

Part 5: Protecting the Environment

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Key Questions About Protecting the Environment

- What happens when a pesticide moves to where it is not supposed to be?
- Why should you be concerned about reducing drift?
- How do pesticides get into ground and surface water?
- What can you do on your farm to prevent pesticides from getting into the water?
- What can you do to protect “non-target” plants and animals from being harmed by pesticides?

Pesticides and the Environment

Environmental protection laws and label directions are designed to limit the environmental problems caused by pesticides. However, it is up to the pesticide applicator to be aware of and avoid practices that can cause environmental damage. It is important to understand what happens to pesticides in the environment and how pesticides pollute water, soil, and air and may affect non-target organisms. When pesticides move to where they don't belong, they may cause serious and long-lasting effects on humans, plants, and animals.

Spray Drift

“Pesticide drift” means different things to different people. A good working definition of pesticide drift is offered by the US Environmental Protection Agency (EPA). The EPA defines pesticide spray drift as the physical movement of a pesticide through the air, at the time of or soon after the pesticide application, to any site other than the intended site (often referred to as an “off-target” site). This definition does not include movement of pesticides to off-target sites from soil erosion, migration, volatilization, or windblown contaminated soil particles. Pesticide drift is not a new problem. However, with increasing acreage planted to herbicide-resistant crops and a shift to more postemergence spraying, the potential for off-target damage due to drift has increased in recent years.

Two types of spray drift occur: vapor and particle. Particle drift occurs at the time of application and is the movement of small droplets and particles of the spray solution suspended in air. Vapor drift occurs when the pesticide changes to a vapor, or gaseous form, and then moves away from the treated area. Vapor drift can occur during and soon after application (‘volatilization’ is the pesticide turning into a vapor after it has been applied and can occur many hours after application). Vapor drift may be more common with certain pesticides. Recent research has shown that all pesticides have the potential for particle drift and most drift that does occur is particle drift.

Why Be Concerned about Drift?

Damage from pesticide drift can be significant. Human health can be adversely affected; farm workers, farm families, and other persons in the vicinity can suffer acute ill effects from such exposures. Damage to adjacent crops, causing destruction of crops or unwanted and illegal pesticides residue, can result in total loss of produce yield. Long established trees and ornamental plants can be harmed by even one drift event. Fish and wildlife kills, including destruction of desirable honeybees, can occur with even minimal off-target movement of some pesticides, particularly insecticides.

It is illegal in Minnesota to make an application of pesticide resulting in off-target movement. Applications must be performed in a manner that does not endanger humans or damage agricultural products, food, livestock, fish or wildlife. The law states that a person may not apply a pesticide resulting in damage to adjacent property. Additionally, the Minnesota Pesticide Law says that a pesticide must always be applied in a manner consistent with labeling. Since pesticide product labels often contain language that says "Do Not Allow this Product to Drift", or words to that effect, evidence that drift occurred would also be a violation of federal pesticide control law. The bottom line is that whether or not damage results, or whether a person complains, pesticide drift is illegal and is not tolerated in the regulatory or agricultural community.

Minnesota has a strict liability legal standard for enforcement of cases involving pesticide drift: if drift occurs, the applicator is responsible, and no showing of negligence, carelessness, or intent is necessary for the Minnesota Department of Agriculture (MDA) to bring an enforcement action against the applicator. In addition, the applicator is always primarily responsible and liable for monetary damages and other loss compensation in regard to pesticide drift damage.

Actual damage and anxiety about pesticide drift are the most common types of complaint reported to the MDA. Pesticide drift issues continue to be a national priority of the EPA, other state departments of agriculture, farm groups, industry, advocacy groups, and the extension service. With the growing encroachment of urban/suburban communities into rural areas, the occasions for off-target movement of pesticides and damage or complaints of that drift, have increased substantially. Surprisingly, many complaints of pesticide drift are reported by farmers about farmers, who once too often are frustrated and angered by the repeated and damaging drift from neighboring farms. In urban settings many residents feel the "chemical trespass" that pesticide drift involves is intolerable, no matter the risks or potential to damage property. Whether or not damage or harm has occurred, drift is illegal.

Even if you don't apply your own pesticides, you still play an important role in preventing drift. Drift is not just the responsibility of the commercial applicator. When drift occurs, the customer eventually pays. Costs incurred, such as insurance premiums and legal fees, must eventually be passed on to the customer in higher application fees or product costs. Drift also has non-financial costs such as keeping relations with neighbors, businesses, and other land owners.

