

# USING PESTICIDES SAFELY

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# USING PESTICIDES SAFELY

## Learning Objectives

- Define the term *pesticide*.
- Summarize how to prevent pesticide resistance.
- List where to find personal protective equipment (PPE) on a label.
- Calculate the total amount of a pesticide mixture.
- Restate pesticide properties and movement.
- Explain how to hire a professional applicator.
- Record important numbers and information.
- Complete the reading of the pesticide label activity.

## Introduction

**Pesticides** are used to destroy, repel, suppress, mitigate, or otherwise control an unwanted organism in our environment, one that is in the wrong place at the wrong time. To some gardeners, this may include powdery mildew in an orchard, a dandelion in a lawn, or an aphid colony eating through a kale patch. This chapter by no means enables you to be a pesticide specialist, but it will help you to understand the best practices for pesticide use, safety, and stewardship.

## Pesticide Use

### LAW AND REGULATION

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) establishes federal regulatory authority for the use, sale, and distribution of pesticides. In 1970 the United States Environmental Protection Agency (US EPA) was created to protect and treat air, water, and land as an interrelated system. That same year, the US EPA was charged with the enforcement of FIFRA. Under the authority of the US EPA,

the Idaho State Department of Agriculture (ISDA) oversees the enforcement of pesticide use and regulations within the state of Idaho.

As consumers purchasing a pesticide product, we enter a legal binding contract with a pesticide company to follow the product's labeled instructions. The label is the law. Master Gardeners (MGs) should be able to understand the elements of a pesticide label and explain them to a homeowner. If MGs make pesticide recommendations to the public, they need to follow all the labeling directions and requirements.

### MASTER GARDENER TIP

You may need to invest in a small magnifier because pesticide labels are printed in very small fonts.

Researchers conduct extensive studies that often cost millions of dollars to ensure the efficacy and safety of each pesticide product. Every product that is registered as a pesticide with the US EPA must comply with FIFRA regulations and Idaho's pesticide law, regardless of whether it is an **organic** or a conventional pesticide. Pesticides are registered as one of two types: those for general use and those for restricted use.

Anyone can purchase and apply general-use pesticides. To purchase and apply restricted-use pesticides, however, an individual must possess a pesticide license and be eighteen years of age. This requires passing a state-regulated exam and undergoing a certification process conducted by the ISDA. MGs, who help communities and homeowners to recognize pest damage and identify pests and the stages of a pest's life cycle (and the best pest control method to choose), can only recommend general-use pesticides for use by homeowners. They must be University of Idaho MG-certified, meaning they have successfully completed MG pesticide policy training and follow their county's procedures.

### MASTER GARDENER TIP

Pesticides are tools that help gardeners to manage pests that have become a problem. If you are using the wrong tool (or wrong pesticide), your efforts will prove ineffective.

## PEST MANAGEMENT

Bactericides kill bacteria, fungicides kill or prevent fungus and mildews, herbicides control weeds and other plant materials, insecticides kill insects, and so forth. Choosing and using the best one as part of an Integrated Pest Management program gets you one step closer to gaining the upper hand on any pest. Refer to Table 1 for the appropriate pesticide to use to improve the health of your garden and landscape setting.

**Table 1.** Types of pesticides and the pest they control.

Pesticide	Targeted Pest
bactericide	bacteria
fungicide	mildew and other fungi
herbicide	weeds
insecticide	insects
miticide	mites
molluscicide	slugs and snails
nematicide	nematodes
piscicide	fish
rodenticide	rodents (mice, rats, voles, gophers, etc.)

Other good reference sources for pest management methods to add to your library are the Pacific Northwest (PNW) Pest Management Handbooks published by University of Idaho, Oregon State University, and Washington State University. This is a collaborative resource for pest management information. These handbooks provide useful information about both horticultural and agricultural pest management practices.

## PESTICIDE PRODUCT TYPES

Pesticides are either selective in targeting a specific pest or nonselective (sometimes called broad spectrum). Broad spectrum insecticides can eliminate all insects, including beneficial ones, so apply them carefully to prevent further insect pest outbreaks. You do not want to inherit the work of beneficial insects! The most common pesticide products homeowners apply include the following:

### ***Bactericides***

In addition to bactericides for plant protection, bactericides are commonly found in household products such as disinfectants. These products are labeled as pesticide and are registered through the US EPA.

## MASTER GARDENER TIP

Use these products to keep your garden tools clean and sanitized (follow the label's instructions and wear the required protective equipment). Routine sanitation practices reduce the chance that plant diseases will spread in your garden or landscape.

### ***Fungicides***

Fungicides are used to prevent and control fungal infestations. Some fungicides are systemic, working from the inside of the plant to control an infection that has already occurred. This prevents further spread of the disease. Other common fungicides are protectants that prevent the infection and establishment of a possible fungal disease. Protectant fungicide must be reapplied on new plant growth or after rainfall and overhead irrigation. Many fungicide products are available as premixes that contain both a systemic and a protectant. These products protect the plant with the two types of fungicides and help to prevent fungicide resistance.

## MASTER GARDENER TIP

If a gardener has a problem with fungus in their landscape, investigate their watering and planting practices. They may be creating their fungal problem.

### ***Herbicides***

Herbicides affect plants differently, depending on the chemical properties and how the herbicide attacks the weed, qualities collectively called the mode of action (MoA) of a herbicide. Herbicides generally control weeds as a preemergent, attacking underground weed growth when germination occurs, or as a postemergent, after the weed has begun growing. Preemergent herbicides are applied to the soil before weeds emerge. Postemergent herbicides are applied directly to the weeds after they have emerged. Proper spray coverage is important for good weed control. Some herbicides may be persistent in the soil and will not break down quickly. They can remain active in the soil for several weeks. Check the herbicide label to determine what plants can be sown into the treated area. Otherwise, plant/crop damage can occur.

## MASTER GARDENER TIP

When a homeowner client wants to control a weed, identify the weed species accurately and understand its life stage. Consult the PNW Weed Management Handbook for a list of management options and herbicides recommended for the weed species and life stage.

### ***Insecticides***

Insecticides attack insects in several ways. Stomach-poison insecticides must be ingested as an insect feed. These products are used to eliminate insects with chewing mouthparts.

Other insecticides, classified as contact poisons, penetrate an insect's outer membrane or enter through its respiratory tubes or spiracles. These products must be sprayed directly on an insect.

When insecticides are absorbed and translocated throughout a plant you are protecting, they are called systemic insecticides. They are especially effective against insects with piercing-sucking mouthparts.

Broad-spectrum insecticides kill many insects or other arthropods; however, they also destroy predator insects. The smart gardener retains these predators by using selective insecticides that control the insect pest. These products control fewer but more biologically similar insects. Other selective insecticides are repellent products that discourage insects from eating plant materials and pheromone products whose chemical makeup confuses insects from mating properly.

