

# Pesticide Use

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REMEMBER:

Guidelines help with *how* to manage,  
not *whether* to manage.

These guidelines focus on *how* to protect the functions and values of forest resources during forest management activities. They do not provide advice on *whether* to manage or which management activities are needed.

Guidelines provide a *menu*, not a *mandate*.

Site-level resource management decisions are based on many different factors, including resource needs, landowner objectives, site capabilities, existing regulations, economics and the best information available at any given time. No one will apply all of the guidelines related to a particular activity. Instead, the landowner, resource manager or logger will consider many different factors in determining which combination of guidelines provides the best “fit” for a particular site at a particular time. The intent of having multiple guidelines is to provide decision-makers with as much flexibility—and as much choice—as possible in taking steps to effectively balance forest management needs and resource sustainability.

*General* guidelines and *activity-specific* guidelines  
are closely related.

Frequent references from activity-specific guidelines back to the general guidelines will make it easy for landowners, resource managers, loggers and others to consider all of the related guidelines—both general and specific—that apply to a particular management activity.

Guidelines are supplemented from time to time  
by “Additional Considerations.”

The guidelines are supplemented from time to time by “Additional Considerations,” which provide additional guidance to further promote sustainability of our forest resources.

## INTRODUCTION

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The purpose of a pesticide application is to assist in meeting forest management, utility and rights-of-way objectives by promoting the establishment, survival, growth or maintenance of a desired species or condition through the use of chemical compounds or biological agents that control undesirable plants, animals, insects or diseases.

### The Benefits of Guidelines

**Benefits to cultural resources:** Pesticide use guidelines can help assure that vegetation that is part of a cultural property is not altered, which can diminish the value of the cultural property. Guidelines can also minimize the effects of herbicide applications on natural resources that are used by traditional communities for subsistence and other cultural practices.

**Benefits to riparian areas:** Pesticide use guidelines can minimize alteration of vegetation within the riparian area. That vegetation is important for providing inputs of coarse woody debris and fine litter to water bodies; retaining nutrients, sediment and energy; bank and shoreline stabilization; maintenance of moderate water temperatures through shading; and wildlife habitat. Guidelines for retaining vegetation can also have a positive impact on aesthetics, wood products and recreation.

**Benefits to visual quality:** Pesticide use guidelines can reduce the visual impacts of dead standing vegetation during the growing season or summer tourist season.

**Benefits to water quality and wetlands:** Pesticide use guidelines can protect water quality from pesticide residues during all phases of the pesticide use cycle. Guidelines can also help protect vegetative cover and minimize toxic effects on aquatic organisms. Guidelines that address equipment operations and maintenance can help protect water quality.

**Benefits to wildlife habitat:** Pesticide use guidelines encourage application methods that retain desirable ground cover, shrubs, live trees, insects or other invertebrates, thus maintaining on-site species diversity.

## Considerations

- Planning is the essential first step in reducing pest problems. Maintaining water quality and protecting other resources is an important consideration in all aspects of pesticide operation planning.
- Vegetation that is part of a cemetery is protected by law and must not be damaged or altered by herbicide application.
- If the project area is on ceded lands or within the boundaries of a reservation, consult tribal cultural resource specialists to determine whether there are any concerns about traditional cultural practices in or near the project area. See *Resource Directory*. For locations of ceded lands, see *Appendix E: Ceded Lands and Reservation Boundaries*.
- The effective treatment time for most herbicides is during the active growing season, which corresponds with the summer tourist/recreational use season.
- Broadcast application methods may have a greater visual quality impact than band or spot treatment methods.



Have you identified  
your goals and objectives?

See *Identifying Goals and Objectives*  
in General Guidelines.

Have you conducted a site inventory?

See *Conducting a Site Inventory*  
in General Guidelines.

## PLANNING

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### IMPORTANT! Review General Guidelines:

- Incorporating Sustainability into Forest Management Plans
- Maintaining Filter Strips
- Managing Riparian Areas

### Incorporating Integrated Pest Management Strategies

**U**Employ integrated pest management (IPM) strategies.

Pesticide use should be considered as part of an overall program to control pest problems. Integrated pest management (IPM) strategies have been developed to control forest pests without relying solely on chemical pesticides.

These strategies incorporate a balanced combination of chemical, biological and cultural activities to control forest pests.

A good IPM program has four steps:

- Identify problems.
- Select tactics.
- Consider economic factors, including whether it pays to use pesticides.
- Evaluate the program.

For sources of information on IPM programs, see *Resource Directory*.

