniture; nonporous surfaces like signs, siding or windows; vegetation; food/feed; soil or water. For food/feed, the US EPA sets tolerances for the amount of pesticide allowed in or on the commodity.

If your complaint involved food or feed in the field, the Minnesota Department of Agriculture's Food & Feed Safety Division has been copied when necessary.

If you have questions about the results, please [contact MDA staff].

Example: Laboratory Results

Description: Soybean veg. – sect. 27

Analysis Requested: Acetochlor, Clethodim, Dicamba, Fomesafen

Analyte	Result
Acetochlor	24.5 ug/kg
Clethodim	ND at Detection Limit (4 ug/kg)
Clethodim Sulfone	0.0564 mg/kg
Clethodim Sulfoxide	0.213 mg/kg
Dicamba	8.95 ug/kg
Fomesafen	0.510 ug/kg

While the cover letter is supposed to help explain the accompanying results, we found that it did not provide sufficient or useful context in layman's terms. The red, bold text reflects MDA's original formatting. However, the text does not mean much to someone without a scientific background, and its prominence could be confusing. This text, which explains the units in which results are reported, would serve the reader better as part of a key that appeared with the actual results on the laboratory results. The cover letter lacks information to help complainants understand what their individual results mean and whether they should be concerned about pesticide exposure.

When we discussed this with MDA staff, they replied that explaining the health and safety ramifications of pesticide drift is very complicated and cannot be easily summarized. If, for example, an herbicide is meant for use on corn, EPA will publish food tolerances establishing how much residue is acceptable *on corn.* If, however, the same product drifted onto a neighbor's *tomatoes*, tolerances may not exist to say whether those tomatoes are safe to consume.

In the files we reviewed, the final closure letters the Minnesota Department of Agriculture sent to complainants routinely lacked important details.

In the files we reviewed, MDA sent letters explaining that the case was being closed to each of the 47 individual complainants who had not already withdrawn their requests for an investigation.

As we reviewed final closure letters, we evaluated whether we thought the letters contained several elements that would make the letter useful for the complainant. We determined that a fully "complete" letter would explain: (1) the nature of the complaint, (2) whether MDA substantiated the complaint, (3) what evidence led to that conclusion, (4) whether MDA had taken enforcement action, and (5) that the case was being closed. As Exhibit 4.5 shows, we found that only two of the letters we reviewed contained all of those elements. Another five "mostly complete" letters contained four of those five elements. We considered 80 percent of the letters —all of which contained three or fewer of those elements—to be either "mostly incomplete" or "incomplete."

Exhibit 4.5: We considered most closure letters in Minnesota Department of Agriculture complaint investigations to be at least somewhat incomplete.

	Complete	Mostly Complete	Mostly Incomplete	Incomplete
Summarized nature of complaint	✓	2 of 5	13 of 38	1 of 2
Made clear whether complaint was substantiated	✓	✓	4 of 38	✗
Referenced at least one piece of evidence	✓	3 of 5	✗	✗
Stated whether enforcement action was taken	✓	✓	✓	✗
Stated that case was in the process of being closed	✓	✓	✓	✓
Number of letters reviewed	2	5	38	2
Percent of 47 letters reviewed	4%	11%	81%	4%

NOTES: The exhibit above lists elements that we believe a complete closure letter should contain. "✓" indicates that all of the letters in the category contained that element. "✗" indicates that none did. When results were mixed, we state the number of letters that contained the element.

SOURCE: Office of the Legislative Auditor, analysis of Minnesota Department of Agriculture complaint files.

The box at right shows the text of a letter that we considered mostly incomplete. Nearly half of the mostly incomplete letters contained similar language. The letter says that MDA took an enforcement action for "a violation of the Minnesota Pesticide Law." However, the letter does not make clear whether MDA substantiated the actual *complaint* submitted by the complainant. During our review of case files, we encountered situations in which MDA did not substantiate a complainant's allegation (for example, pesticide drift onto the complainant's property), but did find other violations (such as application of dicamba after the cutoff date). The closure letters in these cases used language similar to that in the box, which is misleading.

Example: "Mostly Incomplete" Closure Letter

RE: MDA Investigation Closure, [File Number]

Dear [Complainant],

We have completed our investigation of the above complaint you reported to the Minnesota Department of Agriculture (MDA) on [date]. The MDA took an enforcement action for a violation of the Minnesota Pesticide Law, and the case file is now in the process of being closed.

If you would like a copy of the case file, or copies of specific public government data contained in the case file, submit your request to our Division's Data Management Unit at [e-mail address] on or after [date].

Feel free to contact me at [phone number] if you have any questions regarding this matter.

RECOMMENDATION

The Minnesota Department of Agriculture should improve the clarity of the laboratory result cover letters and final closure letters that it sends to those who make pesticide-misuse complaints.

The results of pesticide-residue analyses are important to complainants who need to know whether their homes and crops are free from unwanted chemicals. In order to make the cover letter truly helpful, MDA should offer a plain-language explanation of the results. The letter should state clearly which chemicals were detected and where on the property (if samples were taken from multiple locations). MDA should acknowledge that it cannot comment on the risk associated with any positive detections. The department may consider providing links to other resources if relevant resources are available. The information in the current template explaining units of analysis would be more helpful if it appeared in the laboratory report itself, as part of a key immediately above or below the results.

In order to make final closure letters more useful for complainants, MDA should ensure that the letters summarize the nature of the complaint, clearly explain MDA's determination with *respect to the complainant's allegation*, support its determination with key pieces of evidence, and explain any enforcement actions taken against the responsible party.

Communication with Responsible Parties

Not only do MDA inspectors need to communicate effectively with complainants, but they must also communicate clearly with the pesticide applicators they investigate. Written communication with these responsible parties should include a clear description of any violations MDA found and enforcement actions it plans to take.

In the files we reviewed, the Minnesota Department of Agriculture's written communication with responsible parties was generally clear.

The 48 complaints we reviewed included a total of 45 letters from MDA to responsible parties.[22] We found the vast majority of these (41 letters) to be clearly written, whether or not MDA was able to substantiate the allegations against the responsible party.

In each of the cases in which MDA did not observe any violations, the department sent a brief letter clearly stating that the case was in the process of being closed and that MDA did not substantiate the allegation of pesticide misuse.[23] When MDA's investigation resulted in the identification of violations after the inspection visit, the department sent the responsible party a letter explaining whether the department was taking additional

[22] While MDA conducted 55 inspections of responsible parties as part of the investigations we reviewed, some of them were repeat visits to the same responsible party. MDA wrote final closure letters to each of the 45 unique responsible parties.

[23] In some cases, the department issued a notice of violation for an infraction observed during the inspection (such as a recordkeeping violation), and then sent the responsible party a letter explaining that the case was being closed with no further action.

enforcement actions. In most cases, the notices clearly laid out the facts of the case, including the pesticide products applied, key dates, and weather conditions such as wind direction and speed. The notices clearly outlined the violation MDA identified (including the specific statute the applicator violated and in what manner), MDA's evidence supporting its decision, and what sort of enforcement action the department planned to take.[24] We encourage MDA to write clear and well-supported closure letters to responsible parties, as it did in most of the cases that we reviewed.

Investigation Timeliness

As part of our file review, we analyzed the length of time it took MDA to conduct the various phases of its complaint investigations. While there are few deadlines in statute for such investigations, MDA's *Pesticide Drift* brochure sets an expected timeline for the investigation process. The brochure indicates that the case will be closed after enforcement action is taken against responsible parties, which should occur within six-to-eight months from the date that the written complaint is filed.[25]

The Minnesota Department of Agriculture's *Pesticide Drift* brochure sets up unrealistic expectations for the timing of investigations.

Exhibit 4.6 shows the investigation steps listed in MDA's *Pesticide Drift* brochure, how long the brochure claims each step will take, and how long the steps took in the 48 complaint cases we reviewed. We found small delays in early steps of the investigation. For example, conducting the inspection of the complainant's property took an average of four days instead of two.

The much greater concern, however, is the amount of time it took for MDA's Laboratory Services Division to complete its analyses of pesticide residues. On average, pesticide-residue analysis took 12 weeks, about four times longer than the two-to-three week turnaround time suggested in the *Pesticide Drift* brochure. The delayed laboratory results have serious implications for some complainants, such as organic farmers who need to know whether their crops have been contaminated before they can sell them during the growing season. To MDA's credit, once laboratory analyses are completed, our file review showed that the Inspection Unit notified complainants of their results in an average of 3 days, much faster than the 30-day timeline established in statute.[26]

MDA's *Pesticide Drift* brochure states that MDA should take any enforcement action against responsible parties within six-to-eight months of the date the complaint was initiated, and inform the complainant of case closure thereafter. In the cases we reviewed, the average amount of time it took for MDA to close a case was a little more

[24] In one case, MDA cited an applicator for a recordkeeping violation, but did not provide evidence or an explanation of how the responsible party's pesticide application record had been found lacking. We discuss MDA's enforcement mechanisms later in this chapter.

[25] MDA's standard operating procedures require inspectors to provide the Pesticide Drift brochure to complainants. Minnesota Department of Agriculture, *Standard Operating Procedure for Investigating Pesticide Misuse Complaints*, 8. While inspectors are not explicitly required to give the brochure to the responsible parties being investigated, files indicate that they did provide the brochure in some instances.

[26] *Minnesota Statutes* 2019, 18D.201, subd. 2(a).

Exhibit 4.6: The Minnesota Department of Agriculture's laboratory analysis took considerably longer than estimated.

Investigation Activity	Number (Unit Varies by Activity)	Suggested Timeframe[a]	Average Actual Timeframe	Actual Timeframe Range
MDA inspector contacts complainant	48 complaints	Within 24 hours of complaint	38 hours	0-383 hours
Inspector visits complainant	48 complaints	1-2 business days	4 business days	1-18 business days
Inspector submits samples to MDA laboratory	38 samples submitted	1-3 business days from sample collection	4 business days	1-30 business days
Laboratory completes analysis	36 samples analyzed[b]	2-3 weeks from date lab received samples	12 weeks	1-29 weeks
MDA notifies complainant of lab results	36 samples analyzed[b]	Within 30 days of analysis completion	3 days	0-24 days
MDA initiates enforcement action against responsible party	30 enforcement actions	6-8 months from complaint initiation	6.5 months	0.2 to 11.9 months
MDA notifies complainant of MDA enforcement actions and case closure	47 complaints[c]	After enforcement action is taken	8.2 months	0.5 to 13.5 months

NOTES: "MDA" is the Minnesota Department of Agriculture.

[a] Most of the activities listed and their timeframes are published in MDA's *Pesticide Drift* brochure. The *Pesticide Drift* brochure does not include the first activity, "MDA inspector contacts complainant." MDA's standard operating procedure requires that investigators contact complainants within 24 hours to schedule a site visit and in-person interview. The brochure also does not specify how quickly MDA must notify complainants about laboratory results. *Minnesota Statutes* 2019, 18D.201, subd. 2(a), requires that MDA provide the owner or operator with a copy of the results within 30 days of the analysis being performed.

[b] The number of samples analyzed differs from the number of samples submitted because in one case, the complainant withdrew the complaint after the samples had been collected and submitted to MDA's laboratory. In another case, MDA collected a sample but did not analyze it when additional investigation revealed that no pesticide application had been made.

[c] In one of the 47 complaints, the complainant withdrew the complaint and MDA did not send a closure letter.

SOURCES: *Minnesota Statutes* 2019, 18D.201, subd. 2(a); Minnesota Department of Agriculture, *Standard Operating Procedure for Investigating Pesticide Misuse Complaints* (St. Paul, 2018), 7, and *Pesticide Drift* brochure; and Office of the Legislative Auditor, analysis of complaint investigation files.

than eight months. The majority of investigations (55 percent), however, took longer than eight months from the time MDA received the initial written complaint to the final communication to the complainant. The longest case was open for 13 months. Many of the investigations that took longer than eight months were delayed by the amount of time it took the laboratory to analyze collected samples for pesticide residue.[27] Another reason that case closure may be delayed is that MDA does not notify the complainant of the final case disposition until it has initiated enforcement action *and* the responsible party has paid any resulting penalty. MDA staff told us this is because, until the penalty is paid, the responsible party may appeal the claim or provide new information that could change MDA's determination.

[27] We did not evaluate MDA's Laboratory Services Division and thus cannot comment on the reasonableness of these delays.

RECOMMENDATION

The Minnesota Department of Agriculture should revise its *Pesticide Drift* brochure to more accurately reflect the true investigation timeline.

Complainants who initiate pesticide-misuse investigations deserve an honest assessment of how long it will take to receive the results of their pesticide residue analyses, as well as the final disposition of their case. The department should revise its brochure to give a more realistic estimate of when complainants can expect to hear about their results.

MDA should also add to the *Pesticide Drift* brochure a statement explaining that notification of the final case disposition does not occur until after the responsible party has paid any financial penalties, which may extend the length of the investigation beyond eight months.

Enforcement Actions

During any given inspection activity, MDA inspectors may observe violations of state or federal law, as well as situations that have the *potential* to violate state or federal law.[28] MDA issues "actions" (such as orders to comply or advisory notices), as a means of remedying the violation or potential violation it observes. MDA assesses financial penalties (which are also actions) against a subset of violators. In this section, we discuss violations and actions, financial penalties, and the consistency of MDA's enforcement actions.[29]

Violations and Actions

When MDA Inspection Unit staff conduct an inspection activity—whether it is a routine inspection visit, a desk audit, or a complaint investigation—they record their observations in the department's Compliance Information System (CIS). The CIS system helps inspectors identify violations of state or federal pesticide law. Depending on the responses

Violation vs. Action

Violations are instance in which the inspected entity did not comply with state or federal pesticide law.

- Example: During a use inspection, MDA staff observe a licensed applicator using more pesticide product per acre than allowed by the product label.

Actions are remedies prescribed by MDA. Actions can be associated with violations (such as orders to comply), or potential violations (such as advisory notices).

- Example: CIS generates a cease and desist order stating that the "company and all applicators must cease and desist applying…pesticide in excess of the maximum label rate."

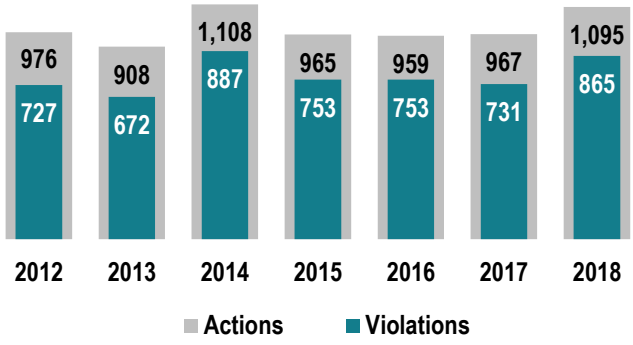
[28] For example, MDA staff explained that inspectors may notice that a backflow-prevention device on a chemigation system is inadequate and recommend the installation of a new one. It would not be a violation, however, unless the inspectors saw the inadequate backflow device in action, actively failing to serve its designated purpose (which is to prevent a pesticide from flowing into the original water source).

[29] In some of the pesticide inspections we analyzed, MDA staff observed fertilizer-related violations or issues. (For example, bulk storage facilities may contain both fertilizers and pesticides; an inspection could reveal issues related to either or both type of chemical.) In the analysis explained below, we excluded violations and actions explicitly related to fertilizer, even if they occurred during a pesticide inspection.

inspectors enter, CIS generates "actions," often representing something the inspected party must do or should stop doing, depending on the observation that triggered it.

For all inspection activities conducted from 2012 to 2018, MDA's Inspection Unit issued almost 7,000 actions, about 5,400 of which were associated with observed violations. As shown in the box at right, the numbers of actions and violations fluctuated over time. In each year, there were about three-quarters as many violations as actions.

The number of pesticide-related actions and violations resulting from MDA inspections has fluctuated.



NOTE: Counts are based on all pesticide inspection activities, including routine and complaint inspections, reinspections, and desk audits.