Because there are many types of insecticides on the market, we recommend you seek advice from a county educator or consult the PNW Insect Management Handbook. Insecticides are crucial to pest management because insects can take down any untreated single plant or tree.

## MASTER GARDENER TIP

When a homeowner wants to control any insect, identify the insect species and understand the life stage of the insect. Consult the PNW Insect Management Handbook for a list of management options and insecticides recommended for the insect species and for information on proper insecticide timing and coverage.

## ACTIVE INGREDIENTS

Pesticide concentrates are formulated products that contain different combinations of ingredients. The **active ingredient** is the working portion of the product that controls the pest problem. Other ingredients, called inert ingredients, are added to the active ingredient to enhance its performance. For instance, surfactants help pesticides to adhere to plant surfaces. For science-based pesticide information, contact the National Pesticide Information Center (NPIC).

Because homemade remedies and concoctions are not labeled for pesticide use, Idaho MGs cannot recommend these products. Be sure to complete the Idaho MG Pesticide Policy module and sign the MG Pest Management Agreement prior to making any pesticide recommendation.

### MASTER GARDENER TIP

All recommendations must follow the pesticide label to ensure that the host plant or application site and the pest is listed on the manufacturer's label.

## RESISTANCE

Most pests can rapidly reproduce in favorable environmental conditions. Pests that produce multiple generations in a season have a better chance of developing **pesticide resistance** if repeatedly exposed to the same group of pesticides. Some individual pests have the natural ability to survive a pesticide application. Those that do may produce offspring or seeds with the same genetic traits, thus hastening the development of a pesticide-resistant population. Rotating pesticide products with a different MoA will play a role in thwarting resistance. In agricultural settings, it's a particularly vital strategy, so rotate the pesticides every two years to keep exposure to the same MoA at a reasonable minimum. When you notice poor results from a pesticide application, pesticide resistance may occur or it may be an application problem. Investigate it to rule out one or the other. It is very important to identify potential pesticide resistance early.

### *Understanding Pesticide Mode of Action*

MoA influences the development of resistance in pests and refers to a cellular process interruption of a particular function in the pest. It involves how a pest ingests or absorbs the toxin, how it metabolizes it, and how it physiologically responds to the poison.

Site of Action (SoA) is another resistance-related term, used by weed scientists, to describe the specific "site" or area in a weed where the herbicide interferes with the plant's growth and development.

Most pesticide labels contain a numerical resistance code to manage your pesticide choices. This helps to discourage resistance development. Pesticides are grouped by the MoA codes. These codes are determined by three international bodies of scientists and pesticide manufacturers based on the pesticide's "mode of action" and the specific site or target on the pest. The international MoA codes are located on the front panel of all pesticide product labels. Pesticide applicators use the designations to help them avoid purchasing and using pesticides from the same group. Rotating MoA groups is one of the best tactics to prevent pesticide resistance. MoA and SoA codes are available online through the PNW Handbooks or Resistance Action Committees (see "Resources").

## FORMULATIONS

The pesticide formulation is a mixture of active and other (inert) ingredients designed to prevent, kill, or repel pests. Pesticides are sold in many different types of formulations to make the products easier to measure and use. Most liquids are concentrated and require dilution in your spray tank before application. Those that are ready-to-use, however, do not require dilution. The "ready-to-use" products have a very low percentage of active ingredients, making them much more expensive than the concentrates. These products are convenient for some homeowners who may have small areas to spray and who do not like to mix pesticides or clean out the sprayers.

Dry pesticide products include dusts, powders, granules, and baits; some require mixing with water to apply as a spray mixture and some are ready-to-use. Weed and feed products are a common example of ready-to-use granules. Whichever type you choose, look for one that will control your problem pest but is the least toxic to humans, pets, bees, other beneficial organisms, and the environment. See Table 2 for the advantages and disadvantages of formulations.

Accurate measurements must be precise when using concentrations. An efficient and effective application must be measured and mixed according to the label directions. For liquid formulations, measure by volume in the proper graduated measuring container.

Conversely, for dry formulations, measure by weight using a scale for accuracy. Ready-to-use products reduce the need to purchase specialized equipment and the incidence of mixing errors.

A home-brewed remedy is not labeled for pesticide use and MGs cannot recommend them. See the Idaho MG Pesticide Policy training module housed on the Idaho MG Pesticide Safety Education course site at <https://campus.extension.org/course/view.php?id=926>. This must be successfully completed prior to MG certification.

### MASTER GARDENER TIP

If you purchase only what you need, you will save money, reduce storage issues, and rotate through the products more easily.

### BIOPESTICIDES

Another type of pesticide that is gaining popularity in the marketplace are biopesticides. These products are registered pesticides with an active ingredient derived from some type of biological organism.

Although naturally occurring, the biologically based ingredients require research data, similar to conventional pesticides, before they become commercially available as a pesticide product. The US EPA still evaluates and registers them in a similar manner as conventional pesticides. An example of a biopesticide is *Bacillus thuringiensis* (Bt), a microbe that is toxic to certain insects.

### MASTER GARDENER TIP

There are many subspecies of Bt, so understand each type, particularly the different pests it treats or targets.

### PEST CONTROL FOR ORGANIC SYSTEMS

All pesticide products used in organic systems are derived from natural sources and must be registered with the US EPA and ISDA. The US EPA's role is to assist the United States Department of Agriculture National Organic Program (NOP) by assuring that the NOP's policies are implemented regarding organic

**Table 2.** The advantages and disadvantages of different pesticide formulations.

	Formulation	Definition	Advantages	Disadvantages
Ready-To-Use	Dusts	Pesticide + finely ground dry carrier	Ready-to-use	Drift hazard
	Granules	Like dusts, but larger particles and organic or mineral particles impregnated with pesticide	Reduced drift hazard vs. dust	Calibration
	Aerosols	Pesticide + volatile petroleum solvent + pressurized propellant	Ready-to-use convenience	Fine droplets, extreme low-percent active ingredient = inhalation hazard and high relative cost; plus drift hazard
	Ready-to-Use Sprays	Liquid in a trigger hand pump	Convenient (no mixing nor spray equipment)	Low-percent active ingredient = high relative cost
	Baits	Pesticide + food source	Ready-to-use	Must be in a bait station to reduce access to children and pets
Concentrated	Emulsifiable Concentrates	Petroleum-soluble pesticide + solvent + emulsifier	Very little agitation needed	More readily absorbed through the skin than dry or water-based formulations; may cause plant injury
	Flowables (liquids)	Water-soluble pesticide mixed with water	No agitation needed	None
	Wettable Powders	Water-insoluble pesticide impregnated on a finely ground organic or mineral particle +/- a wetting agent	Easy to store, handle, and transport	Requires agitation, may leave visible residues. Sometimes difficult to mix in cold water.
	Water-Dispersible Granules	Water-insoluble pesticide impregnated on finely ground organic or mineral-aggregated granular	Reduced inhalation hazard from the powders	Requires agitation, may leave visible residues



claims made by registered pesticide producers. The products that meet the criteria defined by NOP, for both active and inert ingredients, use labeled language approved by the US EPA. Examples of labeled language include “For Organic Production” or “For Organic Gardening.” An organic system integrates organic pesticides with cultural, biological, and mechanical pest management practices.