## Characteristics Affecting Contamination Potential

The three main pesticide characteristics that can greatly affect a pesticide's potential to contaminate surface or ground water are solubility, adsorption and half-life.

☐ **Solubility** is the ability of a pesticide to dissolve in water. The greater the solubility, the greater the chance that the pesticide will leach to ground water or move in solution in surface water. Pesticides with very low water solubilities tend to remain at the soil surface and potentially move to surface water attached to sediment carried in runoff.

☐ **Adsorption** is the inherent ability of a pesticide to attach to soil particles. Some pesticides stick very tightly to soil, while others are easily dislodged:

- The greater a pesticide's ability to adsorb to soil particles, the less the potential for that pesticide to move (except by soil erosion in surface runoff).
- Conversely, the lower a pesticide's ability to adsorb to soil particles, the greater the potential for that pesticide to leach to ground water or move in solution in surface runoff.

Adsorption increases as soil organic matter increases. An index or measure of soil adsorption is expressed by the Koc value.

☐ **Half-life** is the time it takes for a pesticide in soil to be degraded so that its concentration decreases by one-half. Each pesticide will have successive half-lives that will continually decrease concentrations by one-half.

The persistence of the pesticide in soil is the time it takes for the pesticide to degrade to the point where it is no longer active. Pesticides that do not break down quickly can be a hazard if they move to ground water or surface water in toxic forms.

Table PEST-1 provides information on pesticide characteristics that influence the potential for the chemicals to leach to ground water. In a given situation, pesticides with the highest water solubilities, greatest persistence, lowest affinities for adsorption to soil particles, and highest application rates have the greatest potential for movement in surface runoff and for leaching to ground water.

*Table PEST-1*

Pesticide Characteristics Influencing Leaching Potential	
<i>Characteristic</i>	<i>Threshold value for high leaching potential*</i>
Water solubility	30 mg/liter or greater
Adsorption to soil organic matter (Koc)	Less than 300-500
Field dissipation half-life	Greater than 3 weeks

*\*No one value will indicate leachability.*

For sources of assistance in evaluating pesticide alternatives and determining potential pesticide loss due to surface runoff or leaching, see *Resource Directory*.

## Selecting Pesticides

When the decision is made to use pesticides, choose products suitable for use on the target species and registered for the intended uses.

**U** Use only pesticides registered by the U.S. Environmental Protection Agency and the Minnesota Department of Agriculture. See *Resource Directory*.

**U** Read and follow all label directions carefully prior to using any pesticide.

**U** Maintain current labels and Material Safety Data Sheets (MSDS). The MSDS is a source of cautionary information and data.

**U** Evaluate other factors besides effectiveness and cost when selecting among pesticide options. Factors that influence potential impacts on water quality and other forest resources include site characteristics, pesticide characteristics, application conditions, delivery systems and application techniques.

For pesticide characteristics that affect contamination potential, see Table PEST-1. For additional information on registered pesticides, see *Resource Directory*.

**U** Select only pesticides labeled for aquatic use on sites where surface water is present at the time of application.

**U** Select pesticides, application methods, equipment and formulations that:

- 1) Minimize the potential for pesticide drift.
- 2) Minimize pesticide residue movement to surface water and ground water.

## Selecting Application Methods

**U** Design chemical treatments of regenerating stands to protect reserve areas and structural habitat components retained in previous stand treatments.

**U** Promote protection or growth of mast species and browse by employing chemical site preparation methods that target pesticide application (low intensity, spot, band) in preference to broadcast applications. Regenerating oak, an important mast species, may warrant more liberal application.



**U** Use pesticide application equipment that minimizes soil disturbance.

**U** Consider non-broadcast application of pesticides where appropriate. Limit broadcast application of pesticides, particularly from the air, to situations where it is the only feasible management option.

**U** If pesticides must be applied to sites containing endangered, threatened or special concern species (ETS species), select pesticides, application methods, equipment and formulations to protect those species. For sources of assistance regarding ETS species, see *Part 2: Endangered, Threatened and Special Concern Species* and the *Resource Directory*.



Ground application of pesticides limits unintended effects on the forest overstory. Photo courtesy of Minnesota DNR

## Reducing Visual Impacts of Treated Vegetation

### *In areas classified as most sensitive: \**

- U** Favor non-herbicide treatment methods.

### *In areas classified as most sensitive or moderately sensitive: \**

- U** Favor band treatment or spot treatment over broadcast treatment.
- U** Leave untreated or selectively treated areas adjacent to travel routes and recreation areas.
- U** Favor late-season or dormant-season herbicides.