Types of Actions

While there are hundreds of specific actions CIS might assign, the actions associated with *violations* generally fall into a handful of broad categories: orders to comply, cease and desist orders, and statements of completion. Depending on the severity of the violation, MDA may also assess financial penalties against inspected entities.[30]

As mentioned previously, MDA sometimes issues actions in cases where a violation has not yet occurred, but has the *potential* to do so. In these situations, CIS may generate advisory notices or recommendations. Exhibit 4.7 gives examples of all of the action categories discussed above.

Violation Types

We categorized all of the pesticide-related violations MDA observed into several broad groups. Exhibit 4.8 shows the most common categories of issues that MDA inspectors encountered during desk audits, routine inspections, and complaint investigations.

From 2012 to 2018, Minnesota Department of Agriculture inspectors commonly discovered recordkeeping issues.

During *desk audits*, MDA most commonly noted incomplete or improper restricted-use pesticide sales records, a violation of the requirement that a "pesticide dealer must maintain records of all sales of restricted use pesticides."[31] This violation, and other recordkeeping violations, made up the majority of the violations MDA identified through desk audits. This is unsurprising given that the purpose of desk audits is often to review sales records maintained by pesticide dealers.

[30] While *Minnesota Statutes* 2019, 18D.305, subds. 2, 4, and 5, give MDA the authority to revoke a license or permit as penalty for a violation, MDA staff said that the department has not taken this action in recent memory.

[31] *Minnesota Statutes* 2019, 18B.37, subd. 1(a).

Exhibit 4.7: The Minnesota Department of Agriculture's enforcement actions range from advisory notices to penalties.

Action Type	Description	Example	Number in 2018[a]
Advisory notice	MDA issues advisory notices to educate inspected entities about new legal requirements with which they have not yet complied	The employer of a pesticide handler must provide handlers with training in the use of the respirator specified on pesticide product labeling	76
Recommendation	MDA suggests, but does not require, a change (more commonly used in fertilizer inspections)	MDA recommends the installation of a discharge line on the low-pressure drain	7
Cease and desist order	MDA orders the inspected entity to stop doing something	The company and all applicators must cease and desist applying a certain pesticide in excess of the maximum label rate	210
Order to comply	MDA orders the inspected entity to start doing something it had not been doing or correct something it was doing improperly	A person applying pesticide must dilute the pesticide according to label instructions prior to commencing a pesticide application	579
Statement of completion	MDA requires the inspected entity to correct a deficiency and report back to the department by a specified date	Properly install an approved backflow prevention device before filling application equipment	140
Notice of intent	MDA intends to assess a penalty against the inspected entity[b]	Financial penalty	68

NOTE: "MDA" is the Minnesota Department of Agriculture.

[a] The numbers presented above are the numbers of actions resulting from inspections that were conducted in 2018. In some instances, the actions may have been issued later.

[b] When MDA observes a penalty-worthy violation, it also issues an action ordering the inspected entity to correct the issue (cease and desist order, order to comply, or statement of completion).

SOURCE: Office of the Legislative Auditor, analysis of the Minnesota Department of Agriculture's Compliance Information System, 2018.

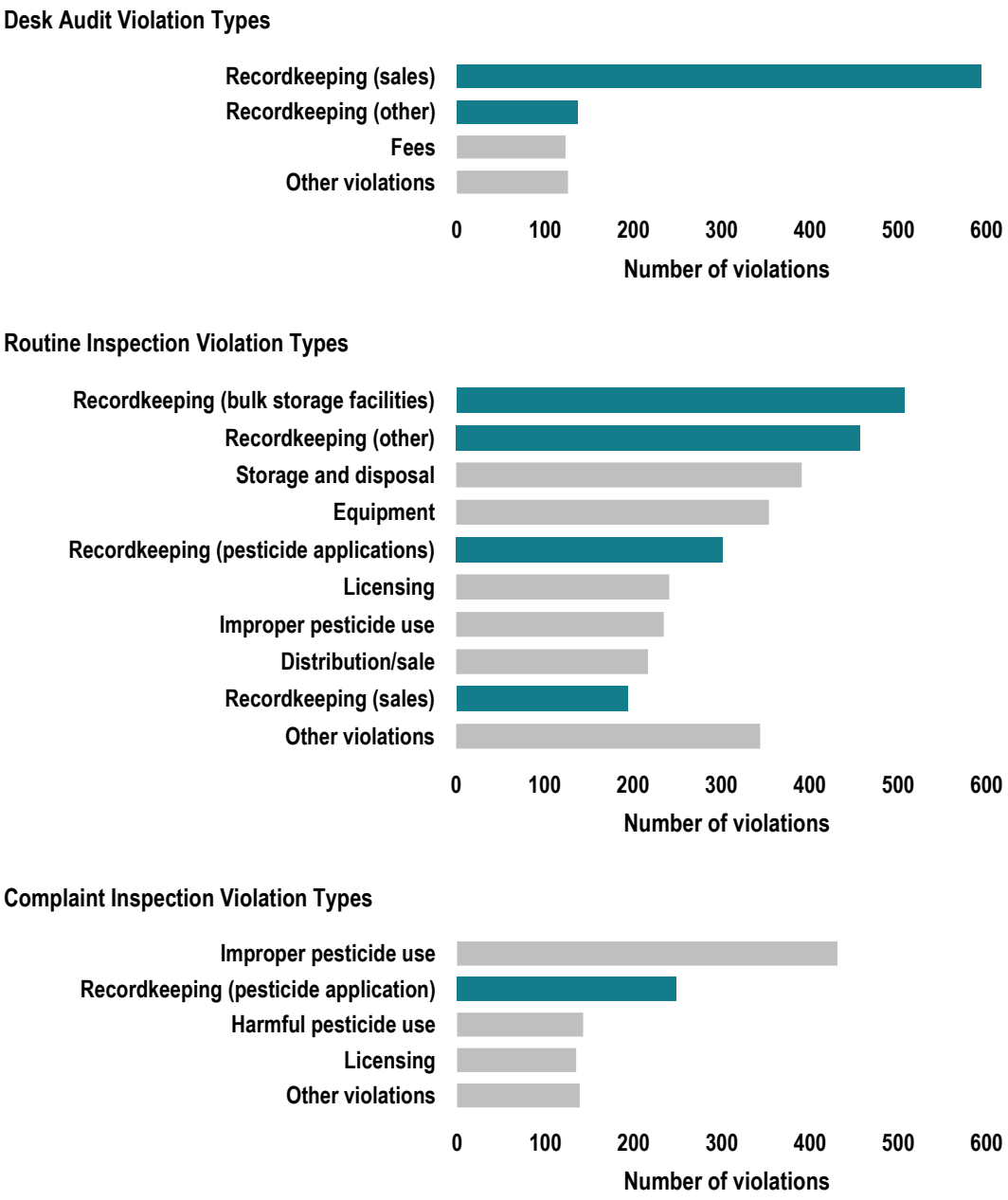
MDA inspectors identified a diverse array of violations through their many types of *routine* inspections. Recordkeeping violations, however, were still the most common. MDA was most likely to identify violations related to bulk-pesticide storage facility recordkeeping or product labeling. During *complaint* investigations, recordkeeping violations were the second-most-prevalent violation type.

Financial Penalties

Minnesota statutes allow MDA to remedy violations through administrative, civil, or criminal financial penalties.[32] The department's policy is to issue a settlement offer before starting any legal proceeding. We analyzed the amounts of these settlements, which we refer to as "financial penalties" in this section.

[32] *Minnesota Statutes* 2019, 18D.315, subd. 1(b); and 18D.325, subd. 1.

Exhibit 4.8: From 2012 to 2018, Minnesota Department of Agriculture inspectors observed recordkeeping violations across all inspection types.

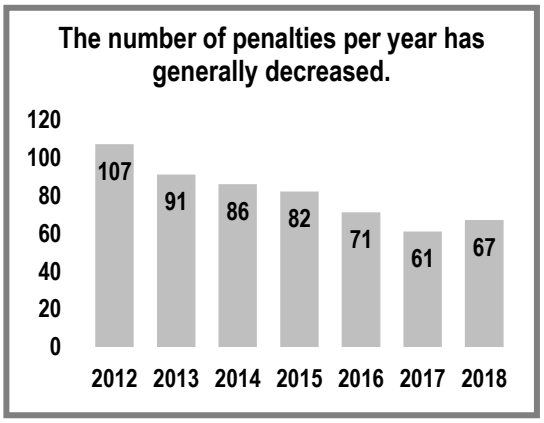


NOTES: We do not present violations observed during reinspection visits because the Minnesota Department of Agriculture identified few violations during those visits for the years analyzed. Each of the graphs above show only those categories with the largest number of violations. We grouped infrequently noted violations for each inspection type under "other violations." Some categories may be listed for one inspection type, but be infrequent enough to fall into the "other violations" category for another inspection type.

SOURCE: Office of the Legislative Auditor, analysis of Minnesota Department of Agriculture's Compliance Information System, 2012-2018.

The number of pesticide violations for which the Minnesota Department of Agriculture has assessed financial penalties is small, and has decreased over time.

For inspections conducted from 2012 to 2018, only 10 percent of violations resulted in the assessment of a financial penalty. MDA assessed its largest number of penalties (107) for inspections conducted in 2012; the number of penalties has decreased each year through 2017 before increasing slightly in 2018. It makes sense that a relatively small percentage of violations would result in penalties, given that many of the issues MDA inspectors have uncovered are related to recordkeeping violations. Such violations are unlikely to threaten human health or the environment or otherwise rise to a level requiring a financial penalty.



For inspections conducted between 2012 and 2018, the amounts of the penalties MDA assessed pesticide applicators and other inspected entities ranged from as low as $50 to as much as $37,500.[33] Large penalties, however, were the exception to the rule. From 2012 to 2018, MDA assessed only 13 penalties greater than $4,000 (the threshold at which the Pesticide and Fertilizer Management Division requests commissioner approval). The average penalty was roughly $850. The penalty amount assessed most frequently was $250.

Consistency of Enforcement Actions

The Minnesota Department of Agriculture has taken steps to improve and evaluate the consistency of its enforcement actions.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA evaluate the consistency and effectiveness of its enforcement actions.

RECOMMENDATION FULLY IMPLEMENTED

MDA has implemented systems designed to increase and evaluate the consistency and effectiveness of its enforcement actions.

Since OLA's 2006 report, MDA has made two significant improvements designed to increase the consistency of enforcement actions.[34] First, MDA instituted a new inspection data system: CIS, which we have cited earlier in this chapter. MDA staff conduct inspections by answering questions about the conditions they observe during the inspection, and CIS determines the appropriate action or actions that the situation requires. The system's design is intended to remove subjectivity from the assignment

[33] MDA assessed the penalty of $37,500 against an applicator who had knowingly ignored pesticide label requirements on a repeated basis. The offense involved the use of a pesticide on a crop for which it was not approved. The applicator inappropriately treated carrots, which readily absorb and maintain pesticides.

[34] Office of the Legislative Auditor, *Pesticide Regulation*, 54.

of most enforcement actions, and MDA staff said that it has been particularly useful in ensuring consistency among the inspectors across the state.

We analyzed documentation showing how CIS assigns actions for the various types of pesticide facilities inspections. We found that the actions resulting from the specific questions were uniformly logical. The box at right shows an example of an inspection question and the resulting action and violation built into CIS.

Example: CIS Inspection Question and Related Action/Violation

Question	Are pesticides stored separate from food, feed, and seed?
Action criteria	"No" response
Action	Store pesticides separately from food, feed, and seed
Action type	Statement of completion, due in 15 days
Violation	Pesticides not stored separate from food/feed/seed
Legal basis	*Minnesota Statutes* 2019, 18B.14, subd. 1

The second change MDA made to improve enforcement consistency is to implement a quality-control process for inspections. MDA now has "review coordinators" review every inspection. The coordinators review the documentation that inspectors provide, such as their answers to specific inspection questions and the accompanying photographs to make sure that inspectors have interpreted the available evidence correctly.

When setting penalty amounts, MDA strives for consistency in a number of ways. MDA staff explained that MDA's Enforcement Unit drafts penalty proposals, using "gravity factors" enumerated in state law.[35] They explained they review the penalties assessed for similar past violations in order to maintain consistency. The Enforcement Unit's proposed penalties are then reviewed by (1) the Inspection Unit, (2) the administrators of the Pesticide and Fertilizer Management Division, and (3) MDA's commissioner (if the recommended penalty exceeds $4,000).

MDA has evaluated the consistency of its financial penalties and found it to be satisfactory. Staff told us that a comparison of penalty amounts across similar violations shows good consistency. They said that this is especially true of "black and white" cases, those that are fairly common and for which the language of the law or pesticide label has unambiguously been violated.

One difficulty with evaluating the effectiveness of enforcement actions is that one never knows what violations would have occurred in the absence of the action. Thanks to CIS, certain actions result in an automatic reinspection or come with a requirement for the inspected entity to remedy an issue and report back. Using CIS, MDA staff can analyze compliance with these types of actions. With respect to the effectiveness of financial penalties, MDA staff pointed out that there are very few entities that have been penalized multiple times, which they see as evidence that the penalties are a sufficient deterrent.

[35] *Minnesota Statutes* 2019, 14.045, subd. 3. Statutes require that, when assessing financial penalties, agencies take into account the willfulness of the violation; the severity of the violation, including damage to humans, animals, and natural resources; the number of violations; and the history of past violations.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Chapter 5: Pesticides and Pollinators

One common criticism of pesticides is that they have contributed to the decline of pollinator populations, which in turn threatens our food supply and the planet's biodiversity. A small number of the pesticide-drift complaints the Minnesota Department of Agriculture receives each year are from beekeepers alleging pesticide-related bee kills.[1] In this chapter, we discuss the impact of pesticides on bees and other pollinators and the work that state agencies have done to address the issue. We conclude the chapter by following up on a pollinator-related recommendation that the Office of the Legislative Auditor (OLA) made in the 2006 *Pesticide Regulation* report.

Pollinators

Pollinators are organisms that transfer pollen from one flower to another, allowing that plant to reproduce. These pollination "services" are crucial for many plants that are otherwise unable to reproduce on their own, such as alfalfa, apple, blueberry, canola, and sunflower. While the large majority of pollinators are insects—including bees, wasps, ants, and butterflies—there are also some species of pollinating birds and bats. According to some estimates, pollinators support the reproduction of at least 80 percent of the world's flowering plants and 30 percent of global crop production. "Managed pollinators," such as honeybee colonies maintained by beekeepers, are estimated to pollinate more than $17 billion worth of crops in the U.S. each year.[2] Some commercial beekeepers move their hives around the country, providing for-hire pollination services for crops such as almonds, fruits, and various vegetables.[3] Minnesota has an estimated 40 to 50 commercial beekeepers and many more hobby beekeepers.[4]

Pollinators

Pollinators are organisms—such as bees and butterflies—that transfer pollen from one flower to another, allowing plants to reproduce.

Minnesota is home to thousands of species of pollinators, including more than 400 different types of bees. Some pollinators in Minnesota have experienced declining populations, with some species, such as the rusty patch bumblebee and the Dakota skipper butterfly, becoming endangered or disappearing from the state. The declines may result from a combination of stressors, including loss of habitat, disease, and

[1] The Minnesota Department of Agriculture investigated 15 reported bee kills from 2015 to 2018.

[2] Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *Review of Neonicotinoid Use, Registration, and Insect Pollinator Impacts in Minnesota* (St. Paul, 2016), 4.

[3] "Native" (wild) bees and insects of various species are also important crop pollinators, individually pollinating crops such as squash, berries, and fruit trees. These free pollination services annually support an estimated $8.7 billion in U.S. crops. Minnesota Department of Agriculture, *Review of Neonicotinoid Use*, 14.

