

Best Management Practices for Turfgrass Pesticides

Pesticide Impacts on Water Resources and Non-Target Organisms Including Pollinators

Water Resources



Minnesotans depend on groundwater and surface water as the main sources for drinking and home use. Surface water resources act as habitat to aquatic life but also provide space for recreational activities. Therefore, the quality of our water resources is very crucial to sustain healthy ecosystems and a healthy lifestyle.

Non-Target Organisms



Non-target organisms (animals, insects, fish, birds, plants etc.) contribute biodiversity, ecological balance, and provide us food, fuel, and outdoor recreational activities. Although pesticides play a very important role in pest management practices of turfgrass, improper use can be harmful to non-target organisms, including pollinators. More than one third of all plants or plant products consumed by humans are directly or indirectly dependent on pollinators such as bees and butterflies for pollination. Globally and locally, pollinator

populations are considered to be in decline and this can be attributed to loss of habitat, poor nutrition, diseases, pests, and the improper use of pesticides.

Background



In order to protect Minnesota's water resources, citizens, and other non-target organisms, the Minnesota Department of Agriculture (MDA), in cooperation with University of Minnesota Extension, has developed a set of core voluntary Best Management Practices (BMPs) related to pesticide use on turfgrass. Integrated Pest Management (IPM) programs take advantage of all appropriate pest management strategies, including the judicious use of pesticides. Careful use of pesticides as a part of an IPM approach not only reduces total

pesticide use but also improves pesticide efficacy. Adoption of IPM also reduces negative impacts of pesticides on the environment and human health. An IPM approach focuses on understanding the biology of individual pests and using a combination of pest monitoring and management measures. The mission of these BMPs is to bring awareness among golf course superintendents, lawn care companies, park and sports field managers, homeowners, and other pesticide applicators on the proper and judicious use of pesticides on turfgrass. Turfgrass pesticide applicators are required to always read and follow the pesticide product label. Language on the pesticide label is legally enforceable. The University of Minnesota Extension focuses on education of pesticide applicators leading to adoption of good practices for effective pest management, increased safety, and less harm to the environment. Most BMPs are voluntary but these BMPs do refer to mandatory label requirements. Depending on the product, the mandatory requirements can be found under Environmental Hazards, Use Restrictions, Directions for Use, etc. sections of the product label. **Pesticide applicators should carefully read, understand, and follow the label.**



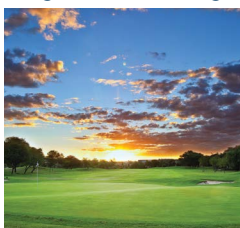
General Best Management Practices

These BMPs are designed to minimize the impact of pesticides on water resources, humans, and other non-target organisms and their habitat. Provided are general BMPs for all pesticides used by turfgrass pesticide applicators and BMPs given under other sections to address a specific concern. Individual pesticides may have additional BMPs based on the chemistry or formulation—**be sure to read the label to identify these BMPs.**

Adopt Integrated Pest Management Program for Each Specific Pest

IPM is integrating multiple tactics (e.g. cultural, chemical, biological, and mechanical) in ways that favor turfgrass and suppress pest populations. For instance, plant clean seed, hand pull weeds, spot treat with herbicides, grow resistant turfgrass varieties, etc. The adoption of an IPM approach will likely reduce the total use of pesticide on turfgrass and minimize the loss of pesticide to the environment.

Regular Scouting



Scouting is the first step in identifying a pest's presence and in determining if pest pressure warrants pest control tactics. Scout turfgrass for pests, maintain pesticide treatment records and understand the life cycle of the target turfgrass pests (weeds, insects, diseases), and when control measures are most successful.

Set Threshold Levels

Only use pest control tactics when pest populations reach a certain threshold level or when conditions favor pest development. Threshold levels are based on economics, aesthetics, and environmental factors.

Calibrate Pesticide Application Equipment Properly



Calibrate equipment in advance of making applications. Depending on how often equipment is used, calibrate equipment periodically. Do not calibrate equipment near water bodies. Check equipment periodically for wear and tear and use anti-siphon device while filling sprayers.

Always Apply Labeled Application Rates

Always apply pesticides at labeled rates and use pesticides only when needed. Application of labeled rates makes pest management cost-effective, efficient, and reduces chances of contamination of water resources.

Consider Using Spot Treatment

Use spot treatment if pest is confined to small areas or localized and not prone to spread to other parts of the turfgrass. To get the benefit of spot treatment, scout pests regularly to determine the size, distribution, and change in pest populations.

Manage Pesticide Drift and Volatilization

Review each pesticide label for spray drift management recommendations before applying, to reduce the aerial flow of pesticides. Several pesticide labels have specific recommendations on use of nozzles, spray pressure, spray volume, spray boom height, wind speed at the time of application, etc. to minimize spray drift. Avoid pesticides or pesticide formulations that are prone to volatilization or follow specific post-management practices when using these products. For example, applying irrigation shortly after pesticide application may decrease volatilization by reducing the amount of exposed pesticide on the soil surface.