Organic Agriculture

Organic acreage is increasing in the US and in Minnesota. To receive “organic certification” a farmer must keep his fields pesticide-free for at least three (3) years. A relatively new and increasing concern surrounds the off-target movement of pesticides into organic acreage. Pesticide drift can result in the loss of such certification, often at a great financial cost to the farmer. Unfortunately, visible drift damage need not occur for certification loss; any pesticide residue can render “organic acreage” unusable. For example, drift from a soybean herbicide will not cause injury to most organic soybeans, but it is still a violation of organic certification.

Factors Affecting Drift

We have control over many variables that affect drift. Select responsible and knowledgeable applicators. Set up and calibrate application equipment with drift reduction nozzles, lower pressure settings, and lower boom heights to minimize drift. To protect sensitive areas—such as surface water, and neighboring gardens, trees, and crops—use buffer zones where no pesticide is applied.

Spray droplet size—not wind—is the single biggest factor determining if drift will occur. Small droplets take longer to fall and can be carried farther by wind currents. Pay attention to the temperature and relative humidity levels. As it gets hotter and humidity decreases, droplets evaporate becoming smaller and lighter and travel further.

After droplet size, wind speed and direction are the most important factors affecting pesticide drift. Avoid spraying any pesticides when winds are greater than 10 mph. Guessing wind speed is difficult and inaccurate. Purchasing a simple, low-cost wind-speed gauge is a good idea. A reading with one of these devices at the application site is the best way to know if you should make the application. The conditions at the local radio station or airport are not the same as the conditions in the field. It is a good idea to record both the speed and direction (the direction **from** which the wind is blowing) for each application. Accurate wind and weather information during the pesticide application will help you if a drift complaint should occur. (Minnesota commercial pesticide applicators are required to record wind speed and direction for all applications they make.)

Always be aware of sensitive areas around the application site, such as gardens, landscape plantings and trees, schools, parks, sensitive crops, surface water, and wetlands. If the wind is blowing towards these sensitive areas, even at low speeds, drift may occur. The best recommendation is to spray when the wind is gentle (3-10 mph), steady, and blowing away from high-risk areas.

Although, tempting, avoid spraying under dead-calm conditions. Under normal air conditions, the air close to the ground is warmer and this warm air tends to rise mixing the air and creating wind. An inversion occurs when the air close to the ground is colder than air higher up in the sky resulting in no air mixing. Under inversions, the winds are very light to dead calm and variable in direction. You can see inversions on some very calm winter days. Under inversions, smoke from a chimney may rise up a short ways until it hits the warmer air above. The smoke then very slowly drifts horizontally as a concentrated cloud, which can be followed for long distances. The same thing can happen to pesticide sprays that have small

droplets that do not fall out under inversion conditions. The concentrated cloud of pesticide can move off site and cause damage to plants or other organisms. In summer, inversions typically occur towards sunset and continue to morning under clear skies or when the winds are dead calm.

How Far Will Drift Go?

This chart shows that with a 3 mph wind, medium-sized particles can move about 30 feet from the intended target. When selecting nozzles, consult the nozzle manufacturer's information on average droplet size produced by nozzles at different pressures. Whenever possible avoid nozzles that produce fine, very fine, and fog droplets (sizes below 200 microns in diameter) at pressures you will be using. **Avoiding small droplets is the single best way to reduce the potential for drift as small droplets stay in the air much longer and move much farther than larger droplets.**

Droplet	Diameter (in microns)	Time to Fall 10 Feet	Travel
Distance @ 3 mph wind			
Fog	5	66 min.	3 miles
Very Fine	20	4.2 min.	1,100 feet
Fine	100	10 sec.	44 feet
Medium	240	6 sec.	28 feet
Coarse	400	2 sec.	8.5 feet
Fine rain	1,000	1 sec.	4.7 feet

Source: Herbicide Spray drift, NDSU Extension

Strategies to Reduce Drift

Here are some things to reduce drift:

- Use nozzles that produce larger droplets. (Avoid droplets smaller than 200 microns in diameter whenever possible.)
- Increase the application volume (gallons per acre of spray).
- Keep pressures towards the low end of the operating range for the nozzle you are using. Higher pressures create a greater percentage of small particles susceptible to drift.
- Calibrate application equipment for lower boom heights to decrease the distance that spray particles must travel.
- Use buffer zones of no pesticides near sensitive areas such as surface waters and neighboring crops, gardens, trees, and public facilities such as schools and parks.
- Use new technologies such as drift-reduction nozzles or drift reduction spray additives.

None of these strategies will allow you to apply in poor conditions or high winds, but they will decrease drift under favorable conditions.

Drift prevention can be accomplished. Selection, calibration, maintenance and use of equipment that produces large spray droplets is of primary importance. Lower boom or application heights. Keep pressures as low as possible.