[4] The majority of Minnesota-based commercial beekeepers are migratory. They spend summers in Minnesota, where they produce and sell honey, then move their hives to California or southern states to pollinate crops in those states during the winter. Many beekeepers place their hives not on their own land, but on farmland with the owner's consent.

pesticides. Honeybees in particular, have faced unprecedented declines nationwide since 2006. While the expected honeybee mortality rate used to be 15 percent per winter, losses since 2006 have been much higher.[5] In Minnesota, beekeepers reported total losses of nearly 40 percent during the 2018-2019 winter.[6]

Neonicotinoid Pesticides

While various types of pesticides can impact pollinators, recent concern has been centered around the neonicotinoid class of insecticides. Use of neonicotinoid insecticides increased dramatically through the 2000s. They are currently the most widely used group of insecticides in the world. A research team at Penn State University found that, as of 2011, at least one-third of soybean acres and at least 79 percent of corn acres were planted with neonicotinoid-treated seeds—a dramatic increase since 2000.[7]

The U.S. Environmental Protection Agency (EPA) has registered six neonicotinoid active ingredients for use in agricultural, landscape, and domestic settings.[8] Neonicotinoids were developed as less acutely toxic alternatives for two types of insecticides (organophosphates and carbamates), which had greater impacts on mammals and other vertebrates.

Neonicotinoid pesticides are detrimental to pollinator health.

There is a large and growing body of research on the impacts of neonicotinoid pesticides on pollinators. When applied at labeled rates, neonicotinoid pesticides are not expected to be acutely poisonous to bees. However, some research has shown that chronic exposure over time may result in detrimental effects, such as changes in foraging behavior, reduced avoidance of predators, delayed development, or reduced reproduction.[9]

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[5] U.S. Department of Agriculture, Economic Research Service, *Economic Effects and Responses to Changes in Honey Bee Health* (Washington DC, 2018), 2.

[6] Bee Informed Partnership, "2018/19 Total Winter All Colony Loss," https://research.beeinformed.org/loss-map/, accessed January 23, 2020. The Bee Informed Partnership has conducted beekeeper surveys annually since 2007.

[7] Sara LaJeunesse, "Rapid increase in neonicotinoid insecticides driven by seed treatments" (April 2, 2015), https://news.psu.edu/story/351027/2015/04/02/research/rapid-increase-neonicotinoid-insecticides-driven-seed-treatments, accessed March 9, 2020.

[8] The six pesticide active ingredients are: imidacloprid, thiamethoxam, acetamiprid, clothianidin, thiacloprid, and dinotefuran. They are sold under hundreds of product names. The registration of thiacloprid was voluntarily canceled by the registrant and the active ingredient was no longer sold after 2016.

[9] The Xerces Society for Invertebrate Conservation, *How Neonicotinoids Can Kill Bees* (Portland, OR, 2016): 55; and H. Charles J. Godfray, Tjeerd Blacquière, Linda M. Field, Rosemary S. Hails, Simon G. Potts, Nigel E. Raine, Adam J. Vanbergen, and Angela R. McLean, "A restatement of recent advances in the natural science evidence base concerning neonicotinoid insecticides and insect pollinators," The Royal Society Publishing (2015), 3 and 5.

PROTECTION OF POLLINATORS

APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.

Look for the bee hazard icon  in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

This product can kill bees and other insect pollinators.

EPA has recognized the risks associated with certain neonicotinoid pesticides. Since 2014, the agency has required that registered pesticide products with certain neonicotinoid active ingredients include a "pollinator protection box" on their labels. The box, which is reproduced in part at left, clearly states that application restrictions apply because the product can kill pollinators.

Neonicotinoids are systemic chemicals, which means that the plant absorbs them through their roots or leaves and transports them to the stems, leaves, flowers, and fruit. The fact that the entire plant becomes permeated with neonicotinoid insecticides means that nontarget organisms that rely on the plant for nectar, pollen, or other resources can be exposed orally even if they were not present at the time of the application.

Pesticide-Treated Seeds

One way to protect crops from pests is through the use of "treated seeds"—seeds that are coated in a pesticide active ingredient. In Minnesota, farmers may use neonicotinoid-treated seed when planting corn or soybeans, among other things.

The pollinator advocates we spoke with were more concerned about treated seeds than they were about pesticide drift from neonicotinoid pesticide applications. During the planting process, dust rises off the treated seeds and may drift into neighboring fields to be absorbed by neighboring plants. An additional concern is that a large percentage of the pesticide on treated seeds is absorbed by the soil and can make its way into surface water or groundwater sources.

The Minnesota Department of Agriculture does not have the authority to regulate treated seeds, which are considered "treated articles" under federal law.[a] As such, the packaging for treated seeds lacks the specific elements required of pesticide labels, including the EPA-required pollinator protection box described above, as well as the enforcement that goes with pesticide labeling.

[a] 40 *CFR*, sec. 152.25(a) (2017).

State Pollinator Protection Efforts

Just as the scientific community has increased its scrutiny of pesticides and pollinator health, the state of Minnesota has dedicated resources to studying the issue over the past several years. Concern over neonicotinoid pesticides led the Legislature to request MDA's 2016 special registration review, *Review of Neonicotinoid Use, Registration, and Insect Pollinator Impacts in Minnesota*.[10] Shortly after the release of MDA's report, former Governor Dayton issued an executive order creating the Governor's Committee on Pollinator Protection, which released its own set of recommendations in

[10] Minnesota Department of Agriculture, *Review of Neonicotinoid Use*. We discussed special registration reviews in Chapter 2.

2018.[11] The Governor also ordered multiple state agencies to collaborate and produce state agency pollinator reports annually.[12]

Recommended Actions for Pollinator Protection

Each of the reports mentioned above acknowledged that pesticides threaten pollinators and contains recommended actions designed to reduce the impact of pesticides.

The Minnesota Department of Agriculture has taken some recommended actions to protect pollinators.

In response to its own review of neonicotinoids, MDA has taken a number of actions to mitigate the impact of pesticides on pollinators. First, the department has completed a review of the labels of 60 top-selling neonicotinoid pesticide products. MDA reviewed the labels' pollinator-specific language and application rates and limits, among other things. MDA identified several issues and is now in communication with EPA regarding suggested label changes that would clarify instructions related to pollinator protection.

Second, MDA increased the number of pesticide-use or post-use inspections of neonicotinoid pesticide applications that it conducted during 2017. Staff reported that they generally found that applicators understood the pollinator boxes on the labels and applied the neonicotinoids according to the label specifications. Finally, MDA has created a number of "best management practices" related to neonicotinoid use and pollinator protection, including one related to pesticide application to crops and another on treated seeds. Best management practices, which we discuss further in Chapter 6, are voluntary practices that MDA encourages farmers to use in order to mitigate the effects of particular pesticides.

Some pollinator-related recommendations require legislative action.

MDA and the Governor's Committee on Pollinator Protection each made their own recommendations that require legislative action, none of which appear to be implemented.[13] While we did not evaluate the merits of each recommendation, we list a selection of

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[11] State of Minnesota Executive Order 16-07, "Directing Steps to Reverse Pollinator Decline and Restore Pollinator Health in Minnesota," August 25, 2016; and Governor's Committee on Pollinator Protection, *Recommendations for Pollinator Protection in Minnesota: Report to the Governor* (St. Paul, 2018). The committee consisted of 15 members with relevant experience in agriculture, conservation, academia, or local government.

[12] Interagency Pollinator Protection Team, *Minnesota State Agency Pollinator Report* (St. Paul, 2017, 2018, and 2019). In 2018, Governor Walz rescinded Governor Dayton's pollinator-protection order and replaced it with his own, which also requires annual reporting from the Interagency Pollinator Protection Team. State of Minnesota Executive Order 19-28, "Restoring Healthy, Diverse Pollinator Populations that Sustain and Enhance Minnesota's Environment, Economy, and Way of Life," April 5, 2019.

[13] MDA recommended that the Legislature establish a dedicated "pollinator protection account." Minnesota Department of Agriculture, *Review of Neonicotinoid Use*, 83. In 2017, the Legislature established a "pollinator habitat and research account." *Laws of Minnesota* 2017, chapter 88, art. 2, sec. 11, codified as *Minnesota Statutes* 2019, 18B.051. However, these revenues go to the University of Minnesota, and the MDA staff we spoke with did not know whether the money was being used for the purposes suggested in the report.

Recommendations for Legislature

- Give MDA the authority to regulate neonicotinoid-treated seeds (made by both MDA and the Governor's Committee)
- Establish a "crop pest loss indemnity fund" for farmers who avoid pollinator-harming pesticides (Governor's Committee)
- Adopt a statutory goal to reduce overall use of pesticides harmful to pollinators (Governor's Committee)
- Discontinue neonicotinoid seed treatments in soybeans (Governor's Committee)

recommendations made either by the Governor's Committee or both MDA and the committee in the box at left.[14]

RECOMMENDATION

The Legislature should revisit the recommendations made in recent state reviews of pollinator health.

Pollinator health is an issue of great concern, which the state has already spent considerable time studying. The Legislature should revisit the reports that it and Governor Dayton commissioned and consider taking further legislative action to protect pollinators.[15]

Integrated Pest Management

The reports discussed in the previous section each place an emphasis on the use of "integrated pest management" as a strategy for protecting pollinators and the environment.[16] Integrated pest management allows for pesticide usage, but only if there is a known threat that cannot be mitigated in more sustainable ways. MDA's various best management practices for pollinator protection suggest using integrated pest management.

Integrated Pest Management

Integrated pest management is a "long-term strategy to manage pests (weeds, insects, or diseases) without relying on pesticides as the first line of defense. It requires a systematic plan that includes monitoring and employing a combination of pest management tactics to control and prevent populations of pests before they cause economic or ecologic losses."

— 2017 Minnesota State Agency Pollinator Report

Minnesota statutes require that state agencies use integrated pest management techniques on state lands.[17] The Minnesota Department of Transportation, for example, uses integrated pest management when maintaining roadside rights-of-way. In addition to pesticides, the department uses mowing and prescribed fires to improve the safety

[14] Governor's Committee on Pollinator Protection, *Recommendations for Pollinator Protection in Minnesota*, ii; and Minnesota Department of Agriculture, *Review of Neonicotinoid Use*, 83.

[15] As of the publication of this report, the 2020 Legislature was considering a bill that would allow cities to adopt ordinance prohibiting the use of certain "pollinator-lethal" pesticides. H.F. 1255, 2020 Leg., 91st Sess. (MN).

[16] Minnesota Department of Agriculture, *Review of Neonicotinoid Use*, 81-82; Governor's Committee on Pollinator Protection, *Recommendations for Pollinator Protection*, 16; and Interagency Pollinator Protection Team, *State Agency Pollinator Report* (2019), 12-15.

[17] *Minnesota Statutes* 2019, 18B.063.

and aesthetics of roadside vegetation. Many local governments have also taken it upon themselves to use integrated pest management as a means of pollinator protection.[18]

Notification of Pesticide Applications

In its 2006 report, OLA noted that Minnesota statutes required advanced notice of pesticide application in only a few situations.[19] The report cited beekeepers as a population that could be adversely affected by pesticide applications and recommended that the Legislature require land managers to provide advanced notification of applications to beekeepers.[20]

While the Legislature has not required advanced notification of pesticide application to beekeepers, it did add statutory language providing for compensation when pesticides harm managed bees.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that the Legislature require land managers to provide advance notice about pesticide applications toxic to bees when nearby beekeepers request notification.

RECOMMENDATION NOT IMPLEMENTED

The Legislature has not amended statutes to require land managers to provide advance notice of pesticide applications to beekeepers.

While the Legislature did not adopt OLA's 2006 recommendation, it did enact legislation providing compensation for pesticide-related bee kills in 2014.[21] The Legislature then amended the section in 2015 to require that, as a condition for receiving compensation, bee owners must first be registered with "a commonly utilized pesticide registry program, as designated by the commissioner."[22] MDA's chosen registry program is "BeeCheck."[23] According to MDA's website, one of the purposes of BeeCheck is to allow applicators to take the precautions necessary to avoid injury to pollinators due to pesticide drift.[24] Pesticide applicators do not, however, have any legal responsibility to notify beekeepers of upcoming pesticide applications or to take any other specific action to prevent injury.

[18] In Minnesota, roughly 40 local governments, including St. Paul, Minneapolis, and Duluth, have pledged to become pollinator friendly and use integrated pest management and other pollinator-friendly practices on the land they manage, such as public parks and golf courses.

[19] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006), 56-57. For example, applicators must notify residents in advance of treating an area either for mosquitos or gypsy moths.

[20] *Ibid.*, 59.

[21] *Laws of Minnesota* 2014, chapter 312, art. 13, sec. 11, codified as *Minnesota Statutes* 2019, 18B.055. A "bee kill" is when a large number (hundreds) of bees die as a result of a single incident (including, but not limited to, pesticide exposure).

[22] *Laws of Minnesota* 2015, chapter 44, sec. 3, codified as *Minnesota Statutes* 2019, 18B.055, subd. 1(c). From 2015 to 2018, MDA conducted 15 bee-kill investigations, finding that 8 of them resulted from "acute pesticide poisoning." In three of those cases, the beekeeper was registered with MDA's pesticide registry program and was eligible for compensation.

[23] BeeCheck is administered by the nonprofit company FieldWatch, Inc., which also administers the DriftWatch registry for the registration of specialty crop growers, such as organic farmers, fruit producers, and Christmas tree growers. These growers can also be negatively impacted by pesticide drift.

[24] https://www.mda.state.mn.us/plants-insects/fieldwatch-driftwatch-beecheck-fieldcheck, accessed September 24, 2019.

We considered whether to again recommend that beekeepers be notified in advance of pesticide applications. We decided against doing so, because the option is neither practical nor popular, even with the population the recommendation would be designed to protect. MDA has explored the possibility of establishing a statewide apiary registry program in the past and found that the state's major beekeeping organizations were strongly opposed to registering hive locations.[25] Even if beekeepers receive advanced notice of a pesticide application, it is not always practical for beekeepers to confine their bees or move their hives. One beekeeping organization asserted that a registry and notification program would put the burden on beekeepers to protect their hives, when really the onus should be on pesticide applicators to use pesticides responsibly.

[25] Minnesota Department of Agriculture, *Feasibility of Re-Establishing an Apiary Program in Minnesota* (St. Paul, 2015), 3. Apiaries are places where one or more beehives are kept. Beekeepers expressed the desire to keep their hive locations private and stated that the farmers who hosted their hives would not welcome government inspectors on their property.


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Chapter 6: Monitoring and Best Practices

Water-quality monitoring is central to the Minnesota Department of Agriculture's (MDA) *Minnesota Pesticide Management Plan* and its efforts to protect the state's groundwater and surface water from pesticide-related contamination. The plan guides MDA's routine water-quality monitoring, its use of various water-quality standards and guidance values, and its development and promotion of best management practices aimed at reducing pesticide contamination.

The U.S. Environmental Protection Agency (EPA) has described MDA's water-quality monitoring program as "exceptional" and its water-quality monitoring reports as sufficiently "expansive" and "robust" to allow MDA "to identify problem areas and intervene where appropriate…."[1] In this chapter, we discuss our own evaluation of how MDA monitors the effects of routine pesticide use on Minnesota groundwater and surface water quality. We also discuss the department's process of developing and evaluating best management practices. At the conclusion of the chapter, we describe revisions that MDA made to the *Minnesota Pesticide Management Plan* in response to the Office of the Legislative Auditor's (OLA) 2006 *Pesticide Regulation* report.

Pesticide Monitoring

MDA has conducted routine monitoring of surface water and groundwater since 1991. In the sections that follow, we give an overview of MDA's routine water-quality monitoring program, its monitoring strategy, and the results of the department's monitoring efforts.[2]

Monitoring Overview

In this section, we discuss MDA's water-monitoring activities with a primary focus on the strategy and practices of its routine monitoring program. We also discuss the interagency cooperation that supports MDA's monitoring programs and introduce the health guidance values MDA uses to interpret monitoring results.

