



## Water Quality Best Management Practices for All Agricultural Insecticides

In order to protect Minnesota's water resources, the Minnesota Department of Agriculture (MDA), in cooperation with the University of Minnesota Extension Service and other interested parties, developed a set of core Best Management Practices (BMPs). These core voluntary BMPs should be adopted when applying agricultural insecticides in Minnesota. The BMPs may also refer to mandatory label use requirements. Always read and follow product labels. Sources of additional information are listed in these BMPs.

Insecticides are designed to control target insect pests. Non-target insects, fish, and other wildlife can be exposed to insecticides lost from fields by surface runoff, drift, volatilization, or leaching. Applicators are required to control potential impacts by carefully following label instructions, including use of mandatory application setbacks from water bodies. Impacts to aquatic organisms can be further managed through adoption of voluntary BMPs. The MDA has also developed BMPs (published separately) for use with specific crop insecticides.

Careful and prudent insecticide use, as part of an Integrated Pest Management plan, can help protect water resources from future contamination and reduce levels of insecticides found in Minnesota's waters. Planning also promotes the efficient and economical use of insecticides which may improve efficacy, increase yields, reduce need for additional insecticide treatments, and reduce production costs.

State and federal law can require that the use of an insecticide be limited due to the potential for adverse impacts on humans or the environment. The Minnesota Pesticide Control Law (Minn. Stat. 18B) specifies state regulatory authority to prevent these impacts. The Clean Water Act outlines a process that can lead to greater oversight of insecticide use in certain watersheds. Adopting BMPs and using pesticides properly will help growers maintain access to a variety of insecticides as important and diverse tools in the effort to control insect pests and protect water resources. For information on monitoring results for a variety of insecticides in Minnesota's water resources, refer to the [MDA's Monitoring and Assessment webpage](#).

### Best Management Practices (BMPs) for insecticide use

- The purpose of BMPs is to prevent and minimize the degradation of Minnesota's water resources while considering economic factors, pest control availability, technical feasibility, effectiveness, and environmental effects.
- These BMPs are intended to reduce the loss of insecticides to the environment and to encourage the efficient use of insecticides, chemistry-rotation, and non-chemical insect pest control measures as part of an Integrated Pest Management program to protect crops, save costs, reduce development of insecticide resistance, and increase profitability.
- Some insecticides are "Restricted Use Pesticides" and can only be bought and applied by a Minnesota Certified Pesticide Applicator.

### Integrated Pest Management (IPM)

Reducing crop losses by integrating multiple tactics (e.g., cultural, chemical, biological, and mechanical) in ways that favor the crop and suppress insect populations. See "Additional Information & References" for more details and practical examples.

Always read product labels for application requirements, including mandatory setbacks from water bodies. Further protect water quality by using voluntary practices that are practical for a given farming operation, soil types, geography, and tillage and cultivation practices. Label use requirements and application setbacks are legally enforceable.