Rotate Pesticide Mode of Action to Minimize Resistance

Check pesticide labels for the mode of action and avoid using pesticides with same mode of action over an extended period of time. Rotate pesticides with different modes of action for target pests. Practice herbicide rotation as a part of an IPM approach both to reduce the impact of certain pesticides on water resources and the environment, and to slow the evolution of pesticide resistance in pests.

Choose Combination Products with Care

Combination products often include fertilizer and herbicide (for example: weed and feed products). These products provide the convenience of making a single application; however, the optimum application rates, timings, and post application strategies for these products can differ. Additionally, these products may not allow for spot treatment and may result in overuse of the product.

Consider Advanced Technology for Pesticide Applications

Use precision application methods like, auto-boom shut off, closed handling systems, and variable application rates. These practices can result in less total pesticide applied, and less potential loss of pesticide to water bodies.

Clean Application Equipment

Check the label for any equipment cleaning directions. Regularly clean pesticide equipment between different product applications, incompatible products, and at the end of each season.

Pesticide Storage and Disposal

Store pesticides in a safe, secure, and separate building with concrete floor. Keep pesticides in their original containers and inspect them periodically for any spills. Properly dispose of leftover pesticide solution.





Water Quality Best Management Practices for Turfgrass Pesticides

The MDA monitors both surface water and groundwater for pesticide residues to prevent, evaluate, and mitigate occurrences of pesticides or pesticide breakdown products in groundwater and surface water of the state.



Surface Water Protection

Surface water is water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and includes all springs, wells, or other collectors which are directly influenced by surface water.

- Mix and load pesticides and clean pesticide equipment on an impervious curbed loading area designed to capture and contain spills, leaks, and wash water. Follow the product label if it requires setbacks between pesticide activities (handling, mixing, and cleaning) and water bodies (wells, lakes, and ponds).
- Evaluate drainage patterns in your turfgrass (esp. golf courses and parks) and apply setbacks/filter strips/buffers given on the product label to reduce movement of pesticides to surface water or other seasonal drainage. Buffers and filter strips can catch run-off or pesticides in soil particles reducing the potential contamination of water bodies.
- To protect surface water, comply with spray drift management label recommendations to reduce physical drift of pesticides.
- Do not apply turfgrass pesticides when a rain event is expected after application.
- Do not apply turfgrass pesticides directly to any surface water body.



Groundwater Protection

Groundwater is the water found beneath the Earth's surface, usually in aquifers, and is the source of water found in wells and springs.

- Work with local turfgrass professionals to identify important factors affecting pesticide leaching such as soil types, water table depth, and locations of wells (active and abandoned) and sinkholes.
- Follow label recommendations concerning application rates and well setbacks. Applicators are advised not to apply pesticides that can leach to groundwater where the water table is shallow and where the soils are permeable (example: coarse textured soils).
- Adjust application rates of pesticides as described on the label to match your turfgrass soil texture and organic matter content.
- Implement an irrigation management plan on golf courses. Effective irrigation management reduces movement of pesticides to water resources.





Turfgrass Pesticide Best Management Practices for Human and Other Non-Target Organism Protection

The purpose of these BMPs is to address exposure concerns to humans and other non-target organisms near or on turfgrass.

Prevent Human Exposure

The risks of pesticide exposure to human health is related to both pesticide toxicity and the level of pesticide exposure.

Look for the Signal Word



Read the label for the product's signal word which indicates the toxicity of the active ingredient and its inert ingredients. Each pesticide has a Safety Data Sheet (SDS) which provides information on what to do during emergency situations and on first aid procedures. For example, pesticides with DANGER as signal word carry

the greatest potential to effect the applicator via oral, dermal, or inhalation exposure. Warning and caution signals indicate reduced levels of toxicity.

Use Label Approved Personal Protection Equipment (PPE)



Always read and follow pesticide label information on required PPE. The use of PPE is intended to prevent pesticide exposure to the applicator by creating a barrier between the applicator and pesticide. Some pesticides require extra PPE to reduce the risk to the applicator during mixing, handling, and applying. Keep PPE in a safe

place to avoid contamination. Each applicator should inspect their PPE on regular basis for wear and tear and follow proper cleaning procedures.

Follow Restricted-Entry Intervals (REI)

After pesticide applications, applicators and bystanders are required to follow the REI to enter into the treated area. Proper PPE is required for early entry to treated areas. Warning signs should be placed on the application areas indicating a pesticide has been applied on turfgrass to caution bystanders.