### *In areas classified as less sensitive: \**

- U** Use methods of application consistent with integrated resource management principles.

\*See Part 2, *Visual Quality: Visual Sensitivity Classifications* for information related to how classifications are determined and which Minnesota counties have developed visual sensitivity classification maps.

## Spill Response

Forestry pesticides that are spilled can enter surface water or ground water. Spills near or in geologically sensitive areas have a high probability of a portion of the spill reaching ground water.

**U** Contact the Minnesota Duty Officer whenever a spill occurs. Phones are answered 24 hours per day. In the Metro Area, call (651) 649-5451. In Greater Minnesota, call (800) 422-0798. The Minnesota Duty Officer will contact appropriate state agencies.

**U** Treat spills properly. Recommended steps include the following:

- Act quickly.
- Protect yourself.
- Control the spill. (Stop the leak.)
- Contain the spill. (Keep it from spreading.)
- Guard the site.
- Notify the authorities.
- Clean up the spill.

**U** Maintain an adequate spill kit that includes:

- Detergent or soap
- Hand cleaner and water
- Activated charcoal, adsorptive clay, vermiculite, kitty litter, sawdust or other adsorptive materials
- Lime or bleach to neutralize pesticides in emergency situations
- Tools such as a shovel, broom, dustpan and containers for disposal
- Proper protective clothing and equipment

## OPERATIONAL ACTIVITIES

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### IMPORTANT! Review General Guidelines:

- Protecting Cultural Resources
- Managing Equipment, Fuel and Lubricants
- Protecting the Normal Flow of Streams and Wetlands
- Protecting Wetland Inclusions and Seasonal Ponds
- Retaining Leave Trees
- Providing Coarse Woody Debris

**U** Conduct on-site meetings with the contractor, landowner and resource manager prior to moving equipment onto a site. Such meetings can help assure common understanding of landowner objectives, contract specifications and site conditions.

Proper pesticide management practices make efficient use of chemicals while preventing or minimizing impacts on surface water, ground water and other forest resources. Residues of pesticides used in forestry can affect these resources at any time—from transporting of pesticides to container and waste disposal.

### Transportation of Pesticides

**U** Inspect all containers prior to loading, and ensure that all caps, plugs and bungs are tightened.

**U** Select transportation routes to minimize the impact of a potential spill on water quality.

### Storage of Pesticides

**U** Locate pesticide storage facilities at sites that minimize the possibility of impacts on water quality in case accidents or fires occur.

**U** Avoid storing pesticides on or adjacent to treatment areas. Where impractical, select unloading and operational storage locations where spills resulting from accidents or vandalism will not have impacts on water quality.

**U** Use storage buildings that have floors constructed of concrete or other impermeable materials, so that spills are easy to clean up. Storage buildings should contain drains or sills with sumps large enough to contain the contents of the largest container stored in the buildings.

**U** Avoid storing pesticides for extended periods in buildings not equipped to contain a complete spill from the largest container being stored.

## Mixing and Loading Operations

**U** Review the label before opening the container to ensure familiarity with current use directions.

**U** Exercise care and caution during mixing and loading of pesticides.

**U** Avoid mixing near wells or where pesticide spills could enter open water or wetlands.

**U** Mix and load pesticides outside of riparian management zones, filter strips and other reserve areas.

**U** Transport and store hoses used to fill pesticide application equipment in a manner that prevents direct contact with pesticides, gasoline or oils, or surfaces on which these substances have been spilled.

**U** Fill equipment from water sources before introducing pesticides into mixing or application equipment.

**U** Replace pour caps and close bags or other containers immediately after use.

**U** Avoid leaving a spray or mix tank unattended while it is being filled.

**U** Provide an air gap between the water source and the mixture surface to prevent backsiphoning.

## 14 Pesticide Use

**U** Avoid filling pesticide mixing or application equipment directly from a public water supply unless the outlet from the public water supply is equipped with a backflow prevention device.

**U** Avoid filling pesticide mixing or application equipment directly from surface water unless the equipment contains proper and functioning anti-backsiphoning mechanisms.

**U** Triple rinse all empty plastic and metal pesticide containers and add the rinse water to the spray solution.

### Pre-Application Activities

**U** Ensure that pesticide applicators are properly licensed in the appropriate category by the Minnesota Department of Agriculture when a license is required. See *Resource Directory*.

**U** Protect vegetation that is part of a cultural resource (such as historic homestead sites) if it will be impacted by herbicide applications.