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[1] Tinka Hyde, Director, Land and Chemicals Division, U.S. Environmental Protection Agency, letter to Joshua Stamper, Director, Pesticide and Fertilizer Management Division, Minnesota Department of Agriculture, *Re: Fiscal Year 2018 Federal Insecticide, Fungicide, and Rodenticide Act Performance Partnership Grant No. BG537218—Year-end report*, April 2, 2019, 3; and Michael Harris, Acting Director, Land and Chemicals Division, U.S. Environmental Protection Agency, letter to Joshua Stamper, Director, Pesticide and Fertilizer Management Division, Minnesota Department of Agriculture, *Re: Fiscal Year 2017 Federal Insecticide, Fungicide, and Rodenticide Act Performance Partnership Grant No. BG537217—Year-end report*, February 15, 2018, 3.

[2] In this chapter, we limit our discussion to *water-quality* monitoring, which is the responsibility of the Pesticide and Fertilizer Management Division. MDA's Food and Feed Safety Division (which we did not evaluate) does a limited amount of testing of food commodities in grocery stores for pesticide residues. The division may also work with the Pesticide and Fertilizer Management Division to conduct pesticide misuse investigations (described in Chapter 4) when a food commodity has allegedly been affected by pesticide drift.

MDA has three approaches to pesticide-related water-quality monitoring.

	Purpose	Location
Routine monitoring	Monitor normal pesticide use to protect human health and aquatic life	Statewide
Private well sampling	Monitor pesticides in private wells with history of nitrate contamination	42 counties (as of 2019) in regions with row-crop agriculture[a]
Incident-based monitoring	Assess pesticide contamination and cleanup progress at incident sites	Locations of pesticide spills, releases, dumping, and chemical manufacturing

NOTES: MDA's Monitoring and Assessment Unit conducts routine and private well sampling. In contrast, MDA's Incident Response Unit supervises sampling and laboratory analysis at incident and accident sites.

[a] MDA plans to sample in an additional eight counties in 2020.

MDA Water-Quality Monitoring Activities

MDA's Pesticide and Fertilizer Management Division monitors and evaluates pesticide-related water-quality risks in three ways: (1) routine groundwater and surface water monitoring; (2) sampling of private-well drinking water in areas with row-crop agriculture and a history of nitrate contamination; and (3) monitoring in and around sites with high levels of contamination due to pesticide spills and other incidents. We summarize each approach in the box at left. For the purposes of our evaluation, we focused on MDA's routine monitoring program.[3]

MDA's routine water-quality monitoring program tracks how the ordinary application of pesticides affects overall groundwater and surface water quality throughout the state. It is broader than MDA's other monitoring programs, collecting the most samples and sampling from the most types of water statewide. Because of the routine program's focus on contamination from normal pesticide use, its results form the basis of "common detection" determinations in groundwater and "surface water pesticide of concern" determinations in surface water, discussed in the box on the next page. These determinations are the foundation of MDA's authority to develop and promote best management practices aimed at reducing or eliminating pesticide-related water contamination. We discuss best management practices in greater detail later in this chapter.

Groundwater vs. Surface Water

Groundwater is water that exists underground in saturated zones beneath the land's surface. The upper surface of the saturated zone is called the *water table*. The saturated zone beneath the water table is called an *aquifer*. Wells can be drilled into aquifers in order to access groundwater.

Surface water is water located above ground and includes streams, rivers, lakes, and oceans.

[3] MDA describes its routine pesticide-related water-quality monitoring as its "ambient program." For simplicity, we will refer to the ambient program as "routine" throughout this report. The program is "routine" because it relies upon repeated, deliberately scheduled monitoring. Furthermore, the aim of the program is to understand how routine pesticide use affects water quality over time.

Groundwater "Common Detection" vs. "Surface Water Pesticide of Concern"

Common Detection	Pesticide of Concern
• Defined by statute as *groundwater* "detection of a pollutant that is not due to misuse or unusual or unique circumstances, but is likely to be the result of normal use of a product or a practice"[a]	• Defined by MDA as *surface water* pesticide detection "at concentrations of concern relative to a water quality [guidance value], not due to misuse or unusual or unique circumstances, but likely to be the result of normal use of product or practice"[b]
• Defined in the *Minnesota Pesticide Management Plan* as any pesticide chemical frequently detected in groundwater due to normal use	• Defined in the *Minnesota Pesticide Management Plan* as any pesticide chemical detected at concentrations greater than 10 to 50 percent of a relevant water-quality guidance value

[a] *Minnesota Statutes* 2019, 103H.005, subd. 5.

[b] Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *Minnesota Pesticide Management Plan* (St. Paul, 2007), 65.

Monitoring Practices and Sampling Techniques

Water-quality monitoring involves taking field notes and measurements, collecting samples and delivering them to MDA's laboratory, and conducting quality-control activities to ensure the integrity of water sampling and analysis.[4]

MDA's monitoring practices and sampling techniques vary based on the water source and sampling locations' susceptibility to and history of pesticide contamination.

MDA groundwater sampling involves retrieving samples from rural and urban observation wells, domestic wells at private residences, and naturally occurring springs. When selecting wells to sample, MDA has prioritized regions with row-crop agriculture and soil types susceptible to pesticide contamination. In addition, MDA monitors groundwater quality in the Twin Cities Metropolitan area.

When MDA staff or their partners sample surface water, they dip sample containers below the surface of a water body such as a lake, stream, or river.[5] At certain surface water monitoring locations, MDA uses automatic sampling machines, which pump water into collection bottles at preset intervals when the water rises to a certain level.

[4] MDA's water-quality monitoring procedures include detailed descriptions of the steps MDA staff must take to ensure that water-quality sampling and analysis is consistent, accurate, and free from contamination. MDA's most recent water-quality reports indicate that MDA met its goals for sampling and laboratory quality in both 2017 and 2018. Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *2017 Water Quality Monitoring Report* (St. Paul, 2017), 2-10 and 3-2; and Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *2018 Water Quality Monitoring Report* (St. Paul, 2018), 2-12 and 3-2.

[5] MDA uses similar techniques for groundwater sampling of natural springs as they do for sampling surface water. MDA partners with a variety of groups to collect surface water samples, including the Minnesota Pollution Control Agency; Metropolitan Council; International Water Institute; and several watershed or soil and water conservation districts.

MDA collects more samples from locations with a history of pesticide contamination, most of which are located in agricultural areas. MDA also began a targeted urban surface water monitoring program in 2006.

In order to understand how pesticide-related chemicals move through the atmosphere, MDA also collects rainwater at three locations where agricultural production is common.

Interagency Cooperation in Water-Quality Monitoring

Statutes assign responsibility for the protection of Minnesota groundwater to multiple state agencies, including MDA, the Minnesota Pollution Control Agency, the Minnesota Department of Natural Resources, and the Minnesota Department of Health.[6] The responsibilities of various state agencies are described in Exhibit 6.1.

Different state and local authorities monitor water quality or use monitoring results for different purposes. While some organizations and agencies collect and analyze samples, others conduct scientific research so that sample results can be interpreted with reference to human health risk and environmental quality. Additionally, some agencies coordinate sample collection at the local level or educate local officials and the public regarding the health and environmental implications of sample results.

Water-Quality Guidance Values

Once MDA's Monitoring and Assessment Unit receives water-sample test results from the laboratory, staff compare detected pesticide concentrations to available pesticide-specific water-quality guidance values to draw conclusions regarding the state's water quality.[7] As Exhibit 6.2 demonstrates, the guidance values MDA uses come from a variety of sources and in different forms, but they all represent levels of pesticide concentrations in water at or below which the publishing agency does not anticipate negative health effects (for humans or aquatic life). Guidance values vary depending on the state or federal regulator responsible for issuing them, whether they are a formal regulatory standard or advisory in nature, whether they are applied to surface water or groundwater, and the health and ecological basis upon which they were developed.

The Minnesota Department of Health (MDH) is responsible for the vast majority of guidance values that MDA uses for its groundwater assessments. MDH develops its guidance values with reference to the human health effects of water consumption over both the short and long term, but MDA typically utilizes chronic (long-term) values. Chronic values tend to be lower than values based on shorter durations.

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[6] *Minnesota Statutes* 2019, 103A.204. In addition, statutes assign the Minnesota Environmental Quality Board the responsibility of coordinating and reporting on state agencies' groundwater protection programs.

[7] Different state and federal agencies refer to water-quality "guidance values," "reference values," "standards," and "benchmarks." Although MDA uses the term "reference values," we use the term "guidance values" to encompass all of these sets of values.

Exhibit 6.1: Multiple state agencies monitor water quality.

	Minnesota Department of Agriculture (MDA)	Minnesota Pollution Control Agency (MPCA)	Minnesota Department of Health (MDH)	Department of Natural Resources (DNR)
Groundwater				
Purpose of monitoring	Detects pesticides and pesticide breakdown products in urban and rural areas[a]	Detects nonagricultural contaminants in urban areas, including residential, commercial, and industrial areas	Oversees local monitoring of treated drinking water and samples treated water; develops heath guidance values for drinking water; monitors for pesticides, and industrial and pharmaceutical chemicals[b]	Monitors water supply levels including aquifers
Collaboration with MDA	NA	In 2018, collected pesticide samples from 20 wells in its urban well network on behalf of MDA	Provides MDA with human health guidance values	Under contract to construct and maintain MDA wells; provides geology and hydrology sensitivity assessment mapping to guide MDA pesticide monitoring efforts; MDA also samples DNR observation wells and natural spring hatcheries
Surface Water				
Purpose of monitoring	Detects pesticides and pesticide breakdown products in urban and rural areas	Determines water body impairments	Oversees local monitoring of treated drinking water and samples treated water[b]	Monitors water supply including flows and levels of surface water bodies
Collaboration with MDA	NA	Provides MDA with aquatic life guidance values; makes pesticide-related water body impairment designations	NA	Provides geology and hydrology assessments, precipitation monitoring, and mapping to guide MDA pesticide monitoring efforts

[a] MDA is the agency responsible for pesticide monitoring in urban areas, but it does not collect groundwater samples at urban sites within the Twin Cities metropolitan area. MDA's laboratory analyzes urban samples collected by MPCA.

[b] As part of its oversight responsibilities under the Safe Drinking Water Act of 1974, MDH ensures that select pesticides (in addition to certain pharmaceutical and industrial chemicals) are included in public water system water-quality monitoring. Public Law 93-523, codified as 42 *U.S. Code*, sec. 300f-300j (2019). MDH-conducted monitoring of treated drinking water from groundwater and surface water sources includes pesticides.

SOURCE: Office of the Legislative Auditor.

Exhibit 6.2: The Minnesota Department of Agriculture uses guidance values to assess the state's water quality.

Guidance Value	Agency	Rule or Guidance	Scientific Basis
Groundwater assessment			
Health risk limit	MDH	Rule	Chronic exposure for vulnerable groups such as infants and young children
Health based value	MDH	Guidance	Chronic exposure for vulnerable groups such as infants and young children
Risk assessments advice	MDH	Guidance	Chronic exposure for humans
Rapid assessment value	MDH	Guidance	Chronic exposure for humans; different values for cancer or non-cancer risk
Maximum contaminant level	EPA	Rule	Chronic exposure for humans
Surface water assessment			
Chronic standard	MPCA	Rule	Chronic/maximum level for aquatic life, human recreation, and drinking water
Benchmark value[a]	EPA	Guidance	Acute/chronic exposure for aquatic life

NOTES: "MDH" is the Minnesota Department of Health. "EPA" is the U.S. Environmental Protection Agency. "MPCA" is the Minnesota Pollution Control Agency. A given pesticide may have different guidance values based on the duration of exposure. For MDH and EPA human health (drinking water) guidance values, MDA typically uses the value associated with "chronic" exposure, which corresponds to repeated pesticide consumption for more than 10 percent of a lifetime. MDA does, however, use "acute" guidance values when they are the most conservative values available. "Acute" corresponds to pesticide exposure for up to 24 hours. MPCA "chronic" and "acute" standards vary depending upon whether they incorporate human health or are based only on aquatic life. MPCA human health "chronic" limits correspond to safe concentrations of pesticides for exposures of 30 days or less. MPCA aquatic-life "chronic" limits correspond to safe concentrations of pesticides for exposures of 4 days or less.

[a] EPA aquatic life benchmarks are based upon toxicity to fish, invertebrates, or plants. Benchmark values vary by duration (acute or chronic). Maximum durations for pesticide exposures that are not expected to be toxic to aquatic life typically range between 48 hours and less than ten days.

SOURCES: Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *2018 Water Quality Monitoring Report* (St. Paul, 2019), 2-11 and 3-17; 40 *CFR*, sec. 141.61(c) (2020); and *Minnesota Rules*, 7050.0222, subps.1-7, published electronically September 10, 2018.

In contrast to groundwater, MDA's surface water guidance values come from MPCA. For pesticides that lack an MPCA water-quality standard, MDA uses EPA's aquatic life guidance values. Unlike groundwater, human health considerations are not MDA's only consideration in choosing surface water guidance values. MDA evaluates surface water detections relative to the "lowest applicable aquatic life or human health (where applicable) water quality reference value."[8] Even when MPCA classifies water bodies to support bathing, water recreation, and a drinking water supply, maintaining a healthy community of aquatic life remains a key priority. Due to aquatic life's greater sensitivity to pesticide contamination as compared with humans, surface water guidance values are often more conservative than groundwater guidance values developed to protect human health alone.

[8] Minnesota Department of Agriculture, *2018 Water Quality Monitoring Report*, 3-17 and 3-40.

Monitoring Strategy

We focused our analysis on two key aspects of MDA's monitoring strategy: its selection of pesticide-related chemicals to monitor and its selection of monitoring locations. To do so, we analyzed the water-quality monitoring data that MDA submits to the federal Water Quality Portal.[9]

A review of MDA monitoring data, which goes back as far as 1991, shows a large amount of growth in both the number of sampling locations and chemicals analyzed. For the purposes of evaluating MDA's overall monitoring approach, the period from 2009 through 2018 is particularly important. This period corresponds to the ten years after the 2008 passage of the Clean Water, Land, and Legacy Amendment, which had a transformative impact on MDA's monitoring capabilities.[10] As such, 2009 represents the beginning of MDA's monitoring program as it exists today.

Pesticide Analytes and Laboratory Methods

MDA's Laboratory Services Division analyzes water samples for pesticide-related chemicals using different methods. MDA designed each method to detect specific sets of pesticide chemicals and their breakdown products. The distinct pesticide-related chemical compounds MDA chooses to test for with a given method are called analytes. MDA tailors its sample analysis methods to account for the type of sample collected, when sample collection occurred, and characteristics of the sampling location, such as urbanization, history of pesticide contamination, and status as a drinking water source. As a result, MDA tests many samples for only a subset of possible analytes.

Analyte

An ***analyte*** is a pesticide chemical compound or pesticide breakdown product that MDA tests for with one of its laboratory methods.

A ***breakdown product*** (degradate) is a chemical compound formed when water, sun, air, bacteria, or other naturally occurring chemicals break down a pesticide chemical.

A ***parent chemical*** is a pesticide that breaks down into other compounds.

The analytical capacity of the Minnesota Department of Agriculture's laboratory has expanded over time, and its analyte-selection criteria appear reasonable.

[9] The Water Quality Portal is a cooperative effort of the U.S. Geological Survey, EPA, and the National Water Quality Monitoring Council. The portal provides public access to MDA's routine water-quality monitoring data as well as water-quality data from other state and local governments, watershed groups, and federal agencies. https://www.waterqualitydata.us/, accessed September 4, 2019.

[10] In 2008, Minnesota voters approved the Clean Water, Land, and Legacy Amendment to the Minnesota Constitution, authorizing a 25-year increase in the state's sales-use tax to be used for purposes specified by the amendment. *Minnesota Constitution*, art. XI, sec. 15. One-third of the proceeds goes to the Clean Water Fund to restore, protect, and enhance water quality. The Clean Water Fund appropriations that MDA received beginning in 2010 have allowed the department to upgrade equipment and add staff, expanding its analytical capabilities. In addition, MDA used a one-time appropriation from the Environment and Natural Resources Trust Fund to acquire new analytical equipment.