*It is important to avoid the “I need to spray **right now**” way of thinking.*

Attention to wind direction and wind speed is absolutely necessary. Checking on prevailing and forecasted weather conditions before hand is the responsibility of the applicator, not the farmer or the dealer/employer or even the crop consultant. On the other hand, pressure from a farmer or dealer or crop consultant to spray—no matter the poor or worsening weather conditions—can make for difficult business decisions on the part of the applicator. The decision to not spray in order to avoid spray drift is a good decision.

Sources on Spray Drift

Dean Herzfeld, University of Minnesota

Paul Liemandt, Minnesota Department of Agriculture

Brent Pringnitz, Iowa State University

Bob Wolf, Kansas State University

National Coalition for Drift Minimization

Western Crop Protection Association, Sacramento, CA

Pesticides and Water Quality

Pesticides are one of a large number of chemicals that may affect ground and surface water quality. In Minnesota water has been contaminated by industrial wastes, sewage, urban storm sewer runoff, landfills, underground storage tanks, chemicals in the air, fertilizers, animal wastes, and solvents used in the home, garage and industry. In Minnesota nitrate groundwater pollution—from legumes, manure, fertilizers, sewage and other sources—is more widespread and more often exceeds health standards than pollution from pesticides.

Whether or not a pesticide may affect the quality of surface water or groundwater depends partly on its physical properties, the weather patterns, the type of crop or plant cover, and the properties of the soil and the underlying geological structure. The pesticide selected for use, rates, timing and method of application, and other cultural practices can also be important factors. How these factors interact determines if a certain pesticide on a specific soil will leach to groundwater or run off to surface water.

What Is Groundwater?

Groundwater is an essential natural resource. It supplies the drinking water for 97 percent of rural Americans. It is also the primary source of irrigation water in the midwest.

Groundwater forms when water moves below the ground's surface and fills empty spaces in and around rocks, sand, and gravel. If enough collects in one area, groundwater may become a source of fresh water, supplying wells and springs. Depending on the geology in an area, groundwater can be very deep in the ground or it can be close to the surface. Under any one spot there may be more than one layer of groundwater. Each of these layers, or "aquifers," lie at different depths and may move in different directions and have different recharge areas.

Pesticides Can Be a Problem for Water Quality

Groundwater

Because we cannot see groundwater, we tend not to think about it. It is easy to forget that substances used on the surface can get into the groundwater. As water seeps downward toward groundwater, it carries substances in the soil with it. Once the groundwater is contaminated the problem can no longer be ignored.

Pesticides have been found in the groundwater in some areas of Minnesota. The central sand plains and the Karst region in the southeast are among the more vulnerable areas of Minnesota for groundwater pollution. Some of the pesticides found in groundwater may be associated with cancer or other illnesses, if length of exposure is long and concentrations of the pesticide are high.

It is very expensive, and often impossible, to purify groundwater that has been contaminated by pesticides or other pollutants. Some communities have had to close their wells because of groundwater contamination. Prevention is the cheapest and most effective way to deal with groundwater contamination.

Under federal and state law, Minnesota is developing a state pesticide management plan. This plan is designed to prevent contamination of groundwater by pesticides and reduce existing groundwater contamination. If a pesticide is found to be contaminating groundwater, first voluntary and then mandatory restrictions may be put into place. Which restriction is used will depend on the frequency and level of detection in the vulnerable area, how and where the pesticide is being used, and other factors.

Surface water

Surface water—such as ponds, lakes, streams, and rivers—can become polluted with pesticides. Pesticides in surface waters can affect aquatic and other wildlife. Many large urban areas use surface water as a source of drinking water. Under some conditions surface water can move directly into groundwater carrying with it any pesticides and other pollutants. Surface waters can reach groundwater through wells, in sandy areas with high water tables, or through sinkholes and other Karst features found in some areas of the state. In other areas it may take many, many years for surface water to reach groundwater.

How Pesticides Get into Water

Leaching to groundwater

A major way pesticides get into groundwater is through accidents and improper handling:

- Spills and accidents around a poorly sealed well or other vulnerable areas.
- Backsiphonage down a well during the filling of spray tanks.
- Improper storing, mixing, and loading of pesticides .
- Improper disposal of pesticide wastes, application equipment rinse water, and containers.

Pesticides also get into groundwater through normal applications. Whether this happens depends on the:

- Pesticide characteristics.
- Soil type, texture, organic matter, and drainage.
- Depth to groundwater.
- Geology.
- Amount of rainfall or irrigation.
- Tillage, crop residue, and vegetation cover.
- Cultural practices.