Develop an Incident Response Plan

Develop an incident response plan to help prepare for and deal with pesticide related incidents quickly and effectively. Describe in detail pesticide storage, handling, and disposal practices on the plan. Also, include contact information of person(s) to be contacted in case of an incident and complete list of label and SDS of all the products stored at the facility.

Minimize Non-Target Organism Exposure



Green spaces are limited in and around cities and most of these spaces act as habitat and movement corridors for pollinators, reptiles, mammals, and other wildlife. The following BMPs are designed to mitigate exposure of pesticides to non-target organisms and their habitat:

Apply Pesticides Only When Needed

Develop a comprehensive IPM program and apply pesticides only when necessary. Guidance-based and careful pesticide application will decrease the potential for offsite movement and non-target organism exposure. Contact your state or county extension agent to assist in developing a specialized IPM program.

Reduce Spray Drift

Follow spray drift management recommendations to increase pesticide performance in controlling pests, and to protect non-target organisms and their habitat.

Reduce Vapor Drift

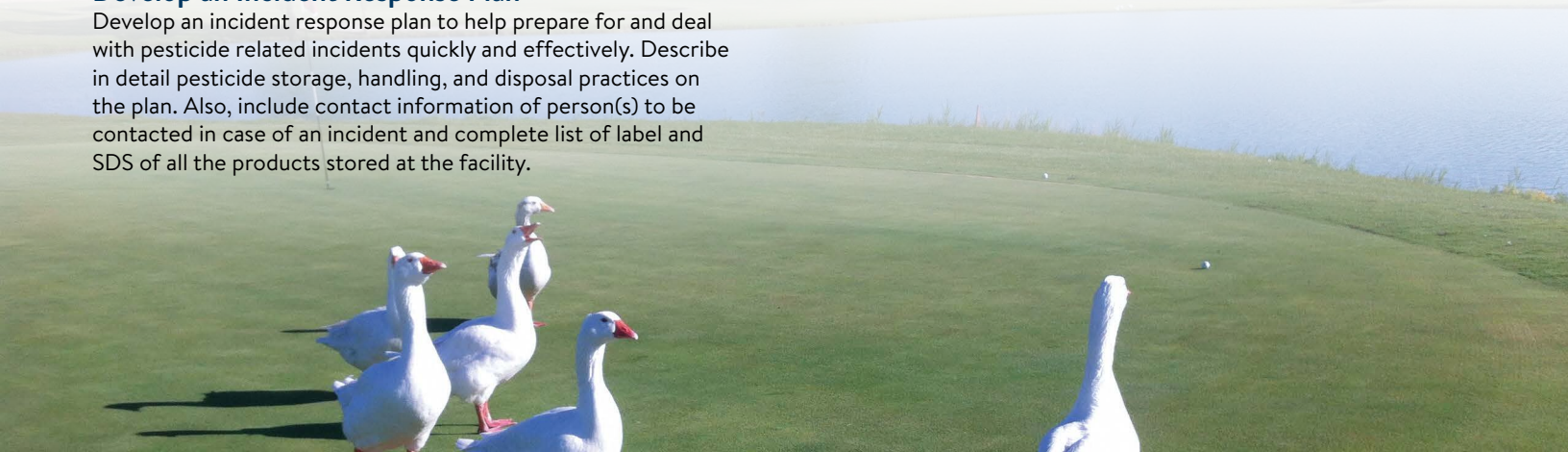
Select pesticide products that are less prone to volatilization or avoid these products altogether. Pesticides with high vapor pressure can volatilize after application and can impact bystanders, non-target organisms and their habitat.

Maintain Buffers/Setbacks

Follow label requirements on buffers or setbacks. Maintenance of buffers or setbacks given on the label are intended to provide protection to non-target organisms and reduce the chance of contamination of their habitat.

Follow the Label

Check the label for specific use requirements to minimize exposure to non-target organisms, for example, pollinators and endangered species.





Follow Pollinator-Friendly Pest Management Practices

Pest management is very important to turfgrass management in order to maintain a specific function and/or aesthetic look. How any landscape is managed, including plant selection, pest management programs, and land maintenance can directly affect native and managed honey bees, and other pollinators. The MDA has developed separate voluntary BMPs to protect pollinators (see references). Smart pesticide practices and adoption of these BMPs can help protect pollinators.

Minimize Off-Target Movement of Pesticides

Minimize the movement of dust to off-target sites while using dry pesticide formulations. Apply these formulations on a calm and clear day. Do not apply pesticides when a rain event is expected after application.

Reduce Pesticide Use

Limit pesticide usage by using an IPM program. Spot treat with pesticides if the pest population is contained in one or few

places and not widely distributed throughout the property. If you must use pesticide, select pesticides with low toxicity to pollinators.