In 2010, with funds from the Clean Water Fund and other grants, MDA more than doubled the number of its analytes from around 50 to 113. Since 2010, MDA's laboratory has increased the number of analytes every year. In 2018, MDA's laboratory tested 155 pesticide-related chemicals as part of its routine monitoring program.[11]

In 2018, MDA analyzed

155

distinct pesticide-related chemicals.

Given that there are more than 5,700 different pesticide products sold in Minnesota, MDA weighs numerous considerations when selecting which pesticide active ingredients and pesticide breakdown products to analyze. In May 2019, the department formed a pesticide-selection working group made up of MDA, MDH, and MPCA staff. For each pesticide compound, MDA and its partners evaluate (1) the chemical's toxicity to humans and aquatic organisms; (2) how much of the chemical is sold and how it will be used in Minnesota; (3) the chemical's "environmental fate"—whether the chemical is likely to end up in groundwater or surface water due to its propensity to break down, its persistence in soil, and its water solubility; and (4) whether MDA's laboratory has the technical capacity to reliably test for the chemical.[12]

Of all the criteria MDA considers when selecting analytes for testing, MDA staff stated that human toxicity is weighted most heavily, particularly when there is a high likelihood that a particular pesticide could leach into groundwater and threaten drinking water sources. MDA also gives added weight to aquatic life when a particular chemical is likely to run off into surface water.

Limitations to the Minnesota Department of Agriculture's current laboratory methods prevents it from analyzing certain pesticides, including three commonly sold pesticide active ingredients or breakdown products with medium-to-high toxicity.

According to MDA staff, certain chemicals are nearly impossible to test reliably or quickly given current MDA laboratory instruments or methods. These technical limitations exist, in part, because MDA developed its laboratory methods so that it could test for many different pesticide chemicals simultaneously using the same laboratory procedure. MDA has explored the feasibility of adding certain analytes to its current methods. Since 2012, MDA has determined that 14 different potential analytes either cannot be tested with current MDA methodologies or they can be tested but only if they were analyzed separately from other analytes with a new, pesticide-specific method.[13]

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[11] Since 1991, MDA has tested for a total of 166 distinct pesticide-related chemical compounds in its ambient monitoring program. MDA staff periodically reevaluate the list of analytes because the sale and use of pesticides change over time. MDA staff told us they consider removing chemicals that have been banned for a long time or chemicals that they have never detected in the state and do not expect to detect in the future.

[12] When evaluating the environmental fate and risks of specific pesticide chemicals, MDA uses EPA, U.S. Geological Service, and academic research regarding the pesticide's chemistry, toxicity, ease of detection, and movement through water and soil.

[13] An additional six potential analytes passed initial feasibility tests, but MDA refrained from further testing. MDA did not pursue further testing due to the limited use of these pesticides in Minnesota. Since their state registration in 2012 or 2013, annual sales for each of these six pesticide active ingredients have not exceeded 5,000 pounds in any year. In contrast, annual sales for the 25th most-common pesticide active ingredient exceeded 530,000 pounds in 2017.

When difficult-to-test chemicals are sufficiently common and pose threats to human health, MDA has made the investments necessary to develop pesticide-specific laboratory methods. Glyphosate, one of the most heavily used herbicides across Minnesota, and its breakdown product aminomethylphosphonic acid, are examples. Since MDA could not reliably test for glyphosate along with other chemicals using its preexisting methods, MDA developed glyphosate-specific laboratory methods and has conducted glyphosate testing since 2012.

Our review of pesticide sales and monitoring data revealed that 41 pesticide active ingredients sold most commonly from 2010 to 2017 are not included among MDA's current analytes.[14] MDA stated that the exclusions of most of the chemicals were justified because they had limited toxicity, patterns of use that make water contamination unlikely, or both, as shown in the box at right. In the case of five pesticide-related chemicals, however, MDA does not monitor for them due to limitations in laboratory methodologies and equipment.

Of the 41 commonly sold pesticide active ingredients that MDA does not monitor…

- 30 pesticide ingredients have chemical properties that lead to rapid breakdown in the environment, limit mobility in water, or make them indistinguishable from naturally occurring compounds.
- 21 pesticide ingredients had use patterns that make water contamination unlikely.
- 5 chemicals (3 pesticide ingredients and 2 pesticide breakdown products) are not analyzed due to technical, methodological, or resource limitations of MDA's laboratory.
    - 3 of these 5 chemicals are excluded due to technical limitations and are **moderately to highly toxic** to humans or aquatic life.

Of the five chemicals not tested due to technical limitations, MDA stated that three have medium-to-high toxicity to humans, aquatic life, or both.[15] EPA classifies one of these three chemicals, triphenyltin, as restricted use, meaning it can be purchased and used only by licensed or certified pesticide applicators. All three of the toxic but unmonitored chemicals are either agricultural pesticides or a breakdown product of an agricultural pesticide.

MDA monitoring staff said that that they have previously made efforts to monitor for all three of the commonly sold, toxic, and unmonitored pesticide-related chemicals that we identified. For these chemicals, MDA's laboratory either (1) tried and failed to test for the chemical, or (2) has found that the chemical can be tested only by itself (and thus cannot be added to existing laboratory methods). MDA staff stated that the Monitoring and Assessment Unit is in ongoing discussions with the Laboratory Services Division about how to test for currently unmonitored chemicals, including the three chemicals discussed above.

[14] We compared MDA's analytes with a list of 69 chemicals that had been in the top 25 pesticide ingredients sold for at least one year from 2010 to 2017.

[15] These toxic chemicals include the active ingredient glufosinate-ammonium, as well as breakdown products triphenyltin hydroxide and ethylenethiourea (ETU). The commonly sold "parent" chemicals of these breakdown products are triphenyltin and mancozeb.

RECOMMENDATION

The Minnesota Department of Agriculture should continue or resume its efforts to test for all high-risk pesticide-related chemicals that are toxic to humans or aquatic life.

If a pesticide is commonly sold in Minnesota, and if it or its breakdown products are considered toxic, it is important for MDA to monitor whether those pesticide-related chemicals are appearing in groundwater or surface water around the state. At present, MDA does not know whether the three chemicals discussed in the previous section have contaminated Minnesota waters or the extent to which they may be impacting humans and aquatic life. Without this monitoring data, MDA lacks the scientific basis with which to develop best management practices or further regulate the chemicals.

MDA could conduct pilot studies in order to gain a better understanding of the risks posed by the commonly sold and toxic pesticide-related chemicals that the department cannot currently analyze. MDA could conduct project-based sampling, targeting areas of Minnesota where a currently unmonitored chemical is used most widely (whether urban or rural). The department could then have that limited number of samples analyzed by a non-MDA laboratory with the necessary capabilities. The results of such a pilot study would inform MDA's investment decisions concerning laboratory methods, equipment upgrades, and staffing.

Monitoring Locations

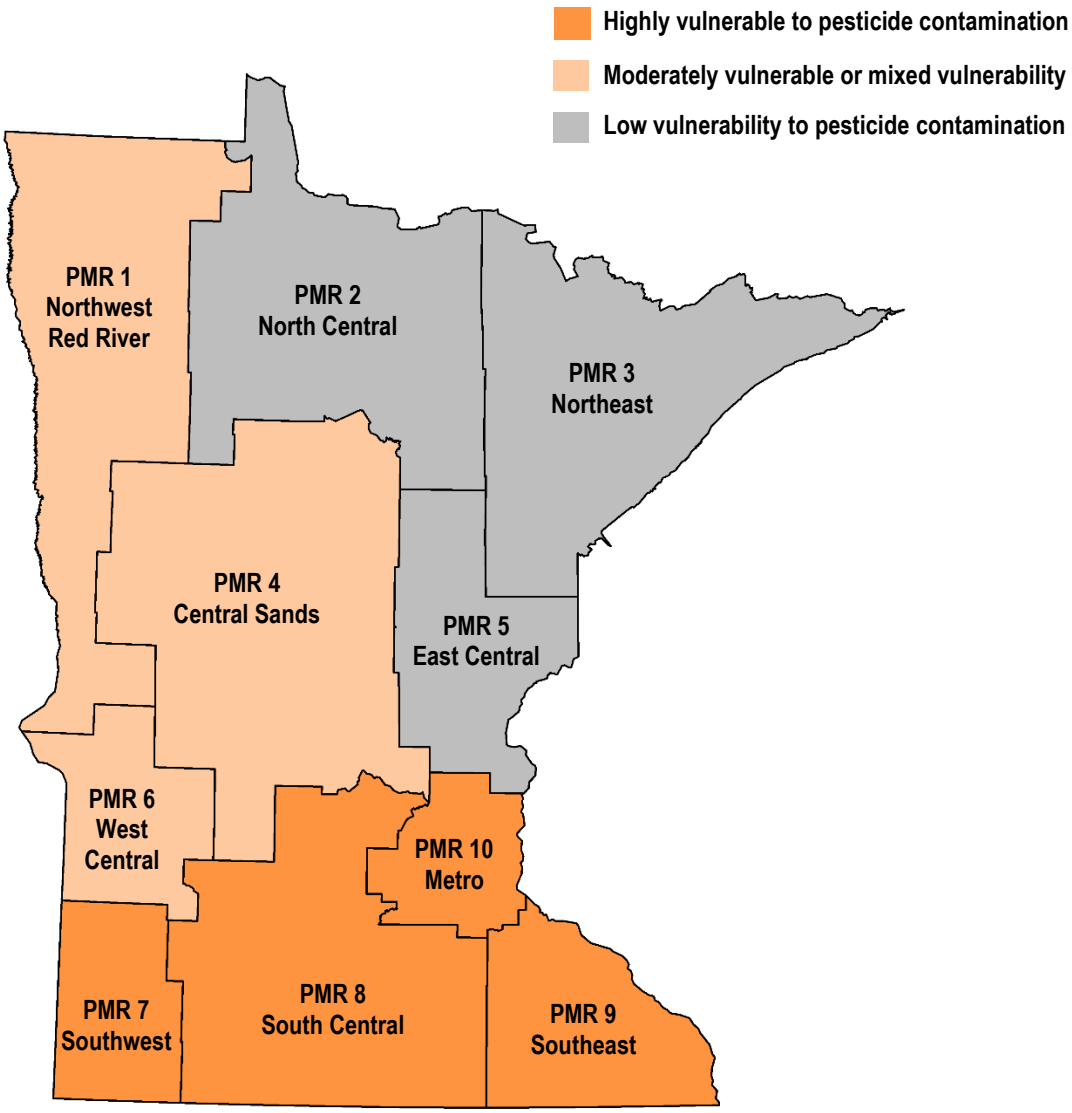
MDA staff collected pesticide-related water samples at roughly 1,000 locations across the state from 2009 to 2018. About 30 percent (294) of these locations were groundwater wells, sampled spigots, or natural springs. About 70 percent (704) of the locations were for surface water sampling.

The Minnesota Department of Agriculture selects its monitoring locations based on a reasonable assessment of regions' vulnerability to pesticide contamination.

MDA distributes its monitoring locations across ten "pesticide monitoring regions" (PMRs), shown in Exhibit 6.3. Each region represents a grouping of Minnesota counties with similar agricultural practices, soil characteristics, geology, watersheds, and aquifers.[16] Different PMRs vary in terms of pesticide exposure (amount of agriculture) and sensitivity to pesticides (the natural features of the land and water). As such, MDA monitors some PMRs more heavily than others. MDA collects samples more frequently and from more locations in PMRs with the highest levels of agricultural production and soil conditions that increase the transmission of pesticides into groundwater or surface water. MDA also responds to previous sampling results by more frequently sampling PMRs with histories of pesticide contamination.

[16] Groups of surface water bodies are often organized into watersheds. A watershed is an area of land in which all streams and rainfall drain to a common outlet, such as a reservoir, a bay within a lake, or into a larger stream or river.

Exhibit 6.3: Pesticide monitoring regions vary in their vulnerability to pesticide contamination.



NOTES: "PMR" is pesticide monitoring region. Borders of PMRs correspond to county lines. We determined a region's vulnerability based on the combination of its geography, the sensitivity of its soil to surface activity, and the likelihood of pesticides impacting that soil.

SOURCE: Office of the Legislative Auditor.

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA increase its water monitoring activities to include surface water locations in sensitive urban areas and, at a minimum, test the samples taken from these areas for nonagricultural pesticides.

RECOMMENDATION FULLY IMPLEMENTED

MDA has established a small number of surface water-quality monitoring locations in the Metro PMR. The department tests for all *commonly sold* nonagricultural pesticides that could reasonably pose a threat to human or aquatic life.

Metropolitan Area Water-Quality Sampling

In the years following OLA's 2006 *Pesticide Regulation* evaluation report, MDA expanded its monitoring presence in and around the Twin Cities Metropolitan area. MDA tests for—or has a scientifically justified rationale for not testing for—all commonly sold nonagricultural pesticides. In this section, we focus on MDA's selection of monitoring locations within the seven counties of the Metro PMR as well as specially designated "urban" surface water monitoring locations in Ramsey, Hennepin, and Washington counties.[17]

Since it contains agricultural, transitional, suburban, and dense urban areas, the Metro PMR is the most diverse in the state in terms of land use and surface activity. MDA's monitoring strategy reflects this diversity. By sampling Metro PMR locations outside of the Twin Cities, MDA tracks water-quality in transitional areas where both agricultural and nonagricultural pesticide use is common. By sampling "urban" locations within or immediately bordering Hennepin and Ramsey counties, MDA can monitor pesticide contamination in the state's most urbanized watershed.

From 2006 to 2018, the Minnesota Department of Agriculture increased the number of groundwater and surface water monitoring locations in the Twin Cities Metropolitan Area.

Since 2006, MDA has increased the number of *groundwater monitoring* locations within the Metro PMR. After numbering in the single digits between 2006 and 2010, the number of Metro PMR groundwater sampling locations was between 17 and 20 each year from 2014 to 2018. In 2018, the department's partners collected 20 pesticide samples from 20 Metro PMR groundwater monitoring locations. The 20 sampling locations reflected the diversity of the Metro PMR: 6 monitoring locations were distributed across the densely urban Hennepin County and the remaining 14 locations were distributed across Anoka, Dakota, and Washington counties.

The number of *surface water* monitoring locations within the Metro PMR has also increased significantly since 2005, when there were only six locations in the entire region. From 2014 to 2018, MDA monitored an average of 14 surface water locations in the Metro PMR each year. In each of these years, MDA designated at least five of these Metro PMR locations as "urban" due to their location within a uniformly urban watershed.[18] In 2018, MDA had five urban surface water locations across Hennepin, Ramsey, and Washington counties.

[17] The seven counties of the Metro PMR are Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties.

[18] MDA began a more targeted urban stream monitoring program within the Metro PMR in 2006. From 2006 to 2018, it has monitored between five and eight urban stream locations each year, as well as urban lake, river, and wetland monitoring on a rotating basis.

Monitoring Results

In order to give historical context to recent levels of pesticide contamination in Minnesota waters, we evaluated trends in pesticide detections resulting from routine monitoring from 1991 through 2018.

Rates of Detection

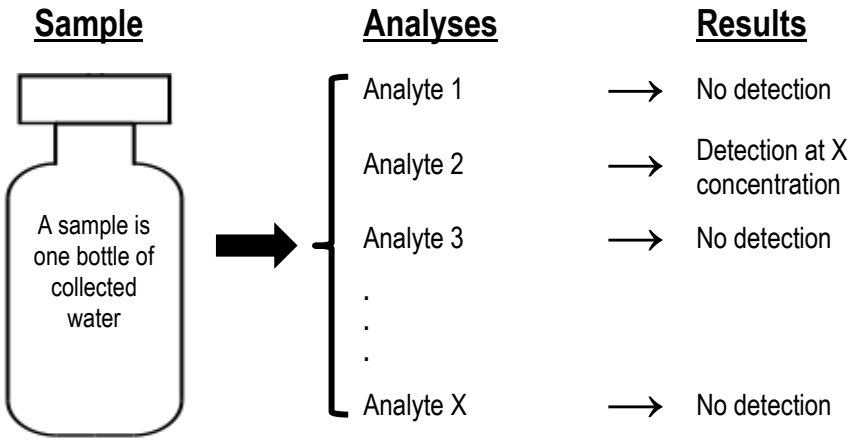
In this section, "detections" include any and all quantifiable concentrations of pesticide-related chemicals, regardless of size.[19] In many instances, detected concentrations are extremely low, sometimes as low as one part per trillion.[20] Most detected chemicals are found in quantities so small that they do not pose a risk to human health.