## Water Quality Best Management Practices for All Agricultural Insecticides

Core Practice *	Description	Benefit
1. Use Integrated Pest Management to determine significance of insect problems and consider all control options.	<ul style="list-style-type: none"> <li>Scout fields to determine populations of pests and beneficial insects. Use thresholds to determine if insect populations warrant an insecticide application. Consult websites on the following page for scouting procedures and thresholds.</li> <li>Use cultural controls such as crop rotation, tillage, and changing harvest or planting schedules to reduce pest populations.</li> <li>Consider biological control options as appropriate.</li> <li>Select insect resistant/tolerant crop varieties well adapted to area growing conditions.</li> </ul>	<p>Reduces production costs, protects water resources, and allows quick and accurate response to insect problems.</p> <p>Less selection for insecticide resistance. However, insects can also adapt to cultural practices.</p>
2. Use sound agronomic practices to promote crop tolerance to pests.	<ul style="list-style-type: none"> <li>In general, vigorous crop growth improves tolerance to insect pests. Factors such as soil fertility, drainage, soil moisture, and compaction impact crop vigor.</li> </ul>	<p>Reduces crop susceptibility and damage caused by insect pests.</p> <p>Reduces need for insecticide treatments.</p>
3. Avoid weather conditions that result in spray drift.	<ul style="list-style-type: none"> <li>Do not spray if wind speed &gt;10 mph or &lt; 3 mph. Wind speeds &lt; 3 mph can indicate a temperature inversion. Temperature inversions occur during very calm conditions (usually in early morning or late evening) where very little air mixing occurs, and cool air is trapped below warmer air. This can cause small spray drops to remain suspended in the air and eventually move out of the treatment area as a concentrated cloud.</li> <li>High temperature (&gt;85°F) and low relative humidity (&lt;50%) increases evaporation of spray droplets before they reach their target. Spray droplet size decreases which increases drift potential.</li> </ul>	<p>Keeps more insecticide in the field to control pests, maximizing their effectiveness.</p> <p>Reduces off target impact on nearby water bodies, bystanders, and the environment.</p>
4. Properly setup, calibrate, operate, and maintain insecticide application equipment to apply the correct rate.	<ul style="list-style-type: none"> <li>Use the correct spray nozzles, pressure, and boom height to provide uniform coverage and reduce off-target drift. Reducing production of small spray droplets (&lt;250 microns) decreases spray drift potential.</li> <li>Low-drift and air-induction nozzles reduce production of small droplets and are necessary for some insecticide applications. Although wide angle nozzles produce more fine droplets, the reduced boom height generally results in less drift. See <a href="#">Low-drift nozzles</a>.</li> <li>Calibrate sprayers at the beginning and periodically during the season. Calibrate planter insecticide equipment.</li> <li>Maintain spray equipment including checking/replacement of worn nozzles, cracked spray lines, pressure controls, gauges, check valves, agitator, and spray controller.</li> </ul>	<p>Results in uniform pesticide application at the correct rate, and reduces potential for drift to nearby water bodies.</p> <p>Cutting droplet diameter size in half results in eight times the number of droplets and increases drift potential.</p>
5. Target insecticide to specific areas of crop/field.	<ul style="list-style-type: none"> <li>Use spot spraying, directed sprays, and band applications based on scouting and variation in insect populations. Application method effectiveness depends on the pest involved.</li> </ul>	<p>Results in less total insecticide use. Conserves natural enemies.</p>
6. Rotate insecticide chemistries with different modes of action	<ul style="list-style-type: none"> <li>Document recent insecticide use.</li> <li>Rotate use of insecticides with different modes of action, such as, synthetic pyrethroids, organophosphates, insect growth regulators, neonicotinoids, microbials, and botanicals.</li> </ul>	<p>Delays insecticide resistance and reduces water quality impact from sequential applications of individual insecticides.</p>
7. Protect surface water, groundwater, and sensitive sites from insecticide drift and runoff.	<ul style="list-style-type: none"> <li>Maintain setbacks/buffers/filter strips for both application and mixing areas to avoid drift or runoff to neighboring property, public areas, water bodies (rivers, lakes, ponds, streams, marshes), tile inlets, wells (active and abandoned), areas with shallow water tables, and sinkholes.</li> <li>Control erosion to reduce the loss of soil-adsorbed pesticides.</li> <li>Use an anti-siphon device or an air gap when filling sprayers.</li> </ul>	<p>Reduces loss of insecticides from farm fields by drift, runoff, leaching, and spills.</p>
8. Dispose of unused insecticide properly.	<ul style="list-style-type: none"> <li>Dispose of small amounts of excess insecticide according to label directions.</li> <li>Do NOT pour leftover insecticides down a drain or in a single spot in a field.</li> <li>Utilize MDA Waste Pesticide Collection Program.</li> <li>Unused insecticide treated crop seed can be planted on extra land.</li> </ul>	<p>Reduces the potential for surface water and groundwater contamination.</p>

\*For practices related to the use of specific insecticides refer to [Water Quality Best Management Practices](#), [Minnesota Department of Agriculture](#). All BMPs are available on the [MDA webpage](#). See “Additional Information & References” for more information.

# Additional Information & References

The listed information and references provide more detailed guidance to support a producer's management programs for the proper use of all insecticides. Websites are current as of January 2018.



## Pesticide Use Information

### Minnesota Department of Agriculture:

Integrated Pest Management information. [www.mda.state.mn.us/plants/pestmanagement/ipm.aspx](http://www.mda.state.mn.us/plants/pestmanagement/ipm.aspx)

Waste Pesticide Collection Program. [www.mda.state.mn.us/chemicals/spills/wastepesticides.aspx](http://www.mda.state.mn.us/chemicals/spills/wastepesticides.aspx)

Pesticide Best Management Practices. [www.mda.state.mn.us/protecting/bmps/voluntarybmps.aspx](http://www.mda.state.mn.us/protecting/bmps/voluntarybmps.aspx)