Runoff to surface water

Pesticides may reach surface waters in many ways. They may drift during application, may enter tile lines and drainage ditches, or may be washed down storm sewers. Pesticides can also enter surface waters through runoff from:

- Spills, equipment leaks, and accidents.
- Pesticide storage, mixing, and equipment-cleaning areas.
- Improper disposal of containers and other pesticide-contaminated wastes.
- Fields—either dissolved in runoff water or attached to soil particles eroded by wind or water.

Whether pesticides enter surface water depends upon:

- Soil type, texture, slope, and amount of drainage.
- Pesticide characteristics.
- Vegetative cover in crop land and at the borders of surface waters.
- Rainfall frequency, amounts, and duration.
- Tillage system used.
- Crop residue amounts.

Factors affecting the leaching and surface runoff of pesticides

Soil types. Some soils allow quick leaching and/or runoff of pesticides while others do not. See section below on soil types.

Depth to groundwater. If groundwater is within a few feet of the soil surface, pesticides are more likely to reach it and to reach it quickly.

Amount of water applied. The goal of good irrigation management is to make sure there is enough moisture to assure plant growth and pesticide uptake. Some pesticides need water in the form of rain or irrigation in order to work. But if too much water is applied during irrigation there is a greater chance for the excess water to leach or run off the soil surface. Pesticides applied shortly before heavy rains or irrigation are more likely to leach or run off.

Geologic formations. Some areas are “recharge” areas where water from the surface enters groundwater. Recharge areas tend to be more vulnerable to groundwater pollution than other areas. Rocky geological formations that are “tight” force water to run off rather than move through the ground. Limestone areas or “karst” areas, as in southeastern Minnesota, often have many cracks in the rocks which let pesticides move quickly to groundwater.

Cultural Practices. Pesticides applied postemergence to a full crop canopy will have much less chance of reaching the soil surface than pesticides applied to bare ground. This reduces the chance of water pollution. Large amounts of crop residues on a field may reduce surface runoff but increase the chance of leaching. Tillage systems may affect soil structure, either increasing or decreasing leaching or surface runoff. Tile drains may also contribute to both surface and groundwater contamination.

Managing Pesticides to Protect Water Quality

Selecting Pesticides to Protect Water Quality

Pesticides and soils each have certain characteristics which affect the leaching and surface runoff of pesticides. It is no single characteristic but their combination that determines whether a particular pesticide will leach on a particular soil.

Pesticide characteristics

Solubility is the ability of a pesticide to dissolve in water. The more soluble a pesticide is in water the more likely it is to move with water. Water can carry soluble pesticides by leaching through soils or by runoff over the soil surface.

Adsorption is the ability of a pesticide to bond with the soil. Some pesticides stick very tightly to soil while others are easily dislodged.

Pesticides that bind more tightly with soil particles will remain in the surface soil longer and are less likely to leach down into the groundwater. Pesticides which are tightly bound to soil will move if the soil is eroded and could reach surface waters.

Breakdown rate is the time it takes a pesticide to degrade or break down into other chemicals. The rate of breakdown varies greatly among pesticides and depends on whether the pesticide is on the soil surface, in the soil or in water. Pesticides are broken down by microorganisms, chemically, or (for certain pesticides) by sunlight. A few pesticides after repeated use are broken down so quickly by microorganisms their effectiveness is reduced. Temperature, moisture conditions, soil type, organic matter, application method, soil pH, and other factors can also greatly affect the rate at which a pesticide will break down. The slower the breakdown rate of a pesticide the more likely it is to reach surface or groundwater.

For a listing of pesticides, their properties, and their potential for leaching or surface runoff see this Minnesota Extension Service publication. AG-BU-3911 Pesticides: Surface Runoff, Leaching and Exposure Concerns. R. L. Becker, et al.

Soil types and pesticide movement

Organic matter is what remains when plant and animal matter decompose. The more organic matter in the soil, the better the soil can adsorb the pesticide, hold water, and promote the breakdown of the pesticide.

Soil texture refers to the size of particles in the soil. Sandy soils have larger particles and pores and fewer sites where pesticides may be attached. As a result, water and pesticides can move quickly through sandy soils. This increases the chance of groundwater pollution but reduces the amount of surface runoff. In contrast, silt or clay soils have smaller particles and pores and are more effective in adsorbing pesticides. This decreases the downward movement of water and pesticides but may increase the amount of surface runoff.

Soil slope is the angle a field lies from the horizontal. The steeper the slope the greater the runoff and the less water available for leaching through the soil.

Adsorption is the ability of a soil to bond with pesticides. Soils vary greatly in their ability to bind pesticides. See pesticide adsorption on page 5-9.