Method Reporting Limit

A ***method reporting limit*** is a limit at or above which a pesticide's concentration within a sample can be reliably detected and quantified. Each pesticide analyte's limit is dependent upon the pesticide's chemical properties and laboratory method.

As shown in Exhibit 6.4, we can discuss monitoring detections either in terms of "samples" or "analyses."

Exhibit 6.4: The Minnesota Department of Agriculture tests each sample for multiple chemical analytes, each of which yields its own detection result.



NOTES: When a specific pesticide-related chemical is tested with a specific laboratory method, it is considered an analyte. All detections indicate a concentration greater than or equal to the method reporting limit for that chemical.

SOURCE: Office of the Legislative Auditor.

[19] A "detected" pesticide is a pesticide analyte whose concentration within a sample is above its method reporting limit. When a pesticide analysis results in "no detection," it does not necessarily mean that the pesticide was absent from the sample. Instead, a result of "no detection" indicates that MDA's laboratory could not reliably quantify a pesticide analyte's concentration due to its small or nonexistent amount within the sample.

[20] One part per trillion is equivalent to one drop of water in 20 Olympic-sized swimming pools.

The Minnesota Department of Agriculture detected pesticide ingredients in 82 percent of routine water-monitoring *samples* from 1991 to 2018. However, only 6 percent of *individual pesticide analyses* resulted in detections.

From 1991 to 2018, detections of pesticide-related chemicals were concentrated in surface water.

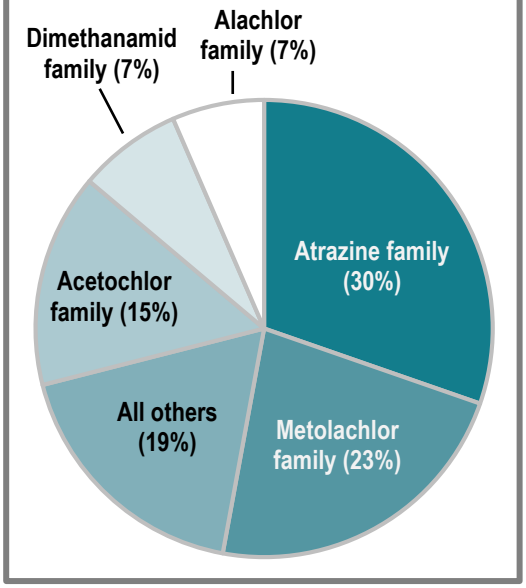
	Groundwater	Surface Water
Number of analyses	397,115	580,742
Number of detections	14,302	43,179
Detections as percentage of analyses	4%	7%
Groundwater and surface water detections as percentage of total (58,290) detections[a]	**25%**	**74%**

[a] Percentages in final row do not sum to 100 because total includes rainwater and wetland detections, in addition to groundwater and surface water detections.

Effectively, 82 percent of the bottles of water MDA has tested between 1991 and 2018 contained detectable amounts of at least one pesticide-related chemical. However, MDA tests all samples for multiple pesticides, as shown by Exhibit 6.4. Six percent of individual analyses since 1991 indicated a positive detection. As shown in the box at left, detections were more numerous in surface water as compared with groundwater.

Of the 166 distinct pesticide-related chemicals included in routine monitoring at any point between 1991 and 2018, MDA has detected 105 of them in Minnesota waters. Despite the apparent diversity in detected chemicals, a handful of chemicals (atrazine, metolachlor, acetochlor, alachlor, dimethenamid, and 12 of their breakdown products) made up 81 percent of all detections from 1991 to 2018.[21] Other frequently detected pesticide-related chemicals are "2,4-D" and the metribuzin family of compounds, but they made up only 3.5 and 1.5 percent of total detections, respectively, since 1991. Individually, the remainder of detected pesticide chemicals each comprise 1 percent or less of total detections.

Five pesticide chemicals and their breakdown products made up 82 percent of all detections from 1991 to 2018.



Despite testing for a wider range of pesticides and sampling more locations more frequently, rates of pesticide detection have not substantially increased since 1991.

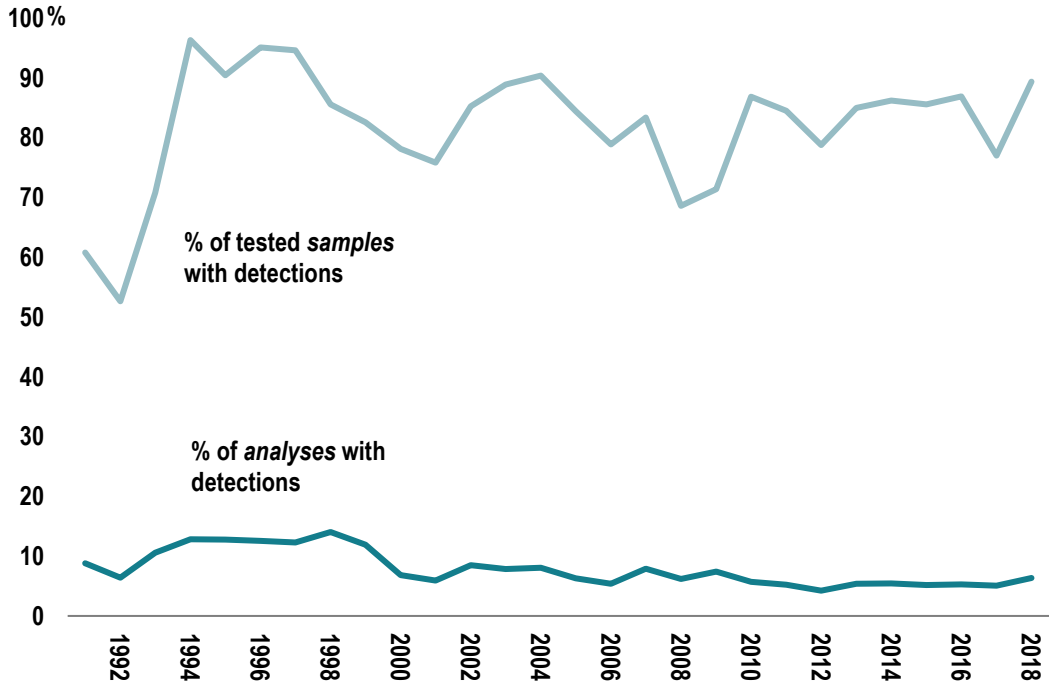
Since 1991, the number of detections per year has increased significantly, but it would be incorrect to attribute this, necessarily, to increased pesticide-related pollution. The increase in the number of detections may be due to more frequent sampling and improved laboratory capabilities that allow for testing a larger number of analytes at lower concentrations.[22]

[21] As of 2016, alachlor is no longer an EPA- or MDA-registered pesticide active ingredient.

[22] In the 1990s, MDA collected an average of 211 samples per year, producing an annual average of 3,532 analyses. In the 2010s, MDA collected an average of 975 samples per year, producing an annual average of 85,620 analyses.

As Exhibit 6.5 shows, the increased number of samples was not correlated with increases in the percentage of total samples or total individual analyses that resulted in a detection. Samples with detections as a percentage of total samples averaged 81 percent prior to 2010 and 84 percent between 2010 and 2018. Detections as a percentage of total individual analyses averaged 9 percent prior to 2010, but decreased to 5 percent between 2010 and 2018. MDA laboratory analysis, measured in terms of total number of analyses and distinct chemicals tested, reached its peak in 2018. While this unprecedented level of laboratory testing led to a greater percentage of samples with detections, the percentage of individual analyses that tested positive for pesticides remained identical to the 1991-2018 average of 6 percent.

Exhibit 6.5: The rate of detection per individual pesticide analysis has remained low over time.



NOTE: This exhibit includes both groundwater and surface water samples, as well as a small number of other samples, tested from 1991 to 2018.

SOURCE: Office of the Legislative Auditor, analysis of U.S. Environmental Protection Agency Water Quality Portal Data, 1991-2018.

Detections by Pesticide Monitoring Region

We analyzed the number of detections per sample and per individual analysis for the ten PMRs since 2009. As Exhibit 6.6 shows, MDA's intensive monitoring of areas with more sensitive soils or more intensive agricultural production is warranted. The Southeast Karst and South Central pesticide monitoring regions lead all other regions in terms of both the percentage of samples with detections and the percentage of total analyses that resulted in detections. Over the last ten years, the other agricultural PMRs fell roughly in line with recent averages in terms of percentage of samples with detections, percentage of analyses with detections, or both.

Exhibit 6.6: The Southeast Karst and South Central pesticide monitoring regions are the most heavily tested regions and exhibited elevated detection levels since 2009.

Pesticide Monitoring Region	Total Number of Samples	Percentage of Samples with Detections	Total Number of Analyses	Percentage of Analyses Resulting in Detections	Number of Distinct Analytes Detected
Southeast Karst	1,671	95%	145,964	7%	68
South Central	2,365	92	150,297	7	65
Metro	1,238	88	120,144	6	78
Southwest	528	87	40,755	5	55
West Central	556	81	44,695	5	50
Central Sands	1,510	80	163,392	4	51
East Central	403	70	35,738	3	29
Northwest Red River	982	62	75,773	5	63
North Central	56	13	2,990	<1	4
Northeast	117	6	10,707	<1	7
Total	9,426	83%	790,455	5%	103

NOTE: This exhibit includes both groundwater and surface water samples, as well as a small number of other samples, tested from 2009 to 2018.

SOURCE: Office of the Legislative Auditor, analysis of U.S. Environmental Protection Agency Water Quality Portal Data, 2009-2018.

Rates of pesticide detection and the diversity of detected pesticide chemicals in the Twin Cities Metro region reveal that pesticide contamination is not limited to rural areas with intensive agricultural production. As Exhibit 6.6 shows, the Metro PMR ranks third out of ten PMRs in terms of both percentage of samples with detections and percentage of individual analyses with detections. From 2009 to 2018, MDA found 78 distinct chemicals in the Metro PMR water, but only 68 different chemicals in the Southeast Karst region, the next closest PMR in terms of the diversity of detected chemicals.

Detections Approaching or Exceeding Drinking Water Guidance Values

When MDA detects pesticide-related chemicals in Minnesota's groundwater or surface water, it compares the concentrations to guidance values developed by state and federal agencies.

The Minnesota Department of Agriculture's analysis of pesticide detections is appropriately conservative.

MDA uses two strategies that allow it to make conservative judgements about the state of Minnesota's waters: (1) it uses the most conservative available health-based guidance values, and (2) it tracks pesticide detections at specific thresholds below those guidance values.

MDH has a number of different types of guidance values, explained previously in this chapter. MDA typically compares groundwater pesticide detections with the *chronic* human health-based value MDH has published for the analyte.[23] Chronic guidance values tend to be lower than MDH's acute or short-term human health-based values. MDA compares surface water pesticide detections with the most conservative MPCA aquatic-life toxicity standards. If an MPCA standard is unavailable for a pesticide-related chemical, MDA will use an EPA aquatic-life benchmark value.

In addition to tracking detections that exceed guidance values, MDA analyzes detections that *approach* guidance values in order to take mitigating action before an exceedance occurs. In surface water, for example, MDA flags all surface water pesticide detections greater than 10 or 50 percent (depending on the pesticide) of relevant aquatic-life guidance values for the purposes of designating surface water "pesticides of concern" and preventing MPCA surface water impairments.[24]

Detection vs. Exceedance

Detection: any detected pesticide concentration that can be reliably quantified (in other words, above method reporting limit)

Exceedance: any detected pesticide concentration that is above a relevant human or aquatic health-based guidance value

We conducted an independent comparison of detected pesticide concentrations against human-health guidance values.[25] We compared both groundwater and surface water concentrations against MDH drinking water guidance values. For pesticide chemicals

[23] MDH and EPA develop all of their guidance values for specific pesticide chemicals rather than families of pesticide chemicals. However, not all MDA-monitored pesticides or pesticide breakdown products have MDH or EPA guidance values. To overcome this limitation, MDA often "conservatively assumes, by default" that guidance values for a specific pesticide chemical can be applied to that chemical's breakdown products. This allows MDA to compare a larger number of detected concentrations against human health guidance values when assessing groundwater quality. Minnesota Department of Agriculture, *2018 Water Quality Monitoring Report*, 2-11.

[24] Under *Minnesota Rules*, 7050.0150, subp. 1, published electronically November 20, 2017, MPCA can designate a surface water body as impaired if pollution results in degradation of the physical, chemical, or biological qualities of the water body. *Minnesota Rules*, 7050.0219-0227, define the water standards that must be violated for MPCA to designate a water body as impaired. For groundwater, MDA evaluates trends in median, select percentiles above the median, and maximum concentrations of detected pesticides in groundwater for comparison with relevant guidance values. It also flags some pesticide detections at greater than 50 percent of relevant guidance values.

[25] Our analysis of routine monitoring data was not meant to recreate MDA's analyses as reported in its annual water monitoring reports. MDA includes guidance values applicable to aquatic life, which tend to be more conservative than guidance values for drinking water.

that did not have corresponding health department guidance values, we used the lowest available EPA or U.S. Geological Survey guidance value.[26]

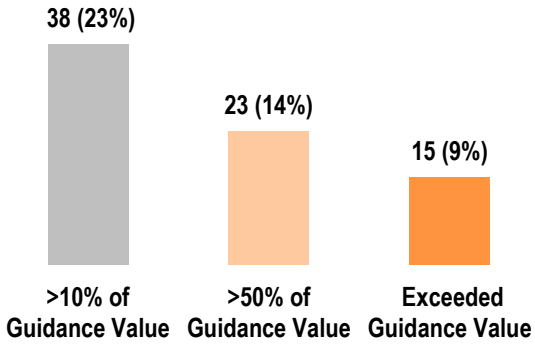
Pesticide concentrations approaching or exceeding human-health guidance values are infrequent, but have occurred.

Nearly 2 percent of the 15,910 samples (from both groundwater and surface water locations) collected from 1991 to 2018 contained pesticide concentrations that exceeded drinking water safety limits.[27] Stated differently, less than 0.6 percent of all detections (51,923) exceeded drinking water safety limits. The bulk (266 of 271) of the samples with exceedances were collected from surface water locations.

We analyzed monitoring data to determine the number of pesticide detections with concentrations greater than 10 percent of relevant guidance values, greater than 50 percent of guidance values, and greater than 100 percent (exceeding) of guidance values.[28] From 1991 to 2018, 3,116 of 51,923 detections (6 percent) exceeded 10 percent of relevant drinking water guidance values and far fewer exceeded 50 or 100 percent of guidance values. The vast majority of these flagged detections were in surface waters.[29]

As shown in the box at right, MDA detected a total of 38 different chemicals at greater than 10 percent of guidance values, 23 different chemicals at greater than 50 percent of guidance values, and 15 different chemicals at greater than 100 percent of guidance values. Regardless of the percentage threshold, atrazine and cyanazine were leaders in terms of the number of detections.[30]

Of the 166 chemicals for which MDA has monitored, 23 percent met at least one detected concentration threshold.



Number of different chemicals exceeding various guidance value thresholds (1991-2018)

[26] Since not all pesticide-chemicals or breakdown products have applicable human health-based guidance values, our comparison of detected concentrations against drinking water guidance values included 89 percent (51,923) of 58,290 total detections from 1991 to 2018.

[27] Our analysis centered on untreated water sampled directly from surface water bodies and groundwater wells. As a result, the analysis does not take into account any reductions in pesticide concentrations that result from filtration at water treatment facilities or home filtration systems.