### University of Minnesota Extension:

Pesticide Applicator Certification. [www1.extension.umn.edu/agriculture/pesticide-safety/](http://www1.extension.umn.edu/agriculture/pesticide-safety/)

Crop Production. [www.extension.umn.edu/agriculture/crops/](http://www.extension.umn.edu/agriculture/crops/)

Extension IPM Program. [www.mnipm.umn.edu/](http://www.mnipm.umn.edu/)

Locate Extension Office. [www3.extension.umn.edu/local/extension-offices](http://www3.extension.umn.edu/local/extension-offices)

### University of Missouri:

Pesticides and the Environment. [extension2.missouri.edu/G7520](http://extension2.missouri.edu/G7520)

### Spray Drift:

University of Florida. Managing Spray Drift. [edis.ifas.ufl.edu/pi232](http://edis.ifas.ufl.edu/pi232)

University of Nebraska. Spray Drift of Pesticides. [extensionpublications.unl.edu/assets/pdf/g1773.pdf](http://extensionpublications.unl.edu/assets/pdf/g1773.pdf)

Selecting Spray Nozzles to Reduce Particle Drift. [www.ag.ndsu.edu/publications/crops/selecting-spray-nozzles-to-reduce-particle-drift/ae1246.pdf](http://www.ag.ndsu.edu/publications/crops/selecting-spray-nozzles-to-reduce-particle-drift/ae1246.pdf)

A User's Guide to Spray Nozzles. [teejet.it/media/40076/user%27s%20guide%20to%20spray%20nozzles\\_2013\\_lo-res-sequential.pdf](http://teejet.it/media/40076/user%27s%20guide%20to%20spray%20nozzles_2013_lo-res-sequential.pdf)

### Pesticide Labels and MSDS:

CDMS, [www.cdms.net/Label-Database](http://www.cdms.net/Label-Database)

## Applied Entomology Research

### Soybean Research & Information Initiative

North Central Soybean Research Program. [www.soybeanresearchinfo.com/resources.html](http://www.soybeanresearchinfo.com/resources.html)

Links to online resources of land-grant university soybean research and extension programs in the 12 state region.

Information on soybean insect and disease management.

### University Entomology Information

University of Minnesota, Department of Entomology. [www.entomology.umn.edu](http://www.entomology.umn.edu)

North Dakota State University, Department of Entomology. [www.ag.ndsu.edu/extensionentomology](http://www.ag.ndsu.edu/extensionentomology)

Iowa State University, Department of Entomology. [www.ent.iastate.edu](http://www.ent.iastate.edu), choose "Extension"

University of Wisconsin, Integrated Pest and Crop Management. [ipcm.wisc.edu](http://ipcm.wisc.edu)

### Insecticide Resistance Action Committee (IRAC)

Insecticide Mode of Action. [www.irc-online.org/modes-of-action](http://www.irc-online.org/modes-of-action)

### Crop Scouting

Northern Plains IPM Guide. [wiki.bugwood.org/NPIP:Main\\_Page](http://wiki.bugwood.org/NPIP:Main_Page)

University of Minnesota Soybean Pest Management. [www.extension.umn.edu/agriculture/soybean/pest/](http://www.extension.umn.edu/agriculture/soybean/pest/)

University of Wisconsin IPM Field Scouting Manual. <http://ipcm.wisc.edu/download/pubsPM/UW-IPM-ScoutingManual-web.pdf>

## Soils & Water

### Local Soil and Water Conservation Districts (SWCD) Offices

Assistance with water table information and soil, groundwater and surface water maps:

[www.maswcd.org/SWCDs\\_On\\_The\\_Web/swcds\\_on\\_the\\_web.htm](http://www.maswcd.org/SWCDs_On_The_Web/swcds_on_the_web.htm)

### USDA – Natural Resources Conservation Service (NRCS)

Assistance with soil and water conservation plans: [www.mn.nrcs.usda.gov](http://www.mn.nrcs.usda.gov) or contact the local service center.

NRCS soil survey information: <http://websoilsurvey.sc.egov.usda.gov>

### Minnesota Department of Natural Resources (DNR)

Information on water table depth, groundwater pollution sensitivity, and karst features: [www.dnr.state.mn.us/waters/index.html](http://www.dnr.state.mn.us/waters/index.html)

Locate Office: [www.dnr.state.mn.us/contact/locator.html](http://www.dnr.state.mn.us/contact/locator.html)



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In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651-201-6000. TTY users can call the Minnesota Relay Service at 711. The MDA is an equal opportunity employer and provider.  
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