Soil structure is the way soil is held together. Highly compacted soil tends to reduce leaching and increase surface runoff. Macropores are large openings in the soil created by animals, plant roots, drying and other causes. Macropores may allow more rapid movement of pesticides through the soils than normal leaching.

For more information on Minnesota soils properties and their effect on pesticide leaching and surface runoff, see this Minnesota Extension Service publication. AG-TO-5755 Minnesota Rating Guide for Potential Leaching and Surface Runoff of Pesticides. 1992.

Handling Pesticides to Protect Surface and Ground Water

Proper transporting, storing, mixing, loading, applying, and disposal of pesticides can greatly minimize water pollution. Usually, when a very high level of a pesticide is found in groundwater it is due to improper pesticide handling rather than to normal field application. Repeated spills on the

same spot, even if each spill is very small, or pesticides running down active or abandoned wells may create large contamination problems. Fire prevention is also important because extensive water contamination may result from fighting fires involving pesticides.

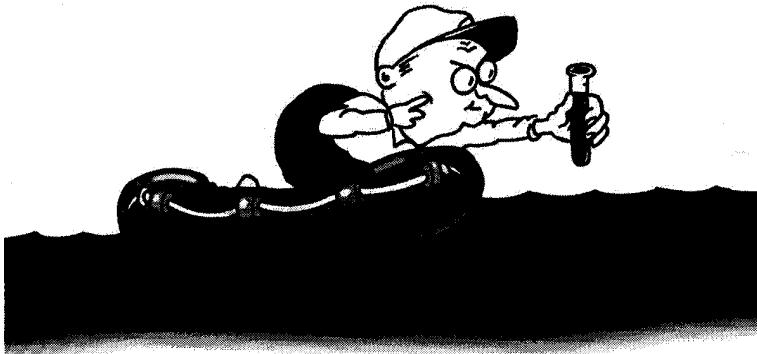
Whenever pesticides are used, there is a potential for water contamination. But there are ways you can protect water and still use pesticides effectively. Many items covered in Part 7— Safe Handling of Pesticides and Part 8—Equipment: Selecting, Calibrating, Cleaning are designed to reduce groundwater and surface water pesticide pollution.

Here are some more ways to protect water quality:

- Use Integrated Pest Management Practices to avoid unnecessary pesticide use.
- Choose pesticides that have less potential for leaching or for surface runoff, particularly in vulnerable areas.
- Use the lowest effective rate of a pesticide for the type of soil and pest conditions.
- Spot spray or band pesticides when possible.
- Keep all pesticide preparation areas, supply tanks, and storage areas at least 150 feet from any water well.
- Design storage areas, supply tanks, and pesticide preparation areas to minimize pesticide runoff.
- Use a rinse pad facility or mix, load, and clean application equipment in the field.
- Prevent backsiphoning into wells by installing backflow prevention devices.
- Keep hose ends out of chemical tanks.
- If pesticides are applied near sinkholes or in areas draining directly into rivers, streams, or lakes, leave an untreated buffer space surrounding the treated area.
- Plant vegetative covers as buffer zones around surface water.
- If rain is predicted do not apply pesticides.
- Control the amount and timing of irrigation to minimize pesticide leaching and surface runoff.
- Control erosion to prevent runoff water from carrying pesticides attached to soil particles.
- Minimize drift during application.
- Properly rinse containers and dispose of waste and rinse water as described in Part 7 — Safe Handling of Pesticides.
- Minimize pesticide waste by using less pesticide, practicing careful pesticide management, using bulk containers, etc.

- Report all spills or backsiphonages to the Minnesota Department of Agriculture and to local authorities.
- Use fire prevention practices to avoid fires involving pesticides. Fire control tactics may create potentially large water contamination problems.

Protecting Non-Target Organisms



How Pesticides May Harm Wild Plants and Animals

Rare species of plants and animals face many threats to survival. These may include: alteration or destruction of their required or preferred habitat; illegal harvest or over-collection; and exposure to certain pesticides.

Pesticides can harm wild plants and animals in two ways:

Acute or lethal effects: Plants or animals are killed as a direct result of pesticide exposure. Examples are:

- An endangered plant dying after being exposed to an herbicide.
- A frog dying after feeding on pesticide-contaminated insects.

Chronic or sub-lethal effects: Normal physiological processes—such as reproduction or digestion—can be harmed by long-term exposure to one or more pesticides. Examples are:

- Reproductive failures in birds of prey (raptors) after prolonged exposure to chlorinated hydrocarbons, such as DDT.
- Decreased resistance to disease or increased risk of predatory behavior for ducks that feed in pesticide-treated wetlands.