### **MASTER GARDENER TIP**

Certified organic produce is a regulated food production system.

## **Safety**

### **HAZARDS AND HEALTH**

#### **Toxicity**

Chronic toxicity is long-term toxicity and usually occurs from exposure over an extended period. Acute toxicity ensues within 24–48 hours of exposure. Reference the signal word on the pesticide label — it identifies a product’s acute toxicity. For example, the signal word “CAUTION” indicates low toxicity of 5000+ mg/kg, meaning that 5000+ milligrams (mg) of pesticide (per kilogram [kg] of body weight) kill 50% of the tested population of animals. The research data for toxicity is complex, however, so you won’t find it on a product label.

To better understand the science behind the rating system, the signal word is determined by a pesticide’s LD50. The acronym LD stands for lethal dose and 50 represents 50% of the animals tested, meaning that in the tested population of animals, 50% die when exposed to a dose of pesticide through oral ingestion. Consequently, the higher the LD50, expressed in milligrams of chemical per kilogram of animal body weight (mg/kg), the less toxic the pesticide. Minimize hazards by choosing an effective product that is least toxic to users, children, pets, and the environment.

### **MASTER GARDENER TIP**

Signal words = acute toxicity

### **PESTICIDE LABELS**

It is important for you to understand the directions on the pesticide label so that you may assist homeowners with questions they may have. Indeed, the pesticide product label is the law. It is a binding contract between the pesticide registrant and the

user. By purchasing and using the product you agree to follow the label directions. This means the application site or crop must be stated on the label. For instance, if you are treating aphids on your kale patch, then the label must list kale as a crop.

### **MASTER GARDENER TIP**

When assisting homeowners with pesticide label questions, be sure that you are looking at the same pesticide product label. The best way to ensure consistency is to verify the US EPA registration number found on the front panel of the label.

Here are some guidelines to understanding a pesticide label (see fictitious pesticide label and corresponding sections at end of chapter, Reading the Label Activity):

#### **1. Product or brand name**

The name given by the pesticide registrant. Several products may have the same active ingredient but are sold and distributed by different companies — thus they will have different product or brand names.

#### **2. Product type**

The pesticide type (for example, an insecticide to control aphids on ornamental plantings; a herbicide to control broadleaf weeds in lawns).

#### **3. US EPA registration number (EPA Reg. No.)**

Each product has a unique registration number, somewhat comparable to a person’s Social Security number. This number makes it easy to inquire about a specific product. Look for the US EPA Reg. No. on the front panel of the label.

#### **4. Ingredient statement**

The ingredient statement is found on the front panel of the label of the pesticide product. The label also lists active and other ingredients listed by percentage of the total product. For science-based information, contact the National Pesticide Information Center (see Resources).

#### **Active ingredient(s)**

The pesticide ingredient that provides the controlling action in the product stated as the chemical and common name(s).

#### **Other ingredients**

The **other ingredients**, also called inert ingredients, are mixed with the active ingredient(s) to enhance

their performance and ease of use (e.g., easier to handle, measure, mix with water, spray, or spread). These ingredients include solvents, surfactants, dyes, etc., they are usually “trade secrets,” and are thus just listed as other or inert ingredients.

### 5. Signal word

The **signal word** indicates the acute toxicity (toxicity that occurs 24–48 hours after exposure) and hazards of skin and eye injury from the pesticide. It provides a quick way to determine the toxicity of the product to humans and animals. Signal words include the following:

- **Caution:** Indicates slight toxicity. Found in labels of common homeowner and ornamental products.
- **Warning:** Indicates moderate toxicity and acute eye hazards.
- **Danger:** Indicates severe toxicity or severe irritation to one exposure pathway. There are few products that are available to gardeners and homeowners that display this signal word.
- **Danger-Poison:** Indicates high toxicity. This is the most toxic group of pesticides and all labels must have a skull-and-crossbones icon. These products require a pesticide license to purchase and apply.
- Some pesticide labels do not list a signal word because they impart no acute effects on humans and animals.

### 6. Precautionary statements

Declarations about the hazards a pesticide presents to humans, pets, wildlife, beneficial insects, and the environment. One of the larger sections in a label, it contains instructions on PPE to protect the user plus instructions on protecting pollinators, endangered species, water resources, and avoiding drift, etc.

### MASTER GARDENER TIP

If not explicitly stated on the product label, protective clothing required for any application is, at a minimum, long pants, long-sleeved shirt, shoes, and socks. It is always good practice to wear chemical-resistant gloves and protective eyewear too!

If you have a choice, compare products and avoid using those that may be harmful to bees and other

environmental resources. Follow the instructions in this section to avoid any problems with off-site movement and unwanted pesticide residues.

### 7. First aid statement

Provides instructions on what to do in case of exposure. It is good practice to read this section before purchasing and using a pesticide product. When seeking emergency medical help, bring the product label with you. Also, contact the pesticide company or the NPIC for any questions.

### 8. Directions for use

This information indicates where, how, and when to apply the product. Be sure the site or crop for application is clearly stated on the label. You will also find the application rates, allowable by law, in this section. Both the restricted-entry interval (REI) — the time to remain out of the treated area after treatment — and the preharvest interval (PHI) — how long to wait before you harvest the plants — are found in this label section. It may also include other directions regarding restrictions, such as how to apply the product, how many times it can be applied per year, etc.

### 9. Storage and disposal

Provides information about the proper storage and disposal of the product. Read each product label section carefully, but some rules of thumb include the following:

- Keep the product in its original container with the label attached (required by law).
- Store it out of the reach of children and in a temperature-maintained, well-ventilated box/cupboard (required by law).
- Mark all measuring utensils “Pesticides Only!” Do not store pesticides with food, feed, or seed.
- Rinse an empty container three times and use the rinsate (the mixture produced from cleaning pesticide containers or application equipment) as directed by the label. Place the clean, empty container in a waste bin. If the extra product needs to be disposed, contact your city or county government or the ISDA Pesticide Disposal Program for dates and times of hazardous materials collection.