[28] MDA uses the 10 and 50 percent thresholds to designate surface water pesticides of concern.

[29] Groundwater detections comprised 16 percent of those detections that were more than 10 percent of drinking water guidance values, 7 percent of those detections that were more than 50 percent of drinking water guidance values, and 1 percent of those detections that were more than 100 percent of drinking water guidance values.

[30] EPA canceled cyanazine's registration in 1999. EPA's cancelation order allowed for the lawful use of cyanazine products through the end of 2002. From 2003 to 2018, MDA's routine monitoring detected cyanazine in four samples.

Metribuzin and its breakdown products also made up a significant number of the detections above the 10 percent threshold.

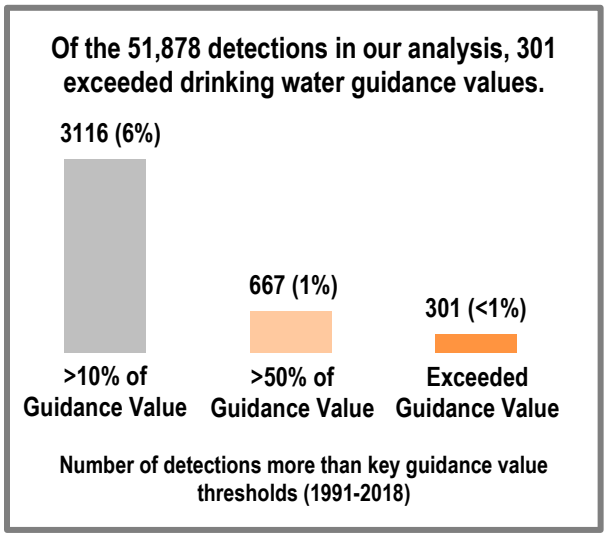


Exhibit 6.7 shows the percentage of all detections that were flagged as exceedances or for surpassing the 10 and 50 percent thresholds from 1991 to 2018. A comparison of the percentage of detections that approached or exceeded drinking water guidance values shows a steady downward trend since 1991 and relative stability in the years following Legacy Amendment monitoring program improvements in 2010.[31]

Combined Effects of Multiple Pesticides

In many instances, MDA's laboratory detected multiple pesticide chemicals in a single water sample. The combined effects of multiple chemicals may present a greater risk to human health than each chemical would individually. Despite this potential risk, our review of scientific literature revealed that the effects of pesticides are typically evaluated in isolation from other chemicals. The combined effects of multiple chemicals is an area in need of greater regulatory scrutiny and scientific evaluation.

In its *2018 Water Quality Monitoring Report*, MDA does not typically evaluate combined exposures to multiple chemicals; it instead provides a link to an MDH website on the topic.[32] The MDH website provides access to a tool the health department created that allows users to enter concentrations of various chemicals and determine whether the effects of those chemicals, when added together, exceed a health-based guidance value for a particular health risk. Health risks include threats to the immune system, respiratory system, and reproductive system, among others. Since the concentration of particular chemicals may be harmless to humans in the short term, but toxic over the long term, the health department's tool assesses toxicity over a variety of exposure durations.

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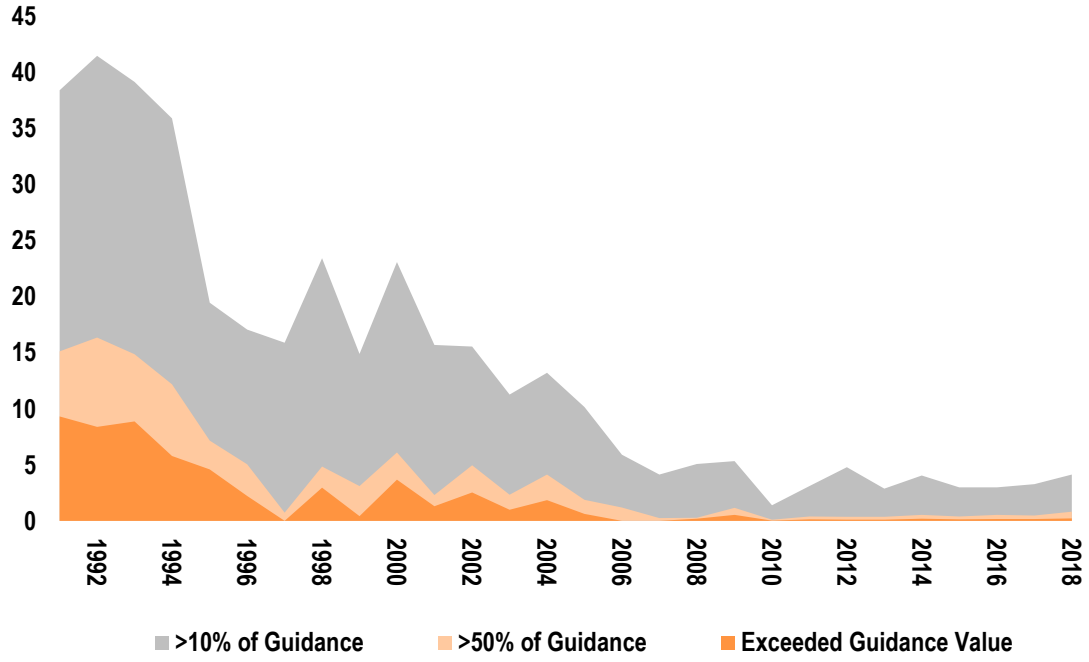
[31] The total number of detections at greater than 10 and 50 percent of guidance values increased in the 2010s from lows in the late 2000s. This increase in the total number of flagged detections coincides with the increased number of pesticide analytes and greater sampling that resulted from MDA's Clean Water Fund appropriations.

[32] Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *2018 Water Quality Monitoring Report* (St. Paul, 2019), 2-11; and Minnesota Department of Health, *MDH Water Guidance and Additivity Calculator* (St. Paul, 2019), https://www.health.state.mn.us/communities/environment/risk/guidance/gw/table.html, accessed September 6, 2019. As mentioned previously, MDA does track additive concentrations of certain chemicals and their breakdown products in groundwater. For example, MDA applies atrazine's health risk limit to some of its breakdown products that lack their own drinking water guidance values, and then calculates additive concentrations.

Exhibit 6.7: The percentage of all detections flagged for approaching or exceeding guidance values has been uniformly low in recent years.



NOTE: This exhibit includes both groundwater and surface water samples, as well as a small number of other samples, tested from 1991 to 2018.

SOURCE: Office of the Legislative Auditor, analysis of U.S. Environmental Protection Agency Water Quality Portal Data, 1991-2018.

We used MDH's calculator to assess the combined risk of the chemicals detected in each of 105 water-quality monitoring samples that MDA collected in 2018.[33] These included 80 surface water samples and 25 groundwater samples with multiple distinct chemicals detected.[34]

[33] We did not evaluate the scientific validity of MDH's tool.

[34] We selected routine water-quality monitoring samples with large numbers of detected chemicals to increase our chance of finding combined chemical exposures that exceeded health guidance values. We excluded any sample in which the detected concentration of any single chemical was high enough to be an exceedance on its own. For surface water testing, each of our 80 samples contained detections of between 12 and 19 distinct chemicals. Among groundwater samples, we selected the samples with the greatest number of detections, as well as all other 2018 samples with a chemical detected at a concentration greater than 10 percent of its guidance value. This resulted in 25 total samples, each with between 5 and 13 chemicals detected.

None of the combined pesticide concentrations from selected samples we reviewed resulted in an additive exceedance of any human health indicator.

We evaluated combinations of pesticide concentrations for both short-term and chronic exposures. Chronic exposure corresponds to repeated exposure for more than 10 percent of an average lifetime. MDH staff described this duration as the "default" duration when the length of exposure is unknown. Short-term exposure corresponds to repeated exposure for between 2 and 30 days. Evaluating short-term exposure is important because that is the duration the health department prefers when evaluating risks to "vulnerable" populations, such as pregnant women, children, and infants.

For each of the 105 samples, we entered detected pesticide concentrations into MDH's calculation tool. At both the short-term and chronic durations of exposure, the additive toxicity of pesticide-related chemical concentrations within our samples never exceeded human-health guidance values, according to the tool.

Best Management Practices

If MDA finds a pattern or trend of pesticide detections concerning, it can take a number of actions to mitigate the effect of the pesticide on the environment and human health. A key strategy the department uses is the development and promotion of best management practices (BMPs).

Best management practices are *voluntary* practices designed to prevent and mitigate the degradation of Minnesota's water resources.

Developing Best Management Practices

The Minnesota Department of Agriculture has developed 21 best management practices to mitigate the effects of pesticide use.

When MDA designates a pesticide as a "common detection" in groundwater, it is legally required to develop BMPs for that pesticide.[35] While there is no explicit legal requirement to develop BMPs in response to surface water detections, MDA has broad authority to develop BMPs in order to mitigate "harmful exposure to pesticides."[36] As a result, the department also develops BMPs when concentrations of pesticides lead to their designation as "surface water pesticides of concern."

BMPs are designed to prevent and minimize the degradation of Minnesota's water resources while considering economic factors, technical feasibility, effectiveness, and environmental effects. BMPs feature selected mandatory label requirements in conjunction with a series of voluntary best practices, which together aim to reduce contamination of water resources. BMPs include schedules or timing for applications; appropriate equipment maintenance; practices designed to prevent spills or leaks; buffer widths or setback distances between application sites and nontarget crops or water

[35] *Minnesota Statutes* 2019, 103H.251, subd. 1(b).

[36] *Minnesota Statutes* 2019, 18B.04a(1)-(3).

bodies; and limits on the amount of chemicals that should be applied over the course of a growing season, among other things. The box below gives examples of the BMPs that MDA developed for the pesticide active ingredient atrazine.

BMPs can be extremely broad—such as *Water Quality Best Management Practices for All Agricultural Herbicides*—or specific to a particular pesticide ingredient—such as *Water Quality Best Management Practices for Atrazine*. Exhibit 6.8 shows a full list of all pesticide-related BMPs. In addition to developing BMPs, MDA also publishes "cue cards," which summarize mandatory label requirements regarding minimum distances between target application sites and nontarget areas, such as water ways and wells.

Summary of Best Management Practices for Atrazine

Highlighted Mandatory (Label) Requirements

- No atrazine application within 66 feet of points where field runoff enters streams and rivers
- No atrazine application within 200 feet of lakes or reservoirs

Suggested (Voluntary) Practices

- Adopt MDA's *BMPs for All Agricultural Herbicides*
- Limit total atrazine use per year to 0.8 pounds of active ingredient per acre on sandy, loamy, or sandy loam soils
- Combine and rotate use of atrazine with herbicides that kill weeds in ways different than atrazine
- Use cover crops and minimize tillage to reduce soil erosion and water run-off during storms

It takes MDA roughly one year to develop a BMP after it designates a pesticide as a groundwater common detection or surface water pesticide of concern. MDA staff stated that they work closely with University of Minnesota Extension crop experts and the registrants of products containing the ingredient in question when developing the BMP. Contributions to BMP development from other participants, such as farmers' organizations and other outside experts, vary depending on the crop and chemical involved.

BMPs highlight specific label requirements that must be followed to address the specific concern that necessitated the BMP development in the first place. MDA also adds additional voluntary recommendations, which may or may not be interrelated with the highlighted label requirements. The MDA commissioner reviews and formally adopts the BMPs after two or more 60-day public-comment periods and multiple revisions.[37]

[37] *Minnesota Statutes* 2019, 103H.151, subd. 2, requires that MDA "give public notice and contact and solicit comment from affected persons and businesses interested in developing the best management practices."

Exhibit 6.8: The Minnesota Department of Agriculture's published best management practices cover a wide range of concerns.

Water-Quality BMPs	Year of Completion or Last Revision
All Agricultural Herbicides	2018
All Agricultural Insecticides	2018
Pesticide-Specific BMPs	
Acetochlor	2018
Atrazine	2019
Metolachlor	2019
Metribuzin	2019
Chlorpyrifos	2018
Alachlor[a]	2011
Neonicotinoid and Pollinator BMPs	
Treated Seeds	2019
Soil and Foliar	2019
Home and Residential Use	2019
Yard and Garden Pollinator Habitat	2017
Agricultural Landscapers Pollinator Habitat	2014
Roadsides and Rights-of-Way Pollinator Habitat	2014
Emerald Ash Borer Guidance	
Insecticides: Use Limits	2017
Homeowner Guide to Insecticide Selection	2018
Pesticide BMPs for Turfgrass	
All Turfgrass Pesticides and Golf Courses	2017
Home and Commercial Lawns	2018
Other Pesticide BMPs	
Potato Fungicides	2014
Bed Bug Control	2014
Soybean Aphids	2018

NOTE: "BMP" is best management practice.

[a] The U.S. Environmental Protection Agency canceled alachlor's registration on June 30, 2016, making it illegal for the pesticide registrant to sell or distribute alachlor after June 29, 2017.

SOURCE: Office of the Legislative Auditor.

Once a set of BMPs are adopted, MDA's BMP Education and Promotion Team helps the department coordinate MDA's promotional efforts and supports BMP education within MDA and across other state and local agencies, farm groups, and applicators.[38] MDA staff stated that the focus of their educational efforts shifts from year-to-year, depending upon which pest-related issues are the most pressing for the state's farmers and applicators.

Evaluating Best Management Practices

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA develop and implement a plan for evaluating the adoption and effectiveness of its best management practices.

RECOMMENDATION FULLY IMPLEMENTED

MDA has developed and implemented a plan for evaluating its best management practices.

Not long after OLA's 2006 recommendation, MDA drafted the 2007 *MDA Evaluation Plan for Voluntary Pesticide Best Management Practices*.[39] The evaluation plan establishes broad areas that should be included in a BMP evaluation and provides examples of data and resources to use when considering each area. However, since BMP implementation differs by PMR and the magnitude of pesticide-related contamination varies from year-to-year, the steps required to evaluate the success of a given BMP will vary.

Despite the inherent variation, BMP evaluations typically begin with a review of water-quality monitoring data. MDA focuses its review on how the detected concentrations of target chemical(s) have changed since the adoption of BMPs. Ideally, monitoring data will show that BMP-targeted chemicals are detected less often and at lower concentrations as compared to before MDA promoted the BMPs. However, MDA staff stated that the factors that explain water-quality trends are dynamic and complex. As a result, the success or failure of a particular BMP cannot be evaluated on the basis of monitoring data alone.

MDA evaluates BMPs based on:

- Trends in groundwater and surface water pesticide detections
- Consultation with agricultural scientists and crop experts
- Pesticide sales data
- Review of weather and pest-infestation data
- Characteristics of pesticide monitoring regions
- Surveys of farmers and applicators regarding their adoption of specific BMPs
- Field studies testing the feasibility and effectiveness of specific practices

In addition to water-quality trends, MDA evaluates BMP adoption and effectiveness by reviewing pesticide application records, use inspections, sales data, and feedback received during annual BMP Education and Promotion Team meetings. MDA also surveys farmers, applicators, and pesticide

[38] The BMP Education and Promotion Team consists of supervisors and directors from MDA's Pesticide and Fertilizer Management Division, as well as individuals from other organizations with an interest in pesticide issues, such as University of Minnesota Extension, MPCA, Board of Water and Soil Resources, and the Minnesota Association of Soil and Water Conservation Districts. Any other groups with an interest in pesticides or water quality can also attend team meetings and contribute to planning and discussion. The team's educational efforts include publishing BMPs on MDA's website; holding annual meetings regarding new BMPs and emerging issues; and sending direct mailings and e-mails to applicators and farm groups, among other things.

[39] Office of the Legislative Auditor, Program Evaluation Division, *Pesticide Regulation* (St. Paul, 2006); and Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *MDA Evaluation Plan for Voluntary Pesticide Best Management Practices* (St. Paul, 2007).

dealers in conjunction with the U.S. Department of Agriculture's National Agricultural Statistics Service. This information allows MDA to better understand farmers' actual practices, as well as explain any discrepancies between trends in pesticide sales and patterns of pesticide use and contamination in the state.