Pesticides have the potential to poison large numbers of non-target organisms. For example, the U.S. EPA estimates that the use of a single pesticide, carbofuran, was responsible for between one and two million bird deaths each year. Some endangered or threatened species have been among the casualties. Many of these bird die-offs could be avoided if the pesticide used were less toxic. For example, fenvalerate, a pyrethrin insecticide, has low toxicity to birds and mammals, but is highly toxic to fish. Therefore, it is very important to evaluate the area to be treated and to determine, in advance which non-target organisms may be susceptible.

An example of a chronic pesticide effect is the dramatic decline in the bald eagle and peregrine falcon numbers in the late 1960s and early 1970s. These birds of prey were exposed to a class of persistent pesticides known as chlorinated hydrocarbons. One chlorinated hydrocarbon is DDT. DDT,

and compounds like it, have a tendency to “bioaccumulate” in the fat of animals that feed at or near the top of the food chain. Because of this exposure, female birds were unable to produce eggs sturdy enough to support their own weight during incubation. The result was a high percentage of nest failures. Eagle and falcon populations fell dramatically.

DDT was banned in the United States in 1973. Since then the trend in the U.S. chemical industry has been toward compounds that break down more rapidly in the environment. Because of this and many other factors, including better wildlife management, many eagle and falcon populations are once again increasing. However, migratory birds may still be exposed to chlorinated hydrocarbons in countries where their use is still legal.

How to Protect Non-Target Organisms from Pesticides

Here are some ways for conservation-minded pesticide applicators to avoid harming non-target organisms:

- Do not apply pesticides directly to surface waters.
- Use buffer zones (untreated crop areas; grassy or wooded filter strips) to help protect sensitive areas such as wetlands or rare plant habitats.
- Avoid applying pesticides when weather conditions are wrong (wind speeds greater than 5 mph, temperatures over 85° F, and/or low relative humidity).
- Avoid Ultra-Low-Volume (ULV) applications by ground or air equipment, since they can increase off-target pesticide movement by as much as 30 percent.
- Choose chemicals that are less toxic to plants and animals in the treatment area. For example, avoid pyrethroids around water because they are highly toxic to fish and other aquatic species. But, choose pyrethroids in upland areas where bird and mammal species are likely to predominate.

Use these recommendations with an integrated pest management program that includes scouting and multi-year crop rotations. In this way you may be able to limit or even omit pesticide application in areas where damage to non-target species is a concern or where pesticides may provide only marginal economic benefits. Extra caution should be used when a pesticide is being applied on or near water or adjacent to a sensitive area. Sensitive areas include endangered species habitats (for example, a native prairie which harbors a population of threatened orchids) and land which is highly susceptible to groundwater contamination (for example, fractured limestone or karst topography).

State contacts

Questions regarding pesticide use as it pertains to endangered or threatened species in Minnesota should go to:

Endangered Species Protection Program
Pesticide and Fertilizer Management Division
Minnesota Department of Agriculture
625 Robert Street North
St. Paul, MN 55155-3529
Tel: (651) 201-6269

Questions about the use of aquatic pesticides should be directed to:

Minnesota Department of Natural Resources (MNDNR)
500 Lafayette Road
St. Paul, MN 55155
Tel. (651) 296-2835

Questions regarding endangered or threatened species in Minnesota should go to:

Minnesota Natural Heritage and Non-Game Resources Program
Minnesota Department of Natural Resources
Box 25, Lafayette Road
St. Paul, MN 55155
Tel. (651) 296-3344

Federal contact

Questions about the Federal Endangered Species Act, federally listed species, or the endangered species listing process should be directed to:

Office of Endangered Species
U.S. Fish and Wildlife Service Twin Cities Field Office
4101 East 80th Street
Bloomington, MN 55425-1665
Tel. (612) 725-3548 ext. 203

Endangered and Threatened Species in Minnesota

Both the federal government and the State of Minnesota classify living organisms to protect them from extinction. The Federal Endangered Species Act classifies species as follows:

- An *endangered species* is a plant or animal that is in danger of extinction throughout all or a portion of its historic range.
- A *threatened species* is one that is likely to become endangered within the foreseeable future.

Classified, or “listed,” species have special protection under the Federal Endangered Species Act. Here are the federally listed endangered and threatened species found in Minnesota as of spring 2001.

Minnesota Dwarf Trout Lily (*Erythronium propullans*). This tiny plant is known from only three counties in the world: Rice, Goodhue, and Steele counties in southeastern Minnesota. It is found primarily on north-facing slopes with the “Big Woods” maple-basswood forests on moist to saturated floodplain soils. Flowering period: late April and early May. Member of the lily family.