## PESTICIDE EXPOSURE GUIDELINES

Do not eat, drink, or smoke while handling pesticides. Wash your hands with soap and water after each use. Stay clean and free of spills. Just in case, place decontamination supplies nearby, including jugs of water, soap, and towels. There are four ways you can be exposed to pesticides: through the eyes, airways (inhalation), mouth (ingestion), and skin (dermal absorption). Be mindful that the risk of a pesticide is equal to the toxicity of a pesticide times the exposure. Always follow pesticide label directions. See Figure 1 for the different routes of pesticide exposure.

### ***In the eye***

Flush eye(s) with water for at least 15 minutes.

### ***In an airway***

Immediately leave the area. In the mouth flush mouth out with water for at least 15 minutes.

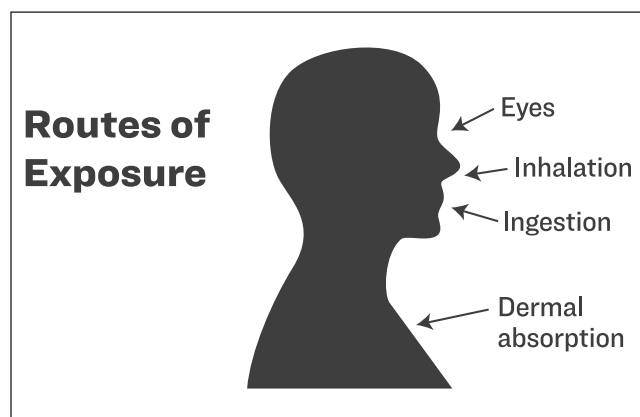
### ***If swallowed***

Follow label directions; if no first aid is applied, take the victim to the nearest medical facility.

### ***On clothes***

Remove clothes and wash skin with soap and water.

When seeking medical attention, always take the product label with you so you can provide healthcare specialists with the proper treatment instructions. However, do not transport the pesticide product to the medical facility; remove its label and take that along instead.



**Figure 1.** Pesticide routes of exposure to an individual. Graphic credit: Lynna Stewart, University of Idaho Extension.

## Stewardship

It is the responsibility of the product user to maintain personal and environmental protection practices. Uphold all restrictions and requirements listed on the product label. Keep a good attitude while handling and applying a pesticide — it is essential. For example, always read a product label prior to purchase. The habit will ensure that you have the correct product for the job at hand and will indicate the time you need to wait before it's safe to harvest any edible garden or landscape (the PHI).

### **HANDLING**

Always use the recommended and mandated PPE listed on the pesticide label. Calculate the correct amount of pesticide for one application. Only mix the amount of pesticide and spray mixture needed for the job to eliminate the need for disposing of unused spray mixture.

In preparation for a pesticide application, evaluate the treatment area to be sure you are aware of ponds and other water features before spraying. Check that bees are not visiting the plants during the application times. It is a good idea to close windows, doors, and household air intakes and to remove objects and pets from the area to avoid creating unwanted exposures.

Follow REI requirements on the label for each product, listed in hours or days. This time period is set to keep humans and pets safe from accidental exposure to any pesticide that may still be on the plants. Some pesticide labels may only require you to wait until the applied sprays are dry. But be sure by reading and following the specific pesticide label instructions.

### **MASTER GARDENER TIP**

If pets have access to the area, barricade half of the area before application. This allows pets to traffic an untreated area. Once the REI has passed, relocate the pets and repeat the procedure in the other half of the area.

When handling edible landscaping, know the PHI for the pesticide that you have used. This is the actual timeline you **MUST** follow before picking the fruits and vegetables. The PHI provides enough time for the pesticide residues to break down under natural conditions, ensuring that residues are at or below

the regulated pesticide tolerance level set by the US EPA. Remember, the PHI is always listed on the pesticide label, under directions for use.

## **HANDLING PERSONAL PROTECTIVE EQUIPMENT (PPE)**

It is best to remove protective clothing and equipment in a certain order to reduce exposure.

1. Keep your gloves on (they are the last thing you remove!).
2. Find an area where you can safely gather your clothing (e.g., garage or mudroom).
3. Wash gloves with soap and water.
4. Remove shoes or boots. Use one shoe to push the heel from the second shoe while keeping the shoe on the second foot. Use the same procedure with the second foot to release the heel from the first shoe. Step out of both shoes.
5. Remove respirator (if applicable).
6. Remove goggles.
7. Remove long pants.
8. Remove socks.
9. Remove long-sleeved shirt.
10. Remove gloves.
11. Using a washing machine, launder the pesticide application clothes separately from other laundry. Use heavy-duty detergent and hot water. If a clothesline is available, hang the clothes in the sun to further the pesticide breakdown process. After removing the clothing from the washing machine, be sure to run a rinse cycle to thoroughly rinse the machine.

## **PESTICIDE PROPERTIES AND MOVEMENT**

The Idaho Pesticides and Chemigation Law maintains that pesticide applications must not damage nor endanger humans, animals, property, or the environment. To uphold this law, it's important to understand how to recognize the fate of a pesticide — how it travels and how it degrades.

### **MASTER GARDENER TIP**

Remember to apply pesticides with accuracy and responsibility and to always follow label directions.

### **Absorption**

Pesticides are generally absorbed by plants or the pests themselves. The organisms' metabolism over time helps break them down.

### **Adsorption**

Pesticide molecules can be adsorbed to soil particles and/or minerals in the soil or water. To adsorb means to adhere tightly to the soil or minerals, like nails attracted to a strong magnet. When pesticides are tightly adsorbed to soil or minerals, they become “tied up” or unavailable for pest control. For example, soils that are high in clay and/or organic matter have a negative charge. Pesticide products that adsorb will be attracted to the adsorption sites and “lock” to the soil. If adsorbed to soil particles, the pesticide will not be available to the pest.

### **Drift**

According to the US EPA, “Pesticide spray drift is the movement of pesticide dust or droplets through the air at the time of application . . . to any site other than the area intended.” To reduce drift, understand these factors: weather, application equipment, and applicator skills.

### **Weather**

Temperature inversion, wind, and humidity are negative weather conditions. An inversion develops when the trapping of cool air at ground level by the warm air above it creates a horizontal airflow. The atmospheric phenomenon may cause pesticides to move horizontally with the layers of air, casting the pesticides off-site and possibly endangering the surrounding environment.

High wind is the perfect conduit for carrying a pesticide away from its target. Idaho state law prohibits applying pesticides in sustained wind speeds that exceed the label directions. However, if a pesticide label does not list a specific wind speed limitation, that pesticide must not be applied in sustained wind conditions exceeding ten miles per hour. Desirable plants, beneficial insects, domestic animals, and other desirable natural features can be damaged by pesticides moving off target with wind drift or other movement caused by inversions. Check your local weather conditions prior to any application to reduce drift and off-target pesticide applications.