Understand and Follow Label Language on Pollinator Protection

Ensure all pollinator requirements on the pesticide label are followed while applying pesticides. Several pesticide labels contain statements to protect bees under “Environmental Hazards” or under a “Bee Advisory” Box. For example, “Do not apply this product while bees are foraging”. Look for the bee sign on the label.

Communicate with Neighbors

Build good communication with local residents, including beekeepers. Encourage creating pollinator friendly landscapes around turfgrass by planting pollinator attractive plants. Encourage posting pollinator signs to caution applying pesticides.

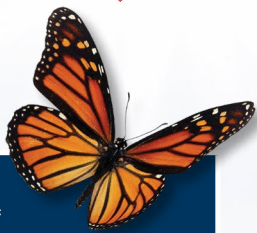


TABLE 1. Water quality, wind speed, and pollinator protection as per label requirements or recommendations for commonly used pesticides on turfgrass.*

ACTIVE INGREDIENT	SAMPLE TRADE NAME	POLLINATOR PROTECTION	MAX. WIND SPEED RESTRICTIONS	BUFFER/SETBACK
HERBICIDES				
2,4-D	Weedar® 64, Vessel	None	>10–15 mph	None
Dicamba	Banvel®, Vessel	None	>10–15 mph	50 ft of wells
Dithiopyr	Dimension® 2EW, Dimension ULTRA 40WP	None	None	None
Mesotrione	Tenacity®	None	None	None
INSECTICIDES				
Carbaryl	Sevin® SL, Lesco Sevin Brand SL	Multiple requirements because of high toxicity to bees	None	None
Imidacloprid	Merit® 2F, Malice 75WSP	Multiple requirements because of high toxicity to bees	None	None
Bifenthrin	Bifenthrin Pro Multi-Insecticide, Triple Crown	Multiple requirements because of high toxicity to bees	None	None
Trichlorfon	Dylox® 420 SL	None	>10 mph	None
FUNGICIDES				
Chlorothalonil	DaconilULTREX®, Intrata	None	>10 mph	25 ft ground 150 ft aerial or airblast
Propiconazole	BannerMaxx®II, Headway Fungicide	None	>15 mph	None
Azoxystrobin	Heritage™Action, Strobe 50WG	None	None	Well-maintained vegetative strip
Mancozeb	Fore® 80WP Rainshield, Junction	None	>15 mph	None



*Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement is implied. Label requirements or recommendations can vary from product label to label. Always carefully read and follow the label.



Pesticide Use Practices

1. **Spray Drift of Pesticides**
(extensionpublications.unl.edu/assets/html/g1773/build/g1773.htm)
2. **Warning Signs for Applying Pesticides to Turf**
(www.mda.state.mn.us/warning-signs-applying-pesticide-turf)
3. **The Calibration of Turfgrass Boom Sprayers and Spreaders**
(content.ces.ncsu.edu/the-calibration-of-turfgrass-and-boom-sprayers-and-spreaders)
4. **Take Action Against Herbicide-Resistance Weeds**
(growiwm.org/take-action-home)
5. **Turfgrass Pest Management**
(www.k-state.edu/turf/resources/lawn-problem-solver/ipm/)
6. **Reduce the Need of Pesticides and Herbicides**
(<https://cfpub.epa.gov/npstbx/files/reducewastepesticides.pdf>)
7. **Waste Pesticide Collection Program**
(www.mda.state.mn.us/pesticide-fertilizer/waste-pesticide-collection-program)
8. **Pesticide Containers: Management & Disposal**
(www.mda.state.mn.us/chemicals/factshts/containermgmtdisposal.aspx)

Best Management Practices

1. **Best Management Practices for Pesticides**
(www.mda.state.mn.us/pesticide-fertilizer/pesticide-best-management-practices)
2. **Pollinators and Their Habitat**
(www.mda.state.mn.us/pesticide-fertilizer/best-management-practices-pollinators-their-habitat)
3. **Florida Friendly Best Management Practices for Protection of Water Resources by the Green Industries**
(<https://fyn.ifas.ufl.edu/pdf/grn-ind-bmp-en-12-2008.pdf>)
4. **Water Quality and Professional Lawn care**
(<https://content.ces.ncsu.edu/water-quality-and-professional-lawn-care>)
5. **Best Management Practices for the Enhancement of Environment Quality on Florida Golf Courses**
(<https://flgolfbmp.com/>)



Photo Credit: Winfield United

Miscellaneous

1. **Minnesota Department of Natural Resources**
(information for some areas of the state on water table depth, groundwater pollution sensitivity, and karst features)
(www.dnr.state.mn.us/waters/groundwater_section/index.html)
2. **Lawns and Turfgrass Management**
(<https://extension.umn.edu/lawns-and-landscapes/lawn-care>)
3. **Herbicide Properties Tool–National Information Pesticide Center**
(<http://npic.orst.edu/HPT>)
4. **FieldWatch**
(www.fieldwatch.com)