Leedy’s Roseroot (*Sedum integrifolium ssp. leedyi*). This close relative of the common jade plant is restricted to limestone cliffs within the Root and Whitewater river drainages in Olmsted and Fillmore counties. Within these watersheds, roseroot plants occupy cool, moist, north-facing cliffs that are fed by a combination of cool air and groundwater. Flowering period: mid-June. Member of the stonecrop family.

Prairie Bush Clover (*Lespedeza leptostachya*). The pale pink flowers of this

delicate plant can be seen from mid-July through early August, but its silvery green foliage and pods make it especially noticeable in late summer and early fall. Prairie bush clover prefers slightly moist shallow depressions and north-facing exposures on hill prairies in the southern part of the state. In Minnesota, it is known from eight counties: Goodhue, Rice, Renville, Redwood, Brown, Cottonwood, Jackson and Houston. Flowering period: mid-August. Member of the pea family.

Western Prairie Fringed Orchid (*Platanthera praeclara*). This showy orchid prefers moderately wet to wet shallow depressions in native prairie habitats in the western and southeastern parts of the state. The most significant populations are found within the former glacial Lake Agassiz interbeach areas in Polk County, but populations are also known from Kittson, Norman, Pennington, Clay, Pipestone, Rock, Freeborn, Mower, and Dodge counties. Flowering period: early July. Member of the orchid family.

Higgins' Eye Pearly Mussel (*Lampsilis higginsii*) and **Winged Mapleleaf Mussel** (*Quadrula fragosa*). Both species are known from only a few locations in the St. Croix and Upper Mississippi Rivers. The system of locks and dams that was installed in the early 1900s to enhance river navigation has proven to be one of the greatest obstacles to the survival of freshwater mussels. Dams produce widely fluctuating water levels and alter both current speed and duration of flow in the rivers. Consequently, the texture of the river bottom above and below the dams has changed and water clarity has decreased. Dams also affect the concentration and variety of suspended food particles available to the filter-feeding mussels and create a barrier for migrating larval mussels and their host fish. Other threats to freshwater mussels include: general water quality degradation, due partly to agricultural and urban runoff; physical destruction of mussel beds as a result of bridge construction; illegal collecting or over-harvesting; and the presence of the newly introduced exotic zebra mussel, which can colonize the shells of native mussels and suffocate them.

Bald Eagle (*Haliaeetus leucocephalus*). In Minnesota the breeding range for bald eagles includes most of the northern half of the state and the counties that border Wisconsin along the Mississippi River. Nesting pairs also occur in Chippewa County. Bald eagles winter in the state along the Mississippi and in both Lac qui Parle and Chippewa counties. The federal "recovery" goal for the bald eagle has been exceeded in Minnesota, largely because of the successful implementation of the Federal Endangered Species Act and the 1973 ban on the use of DDT and other persistent pesticides.

Piping Plover (*Charadrius melodus*). The piping plover is a small shorebird that prefers sandy to gravelly undisturbed beaches for nesting. Since piping plovers are very sensitive to human disturbance, they face a great challenge in attempting to compete with recreational, industrial, agricultural, and other conflicting human uses of shoreline. In 1993 only nine adult piping plovers were documented in Lake of the Woods County by the Minnesota DNR. They are the only remaining breeding piping plovers in the state.

Gray Wolf (*Canis lupus*). Minnesota is fortunate to have a wolf population that is second only to Alaska in numbers and widespread distribution. Current estimates put wolf numbers in Minnesota at between 1,550 to 1,750 individuals. Predation on livestock by wolves can, admittedly, pose a problem in certain areas of Minnesota. However, federal and state programs designed to remove the offending animal(s) and to compensate landowners for livestock losses should minimize human/wolf conflicts.

Recent Federally listed species in Minnesota:

Threatened mammal:

- Canada lynx
(*Lynx Canadensis*)

Endangered fish:

- Topeka shiner
(*Notropis topeka*)

The Peregrine falcon has reached recovery and was removed from the Federal endangered and threatened species lists in 1999.

The Gray wolf is close to recovery and a plan to remove it from the Federal endangered and threatened lists is in negotiation.

The Minnesota Department of Agriculture administers the wolf-reimbursement program statewide.

Karner Blue Butterfly (*Lycaides melissa samuelis*). This tiny, but showy, butterfly is known in Minnesota from only a single Winona County location. Male karner blues are bright violet-blue with a narrow black band, tinged white around the wing margin. The females are mostly dark brown on the upper wings with a crescent-shaped band of orange spots on the hind wings. Both males and females are approximately one inch in long. Karner blue butterfly larvae feed exclusively on wild blue lupine (*Lupinus perennis*). Consequently, the range of this species is restricted to the sandy oak-savanna plant community type that will support wild blue lupine.