Volatilization occurs when either a solid or liquid pesticide product changes into a gas. This happens

in conditions of high temperatures and low humidity. These weather factors cause your pesticide product to change form and either be lost or vaporized into the air and drift off-site, potentially causing unwanted pesticide contamination.

### **MASTER GARDENER TIP**

Consider the environment of your spray zone. It may include a neighboring garden or landscape border.

#### ***Runoff***

Many pesticides are water-soluble, meaning that any water that courses through a treated area may carry off these pesticides. The term runoff refers to the movement of pesticides with water over surfaces. Thus, the degree of water solubility may be a factor for off-site movement of the pesticide and unwanted pesticide residues in surface waters (ponds, streams, lakes, etc.).

#### ***Leaching***

Highly soluble pesticides may move downward through the soil profile, especially in sandy soils. This downward movement of pesticides with soil water is called leaching. Along with possibly compromising groundwater sources, leaching also removes effective pesticides from their intended site.

#### ***Plant Removal***

When a treated crop, such as grass clippings, is removed and taken to another location, the pesticide residues may still be present on that plant material. This is considered an off-site movement of pesticide. Residue on the grass clippings risks causing unwanted pesticide contamination at the new location and in your compost.

### **MASTER GARDENER TIP**

Composting is an example of plant removal. If you hired an applicator to manage the pesticide applications in your landscape, know what they are spraying, especially if you are composting or mulching your grass clippings.

## **WATER-QUALITY IMPACTS ON PESTICIDE PERFORMANCE**

Our beautiful Idaho rivers and streams are fed through local watersheds. As the water travels,

minerals are weathered and transported into our water supplies. Quite often these minerals are in our well water and irrigation canals, impacting the water hardness and pH (acidity and alkalinity). Are you irrigating from a well or are you using city water? Let us address how this influences pesticide applications.

### **MASTER GARDENER TIP**

If mixing pesticides, test your water source for hardness and pH.

#### ***Hardness***

The amount of minerals in a water sample are called total dissolved solids (TDS). These minerals are not visible in the water but can adsorb to a pesticide in the spray mixture, causing it to become unavailable and ineffective for pest control. Water containing a high level of minerals or TDS may need a buffering agent to reduce the hardness, before mixing with pesticides.

#### ***pH***

Many pesticides perform best when the water pH is in the 4–6.5 range. Test your water source to determine the pH of the water you plan to use for the spray mix. You can easily test your own water by using do-it-yourself water-testing strips purchased at your favorite garden or hardware store. If the pH is above 7, use an adjuvant or buffering agent to adjust the water's pH (though the pesticide label will also let you know if one needs to be added). If the water is too alkaline (high pH) or too acidic (low pH), the pesticide will begin degrading or hydrolyzing, neutralizing the pesticide in a short period of time. Remember, adjust the water's pH before adding the pesticide product to the spray mixture.

## **SETTING UP THE APPLICATION EQUIPMENT**

### ***Hose-End Sprayers***

Hose-end sprayers attach to the end of a garden hose. Some come preloaded with pesticide; others you'll need to add to the sprayer tank yourself after measuring the pesticide. All hose-end sprayers have a built-in anti-syphon device to prevent backflow into your water source. Ensure you have a consistent water pressure prior to attaching the hose-end sprayer. For example, that there are no kinks in the hose.

## Small Sprayers

Use a small, hand-operated spray tank (generally 1–3 gallons) for formulations that require dilution. Calculate and measure the pesticide product, add it to the tank, and top it off with water. Mix the solution by shaking; maintain sprayer pressure by hand pumping. For uniform coverage, mix the concentration thoroughly and apply consistent pressure. If using a dry formulation, frequent agitation is necessary to avoid separation and sedimentation. These sprayers are best for applications on lawns, vegetables, bushes, and dwarf trees. It is difficult for them to generate sufficient pressure to reach the limbs of tall trees and get good pesticide coverage.

## Broadcast Spreaders

These are handheld devices or walk-behind hoppers on wheels that apply fertilizer and pesticide granular products. They need to be calibrated so that you can determine how much product to apply. Spreaders allow for a certain amount of adjustment by changing the opening size on the bottom of the spreader.

## CALIBRATION

As you prepare for spring and the garden season, calibrating your equipment is like tuning up your tools. It should be done every year. So, gather your measuring tools, a stopwatch, a calculator, your notebook, and flags for marking certain distances. Your calibration rate is specific to the type of application equipment, your travel speed, and the flow rate.

### Example Using Small Sprayers

Prior to calibrating your equipment, confirm your equipment is in the proper working order. This includes checking the sprayer for the proper nozzle size by cross-referencing the product label. Clean the nozzle tips and screen. Fill up your sprayer with water, pressurize the tank, and verify the spray volume delivery rate has consistent pressure.

### Example Calculating Your Calibration Rate — Using Small Sprayers

1. *Measure your swath width.* Walk on the driveway or sidewalk spraying (with only water) from side to side. Use a measuring tape to measure the spray distance from left to right. This is your swath width and will be the width measurement in the calculation of the test plot area. Example: 4 feet.
2. *Calculate the test plot area.* The test plot is a demonstration space where you can record the

required time for an application. Select a size for your test plot area (e.g., 100 ft<sup>2</sup>) and divide it by your swath width from step 1 (4 feet). Example: 100 ft<sup>2</sup> ÷ 4 ft = 25 ft. The length of your test plot will be 25 feet. Flag the length of this test plot.

3. *Determine your travel speed/stride.* Record your time while simulating an application in the marked test plot (spraying water with your 4-foot swath width). Repeat the simulation to calculate your average travel speed (example: 100 ft<sup>2</sup> in 30 sec). Practice this pace; it is essential to maintain the same travel speed for a consistent application. The time will be used for the collection of the nozzle output.
4. *Collect the nozzle output.* Collect the water spray in a properly sized, graduated measuring container for the time you recorded in the previous step (example 30 seconds). Repeat the collection to calculate your average nozzle output. This quantifies the amount of spray that was distributed over the test plot area (example: 6 fl oz in 30 seconds).
5. *Compile your calibration rate.* Assess your travel speed and flow rate. This is the distribution of spray over the fixed area. Example: 6 fl oz per 100 ft<sup>2</sup>.

To calibrate a hose-end sprayer or drop spreaders, visit the Pesticide Environmental Stewardship website (see Resources).

## MASTER GARDENER TIP

Calibration should be compiled for each person using the application equipment.

## Maintenance

Frequently check your equipment for leaks or holes. Keep equipment clean.

## PESTICIDE APPLICATION MATH

Once you know the best pesticide to use to control your pest, you need to calculate how much to apply. Purchase only what you will need for one growing season.