With the cooperation of private producers, MDA also conducts experiments and trials on farm fields with known histories of crop and pesticide use. These "field studies" allow MDA to evaluate new and existing management practices in a context where it can better control factors that could influence the effectiveness of a practice. Given the resource intensiveness of these projects and their reliance on private landowner cooperation, MDA reserves BMP field studies for only the most serious or urgent issues.

The Minnesota Department of Agriculture's evaluation of best management practices has resulted in changes to recommended practices.

MDA has revised BMPs as a result of its BMP evaluations. One set of BMPs that have undergone revisions over time are MDA's acetochlor BMPs, originally written in 2004. Prior to 2018, acetochlor BMPs recommended that farmers apply acetochlor at reduced rates during their applications, since acetochlor can leach into groundwater or runoff fields into surface water bodies. Anticipating MPCA's listing of the Le Sueur River and Little Beauford Ditch as "impaired" due to acetochlor pollution in 2008, MDA used the impairments as an opportunity to study the adoption and implementation of the reduced-rate practice in the field. MDA developed and implemented its impairment response plan from 2007 to 2012. MDA found that reduced-rate application was a key contributor to the reduction of acetochlor contamination in the Le Sueur River and Little Beauford Ditch, and MPCA removed both from the Minnesota Impaired Waters list in 2014.[40] Despite this success, the practice has been subject to further evaluation and revision since that time.

Example: The Impact of Acetochlor on Human Health and Water Quality

Acetochlor is one of the most common agricultural pesticides in Minnesota and is used to prevent the growth of weeds and annual grasses in corn and soybean fields. In the last decade, detections of acetochlor and its breakdown products have become more common in Minnesota surface water and groundwater.

Depending on the amount and length of exposure, acetochlor may negatively affect kidney and liver function, the male reproductive system, and fetal development.

Due to the frequency of detection in surface water, acetochlor is especially threatening to aquatic life as compared to other common pesticides. From 2014 to 2018, 37 detected concentrations exceeded MPCA guidance values for aquatic life. Since 2008, MPCA has designated three different water bodies in the Minnesota River basin as impaired due to acetochlor contamination.

Crop experts now argue that using reduced application rates may contribute to growing weed resistance to acetochlor and other herbicides. They suggest that since only the

[40] Minnesota Department of Agriculture, *Le Sueur River and Little Beauford Ditch Acetochlor Impairment Response Report* (St. Paul, 2013), 37-38.

most resistant weeds survive herbicide applications, lower application rates increase the number of resistant survivors even as they reduce pesticide contamination in the short term. Over the long term, a growing population of resistant weeds could require the use of application practices or chemicals that pose greater threats to water quality than current practices and chemicals. In contrast, if a standard or elevated application rate is used, there are fewer resistant survivors and reduced risks that high levels of resistance could lead to less environmentally friendly pesticides or application practices.

As a result of this insight, MDA removed the "reduced rate" recommendation from the acetochlor BMPs, as well as the BMPs addressing "all agricultural herbicides." Current acetochlor BMPs recommend applicators apply the chemical at the "right rate" according to "mandatory label use requirements" rather than at a "reduced rate."[41]

Acetochlor BMPs are not the only pesticide BMPs that MDA has reevaluated due to pest resistance. In 2018 and 2019, MDA added a revised recommendation to all of its herbicide-specific BMPs: farmers should combine and rotate between herbicides that target different structures or locations within the weed.[42] By using herbicides with different "sites-of-action," pesticide applications will be less likely to leave behind a large population of herbicide-resistant survivors.[43] MDA developed this recommendation in response to comments received during BMP Education and Promotion Team annual meetings and other consultations with agricultural scientists and crop experts.

Pesticide Management Plan

The 1989 Legislature enacted a requirement that the commissioner of agriculture create 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."[44] The plan provides a generalized, unifying framework for the use of MDA's pesticide-related regulatory authority. Throughout this chapter, we have discussed two of the key components of the *Minnesota Pesticide Management Plan*: water-quality monitoring and BMP development. We now take a closer look at the plan itself.

The Minnesota Department of Agriculture made substantial revisions to the *Minnesota Pesticide Management Plan* in response to the Office of the Legislative Auditor's 2006 report.

We compared the most recent (2007) version of the *Minnesota Pesticide Management Plan* with the previous version (2005), paying special attention to nonagricultural

[41] Minnesota Department of Agriculture, *Water Quality Best Management Practices for Acetochlor* (St. Paul, 2018), 2.

[42] MDA added this recommendation or relevant information to the "all agricultural herbicides," acetochlor, atrazine, metolachlor, and metribuzin BMPs.

[43] Prior to 2018, MDA recommended that farmers combine and rotate herbicides based upon "mode-of-action," which is a classification based on *how* a pesticide kills a pest.

[44] *Laws of Minnesota* 1989, chapter 326, art. 5, sec. 17, codified as *Minnesota Statutes* 2019, 18B.045, subd. 1.

pesticide use, aquatic pesticides, and product registration. We found that MDA added significant and seemingly appropriate content to address the three major concerns that OLA expressed in its 2006 evaluation report.[45]

UPDATE TO 2006 REPORT

OLA's 2006 *Pesticide Regulation* report recommended that MDA revise the *Minnesota Pesticide Management Plan* to better address issues of urban (nonagricultural) pesticide use, aquatic pesticides, and product registration.

RECOMMENDATION FULLY IMPLEMENTED

The Minnesota Department of Agriculture's 2007 revision of the *Minnesota Pesticide Management Plan* added content that satisfactorily addressed the areas of urban (nonagricultural) pesticide use, aquatic pesticides, and product registration.

While the previous version only indirectly addressed nonagricultural pesticide use, the current plan explicitly states that it will "address terrestrial use in settings that are non-agricultural or urban," such as the use of pesticides for protection of buildings, landscaping, forest management, and rights-of-way.[46] MDA addresses urban and nonagricultural pesticide use within many sections of the revised plan, including sections pertaining to pesticide sales data and the licensing and permitting of storage and distribution facilities. The plan also discusses urban and nonagricultural pesticide use in sections regarding BMPs. For example, the plan recommends the integration of generic BMPs into urban and nonagricultural pest management strategies for lawns, turf, gardens, and rights-of-way. It also specifically cites urban landowners, property managers, garden centers, and hardware stores as targets of urban BMP evaluation and promotion efforts.

In contrast to the previous version, which deliberately excluded aquatic pesticides, the revised plan declares that it will "address use of pesticides in aquatic settings that are intended to manage aquatic plants, and animal pests in conformance with product labeling."[47] In line with the revised plan's stated scope, MDA added a number of substantial sections relating to aquatic pesticides, including a discussion of the physical properties of aquatic pesticides, and an explanation of DNR's rules and regulatory options surrounding aquatic pesticides. The revised plan also recommends that MDA's surface water monitoring program take into account "aquatic pest management practices."[48] Additionally, MDA includes aquatic pesticide use in sections regarding BMP development, education, and promotion.

The 2005 management plan included a detailed discussion of MDA's statutory authority to revoke or restrict a pesticide product's registration to prevent an unreasonable adverse effect on the environment. However, there were few details concerning how MDA would exercise this registration authority in practice. In the 2007 plan, MDA added an explanation of the criteria the department uses to determine whether a new pesticide product or pesticide use requires an in-depth review prior to registration (we discuss these "special registration reviews" in Chapter 2). The 2007 plan also discussed how MDA should prioritize among special registration reviews and how those reviews would incorporate federal registration data.

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[45] Office of the Legislative Auditor, *Pesticide Regulation*, 77-79.

[46] Minnesota Department of Agriculture, Pesticide and Fertilizer Management Division, *Minnesota Pesticide Management Plan* (St. Paul, 2007), 5.

[47] *Ibid*.

[48] Minnesota Department of Agriculture, *Minnesota Pesticide Management Plan*, 37.

The Minnesota Department of Agriculture has not updated the Minnesota Pesticide Management Plan since 2007.

Statutes require MDA to submit a biennial status report on the *Minnesota Pesticide Management Plan*; they do not, however, require that MDA update the plan itself.[49] While the 2007 additions satisfied the 2006 OLA recommendation, the plan has not been revised in the 13 intervening years. On December 30, 2019, MDA posted a notice in the State Register that it was revising the *Minnesota Pesticide Management Plan* and it was accepting public comments.[50] The notice stated that the update would incorporate any relevant recommendations relating to OLA's 2020 evaluation.

RECOMMENDATION

MDA should review the *Minnesota Pesticide Management Plan* on a regular basis (such as every five years), and revise it when necessary.

We acknowledge MDA's recent efforts to update the plan and appreciate its willingness to incorporate our 2020 recommendations in its revisions. However, MDA should review and update the *Minnesota Pesticide Management Plan* regularly. More regular revisions of the plan would ensure that it reflects current trends in pesticide use practices, changes in pesticide product markets, and the concerns of the regulated community and public.

[49] *Minnesota Statutes* 2019, 18B.045, subd. 1.

[50] *State Register* 44, no. 27 (December 30, 2019): 773-774.

List of Recommendations

- The Minnesota Department of Agriculture should better document its decisions when reviewing special local need registration applications. (p. 27)
- The Minnesota Department of Agriculture should impose more robust annual requirements for license renewal for commercial and noncommercial applicators. (p. 38)
- The Minnesota Department of Agriculture should collect—and verify the adequacy of—documentation of financial responsibility prior to issuing a license to a commercial or structural pesticide applicator. (p. 39)
- The Minnesota Department of Agriculture should ensure that pesticide applicator training manuals and examinations are current and document its efforts to keep them up-to-date. (p. 41)
- The Legislature should either define "pesticide safety outreach opportunities" for railroad employees, or remove the requirement from statute. (p. 42)
- The Minnesota Department of Agriculture should ensure that common carrier railroad companies provide annual pesticide safety training to employees, as required by statute. (p. 43)
- The Minnesota Department of Agriculture should improve the clarity of the laboratory result cover letters and final closure letters that it sends to those who make pesticide-misuse complaints. (p. 59)
- The Minnesota Department of Agriculture should revise its *Pesticide Drift* brochure to more accurately reflect the true investigation timeline. (p. 62)
- The Legislature should revisit the recommendations made in recent state reviews of pollinator health. (p. 73)
- The Minnesota Department of Agriculture should continue or resume its efforts to test for all high-risk pesticide-related chemicals that are toxic to humans or aquatic life. (p. 86)
- MDA should review the *Minnesota Pesticide Management Plan* on a regular basis (such as every five years), and revise it when necessary. (p. 104)


THE GREAT SEAL OF THE STATE OF MINNESOTA
L'ETOILE DU NORD
1858

DEPARTMENT OF AGRICULTURE

March 17, 2020

James Nobles, Legislative Auditor
Office of the Legislative Auditor
658 Cedar Street
Centennial Building, Room 140
St. Paul, Minnesota 55155

Dear Mr. Nobles:

The Minnesota Department of Agriculture (MDA) has reviewed the Office of the Legislative Auditor's report on pesticide regulation. Pesticide regulation is a complex and highly technical field, and we want to acknowledge the effort and diligence of your staff in conducting this evaluation.

Pesticides are a controversial but essential tool that Minnesotans safely use every day to protect their families from pandemic diseases, to produce food, fuel, and fiber, and to control insects that represent a risk to public health. This audit was a follow up to the 2006 Pesticide Regulatory Audit that identified that "overall, the MDA does a good job regulating and monitoring pesticides." We were pleased to see that this most recent audit found that the MDA has addressed all the recommendations from the 2006 audit, recognizing that there is always room for improvement.

This audit identified four key recommendations directed at the MDA. Most of these key recommendations are constructive, and we will work to implement them as scientific technology and financial resources allow. We will work with the legislature to provide additional clarity on proof of financial responsibility and recertification intervals for pesticide applicators. The audit also makes other minor recommendations that will help the MDA better regulate pesticides, and we have already begun to implement these recommendations.

The audit also makes recommendations for the legislature regarding the protection of pollinators. The MDA has implemented all the pollinator protection tasks, identified in our 2016 neonicotinoid special registration review, that we have authority to implement. We look forward to being a fact-based resource for the legislature, should it take up further policy making involving pesticides and pollinator protection.

Thank you for the opportunity to comment on the report.

Sincerely,

Thom Petersen
Commissioner


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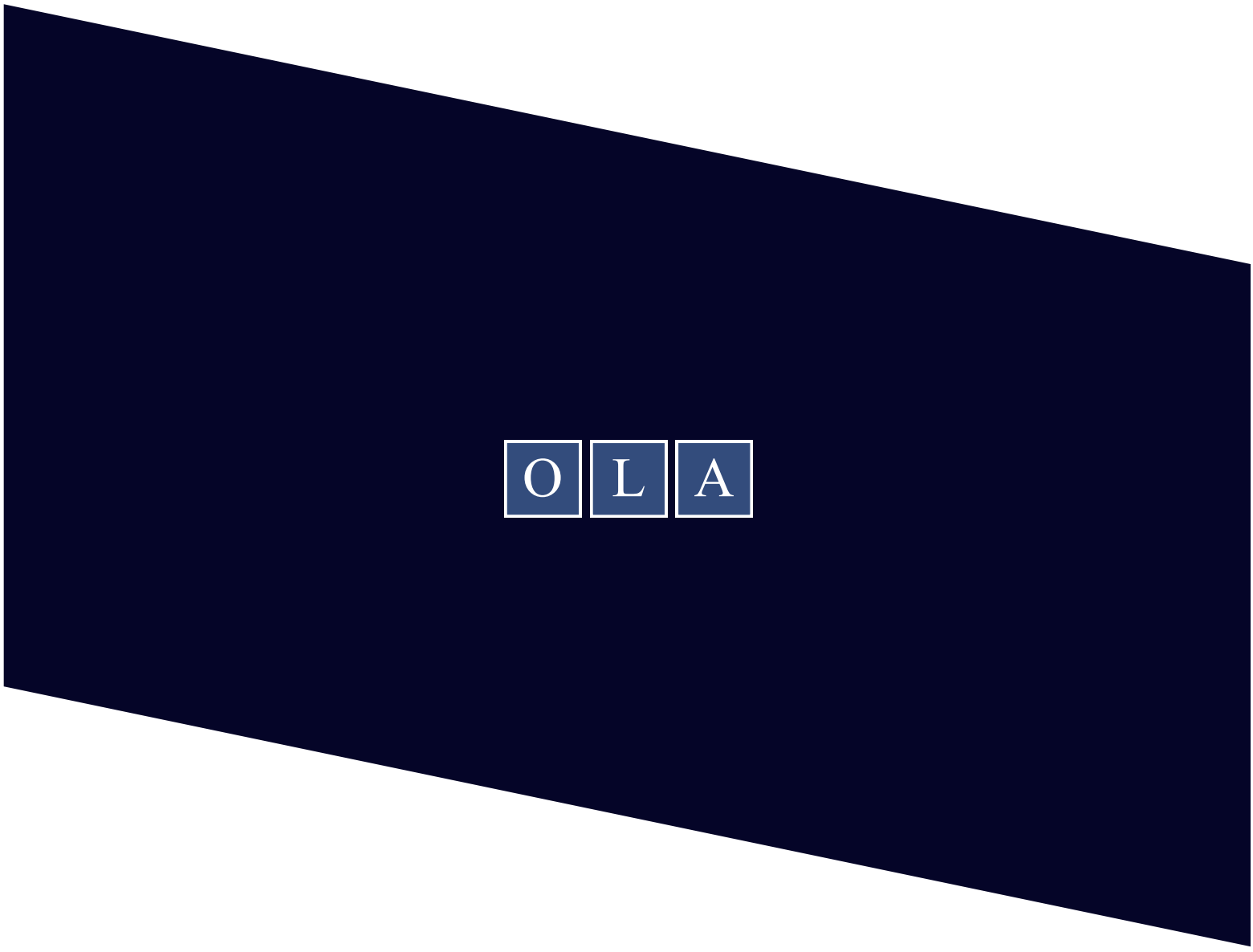

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