In addition to Minnesota's eleven federally listed species, the Minnesota Department of Natural Resources maintains a list of state endangered, threatened, and special concern species. These plants and animals are protected by Minnesota Statute 84.0895. For further information, contact the Minnesota DNR at the address listed on page 5 - 13.

Pesticide Programs to Protect Endangered and Threatened Species

U.S. Environmental Protection Agency's Pesticide Program

The Federal Endangered Species Act of 1973 requires all federal agencies to ensure that their actions do not pose a risk to any of the more than 825 plants and animals that are federally listed as threatened or endangered. The U.S. Environmental Protection Agency's (EPA's) pesticide registration process is one way to do this. Therefore, the EPA is developing a pesticide labeling system that will refer users to an endangered species bulletin prepared specifically for the county where the pesticide is to be applied.

These county bulletins contain a brief overview of the EPA's Endangered Species Protection Program. A table lists pesticide active ingredients that have been shown to pose a risk to the species in question and a map shows the range of that species in the county.

Usually these bulletins recommend a buffer zone around endangered species habitats. The size of the buffers, or pesticide restriction zones, is based on several factors including: the life history requirements of the species; the consistency of the pesticide; the rate of application; and the method of application (for example, aerial vs. ground).

Minnesota Department of Agriculture's Endangered Species Protection Program

The EPA's proposed program has been difficult to put into action and the implementation date has been delayed several times. Because of this, the Minnesota Department of Agriculture (MDA) accepted the EPA's offer to develop an alternative Endangered Species Protection Program. The goal of the MDA program is to be responsive to the needs of the agricultural community while ensuring that federally listed endangered species are protected from harmful pesticide exposure.

The MDA meets individually with private landowners and public land managers who own or manage federally listed plant populations in the state. These people are given detailed information about the rare species on their land. The site is surveyed by an MDA staff person to find out if

pesticide use will harm the species. After the survey and a discussion about pesticide use at the site, a personalized Pesticide Management Plan is drafted. If owners and managers are willing to follow the pesticide use recommendations outlined in their plan, they sign a Voluntary Protection Agreement stating their intentions.

Since the MDA Pesticide Management Plans are tailored to each rare species site, they provide more specific pesticide use recommendations than the EPA program could allow. The MDA plan takes into account the actual distance of the rare plant or insect population from the nearest pesticide application site as well as topographic features that may serve as natural barriers to off-target pesticide movement. Because of this, buffer zones can frequently be reduced to segments of fields, instead of the much larger acreage required by the EPA.

If the Minnesota Department of Agriculture is successful in convincing the EPA and the U.S. Fish and Wildlife Service that Minnesota's federally listed species are well-protected from pesticide harm, Minnesota pesticide applicators will not be subject to the federal labelling/county bulletin approach discussed above. That is why the cooperation of all pesticide applicators is needed in helping to minimize off-target pesticide impacts on Minnesota's rarest plants and animals.

Summary

Pesticides may cause damage to the environment if they move out of the target area into the surrounding environment. This can happen if the pesticides drift in the air, get into surface water or groundwater, or contaminate the soil.

Pesticide drift occurs when dust, droplets, or vapors are carried in the air away from the application site. Small droplets or pesticides that vaporize easily are more likely to drift. To reduce drift select nozzles properly and use lower pressure when spraying. Spray close to the ground. Avoid spraying when it is windy or when temperatures are high. Use low-volatility formulations and spray thickeners where appropriate.

Because groundwater is the source of much of the drinking and irrigation water in Minnesota, it is essential to prevent contamination of this valuable resource. Pesticides may contaminate ground and surface water through accidental spills or, under certain conditions, during normal application. Protect ground and surface water by using Integrated Pest Management techniques to avoid all unnecessary pesticide use. Do not spray plants or animals that are not "pests" (that is, learn the difference between "weeds" and native plants or animals that are not harmful or invasive). Use pesticides that are less likely to leach or run off the soil surface. Use the lowest effective application rate on sandy soils or where groundwater is near the surface. Prevent spills and accidents by using good pesticide management practices. Keep pesticides away from wells, sinkholes, or surface water.

It is illegal to harm or harass an endangered or threatened species. Since pesticides can affect non-target organisms, the EPA and MDA are working together to develop a plan to protect Minnesota's federally listed species from pesticides. Check with the Minnesota Department of Agriculture's Endangered Species Program Manager, the U.S. EPA, the U.S. Fish and Wildlife Service, or your local extension educator for more information about pesticide restrictions in your county.