Before each application, use the formulas on the following page to (a) calculate the treatment area and (b) calculate the total amount of the pesticide mixture required for the treatment area. Gather your measuring tools, the product label, and specific calculations to perform your investigation. Prior to

any application of a pesticide, consult the label to determine the amount of product to use and what protective clothing you should wear.

### Math Review

If you are using pesticides, you need to know how to calculate unknown factors, which involves multiplying fractions. The following is a short primer. You can determine the unknown factor if

$$\frac{a}{b} = \frac{c}{d} \text{ "and only if" } ad = bc$$

Cross multiply the values by taking the first numerator and multiplying it by the second denominator. Conversely, multiply the second numerator by the first denominator. Remember,

$$\frac{\text{numerator}}{\text{denominator}}$$

Let's practice cross multiplying with unknown factors. You are hosting a party and you have fifty friends to feed. How many bags of chips do you need, if one bag feeds four people? Start by setting up your known factors and their units. Then designate the unknown factor as  $x$ . In this case,  $x$  represents the unknown number of bags of chips. Whether the unknown factor,  $x$ , is in the numerator or denominator, you can cross multiply and divide the fractions.

$$\frac{x}{(50 \text{ people})} = \frac{(1 \text{ bag})}{(4 \text{ people})}$$

$$(x \times 4 \text{ people}) = (1 \text{ bag} \times 50 \text{ people})$$

$$4 \text{ people } x = 50 \text{ bags/people}$$

$$x = \frac{(50 \text{ bags/people})}{(4 \text{ bags})}$$

Note that if the unit is the numerator and the denominator, they cancel each other out.

$$x = 12.4 \text{ bags or } 13 \text{ bags}$$

So, for a party of fifty you will need thirteen bags of chips.

### Calculate the Treatment Area

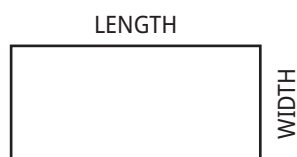
Calculating the size of the treatment area is an important step in using pesticide products correctly.

#### Rectangular

length  $\times$  width = area

For an area that is  
20 ft by 40 ft,

$$20 \text{ ft} \times 40 \text{ ft} = 800 \text{ ft}^2$$

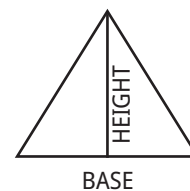


#### Triangular

$$(\text{base} \times \text{height})/2 = \text{area}$$

For a triangle with a base of  
30 ft and height of 50 ft,

$$(30 \text{ ft} \times 50 \text{ ft})/2 = 750 \text{ ft}^2$$

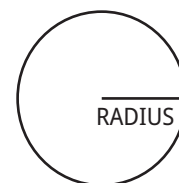


#### Circular

$$\pi (\text{pi} = 3.14) \times \text{radius}^2 = \text{area}$$

For a circle with a 15 ft radius,

$$3.14 \times 15 \text{ ft}^2 = 706.5 \text{ ft}^2$$



### Calculate the Total Amount of the Pesticide Mixture

Reading the product label, you learn that you need to dilute 2 fl oz of product into 1 gal of water and apply the resultant mixture at the rate of 5 gal per 2000 ft<sup>2</sup> (5 gal/2000 ft<sup>2</sup>). Your treatment area is 490 ft<sup>2</sup>, so calculate how much water you need for this application in the following way:

1. 5 gal/2000 ft<sup>2</sup> =  $x$ /490 ft<sup>2</sup>. Solve for  $x$ .  
Cross multiply and divide.
2. 2000 ft<sup>2</sup> $x$  = (490 ft<sup>2</sup>  $\times$  5 gal)
3. 2000 ft<sup>2</sup> $x$  = 2450 ft<sup>2</sup>/gal
4.  $x = 2450 \cancel{\text{ft}^2}/\text{gal} \div 2000 \cancel{\text{ft}^2}$   
(note that square-foot units cancel out)
5.  $x = 1.225 \text{ gal}$

For the 490 ft<sup>2</sup> treatment area you will use 1.225 gal of water.

Now you can calculate how much product is needed to add to the 1.225 gal of water.

1. With  $x$  the amount of pesticide you will dilute into water, solve for  $x$ : 2 fl oz/1 gal =  $x$ /1.225 gal.  
Cross multiply and divide.
2. 1 gal  $x$  = (1.225 gal  $\times$  2 fl oz)
3.  $x = 2.45 \cancel{\text{gal}}/\text{fl oz} \div 1 \cancel{\text{gal}}$   
(note that gallon units cancel out)
4.  $x = 2.45 \text{ fl oz}$  or 2.5 fl oz

**Answer:** You will need to add 2.5 fl oz of product to 1.225 gal of water and apply the result to your 490 ft<sup>2</sup> treatment area.

### Recordkeeping

What was your biggest pest last year? Logging your experiences and careful planning will help you to prevent the same infestation or outbreak.



Evaluate the pesticide you used — was it effective? Be sure to document the pesticide name and US EPA registration number to help you keep track of proper pesticide rotation.

### MASTER GARDENER TIP

Capture your landscape issues, follow plant/insect life cycles, and allow patterns to unfold.

### STORAGE

Always store pesticides in their original containers and always with the label attached. Indicate on your equipment and measuring tools that they are “Pesticide Only!” This includes measuring cups and spoons. Stow these items with your pesticides in a locked container.

Make sure the locked container or box is in a cool, well-ventilated environment. Keep it out of the reach of children and store it separately from feed, seed, and fertilizers. If shelving it, place dry formulations above liquids (in case of leaks) and secure tightly.

### MASTER GARDENER TIP

Buy small quantities for the season (or only what you need) to eliminate storage problems altogether.

### DISPOSAL

If you’ve mixed more product than you need, apply the extra mixture to another area that is listed on the label. For expired pesticides, discard them at designated pesticide collections (sponsored by your county or the ISDA). **Do not dump pesticides!**

After disposal, triple rinse the empty containers. Begin by adding water to the pesticide container, sealing the lid tight, and shaking it (to ensure that the water “rinses” the container’s side walls). Handle its by-product (rinsate) as you would the product. Repeat three times (hence triple rinsing). Remember, by triple rinsing you are using the rinsate as you would the product. Be sure to thoroughly clean the application equipment using either a commercial tank cleaner or water and spraying the cleaning solution through the system.

### MASTER GARDENER TIP

For any question about where to find your local pesticide collection sites, contact the ISDA.