**U** Mark the boundaries of the area for treatment.

**U** Refer to label directions before applying a pesticide.

### Timing and Weather Considerations

**U** Avoid applying insecticides during the spring bloom when pollinators are most active. If there is a choice, spray earlier or later.

**U** Avoid applying pesticides when the likelihood of significant drift exists.

**U** Use a drift control agent where appropriate.

**U** Consider applying pesticides near dawn or dusk, when wind speeds are generally lowest.

**U** Apply pesticides when wind speeds are 6 mph or less for aerial application and 10 mph or less for ground broadcast application.

**U** Limit broadcast applications (both aerial and ground) to appropriate temperature and relative humidity conditions. High temperatures enhance loss of volatile pesticides and the rate of evaporation of droplets. Relative humidity also influences the rate of evaporation, with the rate increasing with decreases in humidity.

## Applying Pesticides

**U** Check all application equipment carefully, particularly for leaking hoses and connections and plugged or worn nozzles.

**U** Calibrate spray equipment periodically to achieve uniform pesticide distribution and rate.

**U** Select a nozzle type that produces the largest drops at a given rate and pressure appropriate to the chemical being applied.

**U** Employ the lowest reasonable equipment pressure when applying pesticides.

**U** Mix pesticides in upland areas, where practical.

**U** Apply pesticides in accordance **with** the product label.

**U** Avoid applying pesticides on small wetland inclusions in upland areas unless that application is part of the management objective. If unable to avoid pesticide use in these areas, select only pesticides labeled for aquatic use when surface water is present at the time of application.

**U** Avoid broadcast application methods within filter strips and riparian management zones (RMZs). Appropriate treatments within filter strips and RMZs include:

- Use of pesticides labeled for aquatic use
- Manual or mechanical treatments
- No treatment
- Spot, banded, stump, basal bark, hack and squirt, frill or injection treatments
- Use of less soil-mobile pesticides
- Increasing filter strip width when using toxic to highly toxic insecticides

### *Additional Consideration*

**K** Consider maintaining the diversity of mast sources on the site, as well as some level of current production of mast sources. For example, leave shoulders of roads or plantation spot failures untreated, or maintain landings as openings.

## Protecting Water Resources

**U** Avoid applying pesticides directly to water except where specifically labeled for application to water. For pesticides not labeled for aquatic or ditchbank use, avoid riparian management zones, filter strips or shade strips and other reserve areas adjacent to all streams, lakes, wetlands and ditches that contain water at the time of application.

**U** Prohibit aircraft that are transporting pesticides from crossing open water where practical. Aircraft also should not fly down the course of any recognizable stream. Where stream crossings cannot be avoided, they should be made at right angles to the stream course. Chemical application should be shut off during turns and over water.

**U** Select potential heliport or helipad locations with consideration for two conditions that could affect water quality: 1) flight patterns in relation to water bodies; and 2) locations adjacent to water bodies.

## POST-OPERATIONAL ACTIVITIES

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**IMPORTANT!** Review General Guidelines:

- Post-Operational Activities and Followup Visits

### Equipment Cleanup

**U** Avoid cleaning pesticide application equipment in surface waters.

**U** Clean equipment in areas where pesticide residues will not enter streams, lakes, wetlands or ground water.

**U** Clean all mixing and loading equipment thoroughly after each use.

**U** Rinse mixing apparatus at least three times.

**U** Apply rinsate in spray form to the area to be treated.

**U** Avoid discharge of rinse water in wetland areas that are not part of the application site.

## Container and Waste Disposal

**U** Dispose of pesticide wastes and containers according to state and federal laws. Some pesticide wastes are specifically identified as hazardous wastes by law; these must be handled and disposed of in accordance with hazardous waste regulations. For sources of information about proper management of waste pesticides, see *Resource Directory*.

**U** Rinse all empty plastic and metal pesticide containers three times, and add the rinse water to the spray solution. To properly triple-rinse containers:

1. Empty the pesticide into the spray tank and allow the pesticide container to drain.
2. Fill the container 10% to 20% full with water (or solvent, in some cases), rinse, and pour the rinse water into the spray tank.
3. Repeat Step 2 two more times and apply rinsate to the spray site.
4. Apply all leftover solutions and rinsates to the treatment area.

**U** Puncture and flatten containers not intended for return to the manufacturer.

**U** Dispose of triple-rinsed containers in one of two ways:

- By recycling through an approved program. A list of dealers or locations who recycle these containers is available at county University of Minnesota Extension offices.
- As ordinary solid waste at a landfill licensed by the Minnesota Pollution Control Agency.

**U** Refer to the product label for additional information on proper disposal.