## PESTICIDE SPILLS

When a pesticide spill occurs, practice the 3 Cs: control, contain, and clean up. Control the spill by simply picking up the pesticide container and placing it upright to stop further spillage. Contain it by installing a small dike around the spilled area (the dike can be a small barrier of soil or other absorbent material). Clean up the spill by using the following recommendations:

### Liquid Product Spillage

- These types of spills can be more difficult to clean up, so begin by absorbing the pesticide with sorbent granules (e.g., Floor-Dry brand) or cat litter. Then sweep it up and dispose of it in a plastic bag.
- Wash the area with an appropriate cleaner, such as household bleach.
- If the spill has contaminated other materials that you may have used to contain or soak up the pesticide, discard that material.

### Dry Product Spillage (these spills can be simpler)

- Sweep up the product and use it.
- Or place it in a heavy plastic bag for disposal. In either case, if you have any questions, read the product label’s disposal instructions or contact ISDA Pesticide Disposal Program.

## HOW TO HIRE A PROFESSIONAL

Professional pesticide applicators are licensed and certified by the state of Idaho to apply pesticides properly and safely. There are many advantages in hiring a professional pesticide applicator. They are knowledgeable about local pest problems and outbreaks. They are skilled at reducing pesticide exposure and have experience using the best practices to obtain good pest control while reducing potential contamination. Professional pesticide applicators are required to follow the state’s regulations, plus they must obey pesticide product label directions and safety precautions.

Before deciding to call a professional, gather information from your local Extension office on the pest’s identification, life cycle, treatment, and environmental effects. Determine whether your client has the time, knowledge, and equipment to complete a pesticide application. If not, suggest they contact a licensed professional pesticide applicator to do the work.

**Table 3.** Professional urban pesticide–licensing categories in Idaho.

AF	Space (Area) Fumigation
AP	Aquatic Weed and Pest Control
CA	Commercial Apprentice
IP	Industrial, Institutional, and Structural Pest
OP	Ornamental Pest
PH	Public Health Pest

The ISDA provides a searchable database of certified applicators (see Table 3 for the licensing categories). To find a licensed professional applicator in your area, search the database by your county of residence. Below are suggested questions to ask a potential professional applicator.

1. What is your reputation and business rating?
2. What is the name of your insurance or bond company?
3. Will you provide a copy of the pesticide application paperwork, including
  - a. the pesticides name(s)
  - b. the rate applied
  - c. application weather conditions
  - d. the reentry interval (when you can reenter the area)
  - e. the PHI (when you can harvest any fruit or vegetables, if treated)
  - f. the applicator’s name
  - g. the applicator’s license number
  - h. the company’s name

### MASTER GARDENER TIP

If a client comes into your plant diagnostic lab looking for a professional applicator, suggest they contact their favorite garden store for references or consult the ISDA website. It is recommended that they collect more than one bid for a competitive market price.

## IMPORTANT NUMBERS AND INFORMATION

Be prepared for accidents or unintended circumstances that put you in harm’s way. For your convenience and safety, we have included a poster on which you can enter your emergency contact information (see end of chapter). Post the completed poster for easy access. If you have an emergency, it will give you a head start on finding assistance.

## Resources

America’s Poison Centers

<https://www.poisonhelp.org/> or (800) 222-1222

Fungicide Resistance Action Committee (FRAC)

<http://www.frac.info/>

Herbicide Resistance Action Committee (HRAC)

<http://www.hracglobal.com/>

Idaho State Department of Agriculture (ISDA),  
Organic Certification Program

<https://agri.idaho.gov/main/about/about-isda/ag-inspections/organic-certification-program/>

ISDA, Pesticide Disposal Program

<https://agri.idaho.gov/main/pesticides/#Pesticide-Disposal-Program/>

ISDA, Pesticides Programs

<https://agri.idaho.gov/main/pesticides/>

Insecticide Resistance Action Committee (IRAC)

<http://www.irac-online.org/>

National Pesticide Information Center (NPIC)

<http://npic.orst.edu> or 1-800-858-7378

Pacific Northwest Insect Management Handbook

<https://pnwhandbooks.org/insect>

Pacific Northwest Plant Disease Management  
Handbook

<https://pnwhandbooks.org/plantdisease>

Pacific Northwest Weed Management Handbook

<https://pnwhandbooks.org/weed>

Pesticide Environmental Stewardship (PES)

<https://pesticidestewardship.org>

US Environmental Protection Agency (US EPA),  
“Pesticides,” <https://www.epa.gov/pesticides>

## Further Reading

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Oregon Occupational Safety and Health Administration, Consumer and Business Services. 2018. *Personal Protective Equipment: Selecting the Right PPE for Pesticide Use* (440-1018). 16 p. <http://osha.oregon.gov/OSHAPubs/1018.pdf>.

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United States Environmental Protection Agency. 2016. "Chemically-Related Groups of Active Ingredients." US EPA. <https://www.epa.gov/ingredients-used-pesticide-products/chemically-related-groups-active-ingredients>, accessed 11 August 2017.

United States Environmental Protection Agency. 2005. *Citizen's Guide to Pest Control and Pesticide Safety. Prevention, Pesticides, and Toxic Substances* (7506C), EPA 735-K-04-002. 53 p. [https://www.epa.gov/sites/default/files/2017-08/documents/citizens\\_guide\\_to\\_pest\\_control\\_and\\_pesticide\\_safety.pdf](https://www.epa.gov/sites/default/files/2017-08/documents/citizens_guide_to_pest_control_and_pesticide_safety.pdf), accessed 11 August 2017.

Whitford, F., G. Ruhl, S. Mayer, J. Orick, R. Lerner, and K. L. Smith. 2015. *What Gardeners Should Know about Pesticides: A Practical Guide for Home Use*. Purdue University Extension, PPP-109.

## Acronyms

FIFRA – Federal Insecticide, Fungicide, and Rodenticide Act

IPM – Integrated Pest Management

ISDA – Idaho State Department of Agriculture

MG – Master Gardener

MoA – mode of action

NPIC – National Pesticide Information Center

PHI – preharvest interval

PNW Handbook – Pacific Northwest Handbook

PPE – personal protective equipment

REI – reentry interval

SoA – site of action

TDS – total dissolved solids

US EPA – United States Environmental Protection Agency

## Glossary

**active ingredient.** The chemical in a pesticide product that controls the organism.

**drift.** The movement, through the air, of a pesticide application.

**organic.** A regulated standard of food production that can involve the use of pesticides derived from naturally occurring substances.

**pesticide.** A product whose application intends to prevent, destroy, repel, or mitigate an unwanted organism.

**pesticide resistance.** The decreased susceptibility of a pest population to a pesticide that develops from repeated exposure; the offspring, in turn, inherit the tolerance.

**signal word.** Terminology on a pesticide label that indicates the level of acute toxicity to pesticide exposure. Identifies the product's degree of toxicity to humans.

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ALWAYS read and follow the instructions printed on the pesticide label. The pesticide recommendations in this UI publication do not substitute for instructions on the label. Pesticide laws and labels change frequently and may have changed since this publication was written. Some pesticides may have been withdrawn or had certain uses prohibited. Use pesticides with care. Do not use a pesticide unless the specific plant, animal, or other application site is specifically listed on the label. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

**Trade Names** – To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

**Groundwater** – To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

# Important Numbers and Information

## UI EXTENSION

Find information about the University of Idaho Extension Integrated Pest Management program at [uidaho.edu/extension/ipm](http://uidaho.edu/extension/ipm).

## EXTENSION HEADQUARTERS

(208) 885-5883  
[extension@uidaho.edu](mailto:extension@uidaho.edu)

## IDAHO STATE DEPARTMENT OF AGRICULTURE

(208) 332-8500  
[www.agri.idaho.gov/main](http://www.agri.idaho.gov/main)

## MARK UTILITY LINES

Before you dig, have utility lines marked. Call 811 or visit [www.call811.com](http://www.call811.com)

## NATIONAL PESTICIDE INFORMATION CENTER

(800) 858-7378  
<http://npic.orst.edu/>

## COUNTY EXTENSION OFFICE

Phone: \_\_\_\_\_

Address: \_\_\_\_\_

## EMERGENCIES

Primary Emergency Contact: \_\_\_\_\_

Poison Control Center: \_\_\_\_\_

Fire: \_\_\_\_\_

Police: \_\_\_\_\_

## PERSONAL DOCTOR

Name: \_\_\_\_\_

Phone: \_\_\_\_\_

Office Address: \_\_\_\_\_

## HOSPITAL

Name: \_\_\_\_\_

Phone: \_\_\_\_\_

Physical Address: \_\_\_\_\_

## MEDICAL HISTORY

Name: \_\_\_\_\_

Allergies: \_\_\_\_\_

Medications: \_\_\_\_\_

Other: \_\_\_\_\_

## VETERINARIAN

Name: \_\_\_\_\_

Phone: \_\_\_\_\_

Office Address: \_\_\_\_\_

## ADDITIONAL NOTES

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# Reading the Label Activity

Review the pesticide label guidelines on pages 6–7. Using this fictitious label, answer the following questions:

## Part 1. Choose the best answer.

- What is the EPA Registration Number?
  - 5888-8888
  - 1234-5678
  - 1800-222-1222
  - 8765-4321
- What is the signal word?
  - Danger
  - Warning
  - Caution
  - No signal word
- What is the active ingredient?
  - Reliocard
  - Insecticide
  - Bugz B-Gone
  - Imaginary Products
- What is the required protective clothing?
  - Shoes, socks, and goggles
  - Long-sleeved shirt, long pants, shoes, and socks
  - Long-sleeved shirt, long pants, shoes, socks, and goggles
  - Long-sleeved shirt, long pants, shoes, socks, and gloves
- What is the application rate for 1000 ft<sup>2</sup>?
  - 64 fl oz
  - 8 fl oz
  - 2 fl oz
  - 4 fl oz
- What is the total percentage of Bugz B-Gone inert ingredients?
  - 10%
  - 20%
  - 100%
  - 90%
- What is the application rate for one-tenth of an acre (1 acre = 43,560 ft<sup>2</sup>)?
  - 12.4 fl oz
  - 4.3 fl oz
  - 17.4 fl oz
  - 14.6 fl oz



**1**

# BUGZ

## B-GONE

Net Contents: 64 fl oz

**2** Fictitious Insecticide Label  
For Control of Beetles and Weevils

**3** EPA Reg#: 1234-5678

**4** Active Ingredients: Reliocard ..... 10%  
Inert Ingredients: ..... 90%  
**100%**

**5** KEEP OUT OF REACH OF CHILDREN

**CAUTION**  
Bugz-b-Gone Reliocard Insecticide kills Blister beetles, Black vine weevils, Elm leaf beetles, Flea beetles, Ground beetles, Hollyhock weevils, Japanese beetles, Pea leaf weevils, Root weevils and Western spotted cucumber beetles. Bugz-b-Gone Reliocard Insecticide liquid formulation is ready-to-use on ornamental plants, trees, shrubs, flowers, and vegetables.

**6 PRECAUTIONARY STATEMENTS**  
**HAZARDS TO HUMANS AND DOMESTIC ANIMALS**  
Caution. May cause slight eye irritation. Avoid contact with eyes.

**ENVIRONMENTAL HAZARDS**  
To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters, or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area.

**USER SAFETY INFORMATION**  
Wash hands with thoroughly with soap and water after handling. Wash hands thoroughly with soap and water after handling. Wash any pesticide contaminated clothing separately.

Applicators must wear long-sleeved shirt, long pants, shoes, and socks. Eye protection is recommended.

**7 FIRST AID**  
**IN EYE:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.  
**IF INHALED:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for treatment advice.  
**ON SKIN:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.  
**IF SWALLOWED:** Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Have the product container or label with you when calling a poison control center or doctor or going for treatment. For medical emergencies, call the poison control center at 1-800-222-1222.

**8 DIRECTIONS FOR USE**  
It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read entire label before using this product. Do not use Bugz-b-Gone on new transplants.

Spray on infested areas when the insect population reaches an unacceptable level and are causing damage to the ornamental plants. Product is best sprayed early morning or late afternoon when temperature is between 50°F and 80°F. Do not apply if wind speed is above 10 MPH to reduce spray drift. APPLICATION RATE: Mix 4 fl oz every 1,000 ft<sup>2</sup>.

**9 STORAGE AND DISPOSAL**  
**DO NOT CONTAMINATE WATER, FOOD OR FEED.**  
Do not store with fertilizer, food, or feed. Keep away from children and pets. Store in original container in a dry, secure storage area. Keep container tightly closed when not in use with label secured. If using measuring utensils, mark 'Pesticides Only!' and keep in storage.

**Pesticide Disposal:** Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide or spray mixture is a violation of Federal Law and may contaminate ground water. Do not pour down kitchen or sewer drains.

**Container Disposal:** Triple rinse pesticide container and use as directed. Then offer for recycling or puncture and dispose of in a sanitary landfill.

**Imaginary Products**  
555 Main St., Suite 100  
Hometown, Georgia

*This is a fictitious pesticide label created for educational purposes only.*

**Figure 1.** The fictitious pesticide label for the purpose of understanding how to read the statements and directions. Courtesy of Mike Cameron, National Pesticide Safety Education Center.

- Yes      b. No
- Use Bugz B-Gone on ornamental plants.
    - Yes      b. No

## Part II. Answer yes or no.

- Spray Bugz B-Gone during wind speeds above 15 mph.
  - Yes      b. No
- Apply Bugz B-Gone on new transplants.

Answers: 1 b, 2 c, 3 a, 4 b, 5 d, 6 d, 7 c, 8 b, 9 b, 10 a