Integrated Pest Management and Pesticides for Home Horticulture

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Integrated Pest Management, commonly just “IPM”, is a decision-making framework using researched-based pest management information. It is designed to help gardeners select management strategies that balance competing goals, needs, concerns and interests to resolve a pest problem. Sometimes IPM may include the use of substances that mitigates damage caused by pests, whether they are man-made, low impact, biorational or organic pesticides. As with all pest management strategies, pesticides should only be used as a part of an IPM program.

1. Introduction: Master Gardeners as ‘Plant Doctors’

As Master Gardeners one of the more common questions you will receive is ‘How do I control this … weed, insect, disease, mammal, bird?’ This question is not as simple as it sounds. Pests are living organisms that do something disruptive to human interests, activities or valued resources:

• compete with people for food, fiber, or space;
• threaten the health of people, domestic animals, or plants;
• or interfere in any way with human activities, needs, desires or goals.

Organisms are only considered pest from the perspective of humans. One person’s weed is another person’s beloved wildflower.

There are a number of ways to manage a particular pest. The challenge is to find a set of pest management tactics that best fit a particular gardener’s specific pest problem. This requires finding out what pest is involved and what resources and expertise the gardener has to deal with the pest. It also requires knowing a gardener’s goals and values. Only by knowing the goal of how they want to maintain and use their garden or landscape and what values they hold around cost, convenience, safety, environmental protection, aesthetics, and so on, can you help them find the best resolution of their pest problem. IPM is as much about providing resolution between a gardener’s conflicting demands and values and needs and wants and goals as it is providing researched-based technical solutions to manage a pest.

Above all, as a Master Gardener, you represent the University of Minnesota Extension, which is a core part of the University of Minnesota’s public Land-Grant mission. As a result, you have an obligation to provide researched-based educa-
tion for the benefit of all citizens of the state. You also have an obligation to respect the values, needs and goals of individuals by providing resolutions to pest problems that best fit the individual, regardless of your own personal values and interests. One way to understand your obligations in providing the public with pest management information is to consider the following four questions:

1. Is it legal or illegal? If the practice is illegal (criminal) you cannot recommend its use and you are required to point out illegal practices when suggested by others – there are no exceptions. State, federal and at times tribal and local laws and regulations address health, safety, environmental and public-security concerns of various pest management practices. Examples of such regulations include quarantines to slow the spread of pests such as emerald ash borer, the management of shoreland vegetation to protect water quality and the handling of waste pesticides. Pesticides present a special challenge. Pesticide label directions are legal requirements. In addition, there are a wide ranging set of laws and regulations covering most aspects of pesticide use. Pesticide laws and regulations are the formal expression of the public’s interest in how someone uses pesticides. As Master Gardeners you are not expected to be an expert on compliance with pesticide laws and regulations, but you do need to understand how pesticide label directions and other regulations must be followed to legally use a pesticide.

2. Is it considered a broadly accepted ‘standard of care’? These practices are based on well accepted research and promoted by public and other authorities for the benefit of public (community) and private (individual/family) health, safety and security or to protect the environment. While not carrying the force of law, these practices should always be broadly promoted by Master Gardeners as human health and environmental protection may be at stake. This is especially true for gardeners raising fruits and vegetables for human and animal consumption. While there are no criminal penalties for not following these practices, in the private sector not following ‘standard of care’ may expose someone to liability – being sued in civil court for damages. Many voluntary ‘Best Management Practices’ fall into this group, such as those designed to reduce pesticide contamination of water. Another example is the need for homeowners to clean up anything in the landscape that holds water longer than five days to prevent mosquitoes that carry diseases harmful to humans.

3. Is it a researched-based recommended practice? Most recommended pest management practices fall into this group as they do not carry the force of law (criminal) and do not reach the same level of importance for public and environmental protection as do ‘standard of care’ practices. These typically are researched-based technical solutions for pest problems people are encouraged to adopt to get the best results. Each technical solution has its own set of pro’s and con’s and tradeoffs that must be considered. The flip side is discouraging those practices that research shows do not work or do not work as well as recommended practices.

4. Is it a practice that meshes with the values and goals of those involved? People who just want an easy to care for lawn will be receptive to a very different set of technical solutions to resolve their weed problem than people who want a ‘perfect lawn.’ Sometimes this is just personal preference, but sometimes it is much more. Some gardeners are passionately organic when dealing with pests while others just as passionate in wanting something convenient to just ‘nuke it’. Ethically, we need to respect adults making their own decisions about how to best resolve their pest problem as long as the solutions are 1) legal; 2) does not conflict with ‘standard of care’ in protecting the public or the environment and 3) they understand the tradeoffs of selecting one solution over another.
2. Basics of Integrated Pest Management for Home Gardeners

IPM started in the 1950’s when researchers of agricultural crops sought site specific combination of pest management strategies that cost less than the value of crop yield saved from the pest. Mainstream adoption of IPM in agriculture started in the 1970’s when environmental concerns became an important part of IPM decision-making. In recent decades IPM has evolved and changed as it has spread from agricultural crops to pest management in structures (buildings, schools, businesses, transportation, etc.); forests, lakes and other natural resources; roadside vegetation management; public health for mosquito control, mold in buildings and food processing; parks, recreation and other urban and rural and public lands; and in people’s homes, gardens and landscapes.

A core part of Integrated Pest Management is selecting and combining different tactics to meet a gardener’s pest management needs. Such pest management tactics, or strategies, are designed to minimize the damage a pest may cause in various ways. Pest management strategies may be designed to:

- Remove a pest’s food, water or shelter
- Prevent a pest’s access to a landscape, site or plant
- Work directly on the pest by killing, confusing, repelling or otherwise change the pest
- Work directly on desirable garden plant to better repel pests, better tolerate pest damage or become less attractive to pests.

The best IPM programs focus on fixing the underlying conditions that lead a pest to cause damage rather than just killing, eliminating or control the pest itself.

Different pest management strategies include:

- Genetic - through plant breeding and other techniques plant varieties may be developed that are resistant to pests (show now damage) or are tolerant to pests (able to sustain pest damage below unacceptable levels). Genetic engineering includes the ability to take the genetic instruction from one organism that naturally produces its own pesticide or other characteristics to resist or tolerate pests and ‘gene splice’ it into desirable plants.

- Cultural/Sanitation - involves the growing practices and care given to landscape and garden plants. Planting, watering, fertilizing, removal of infected plant parts and other such cultural practices all may affect pests and expression of plant damage, depending upon when, how and how much they are done.

- Physical/Mechanical – is the use of physical barriers to prevent movement of pests or the physical removal or destruction of pests. Examples include trapping, use of heat or cold to kill pests, hoeing or pulling weeds, window screens to keep out insects and garden fabrics that exclude pests.

- Biological – uses living organisms to management pests. This includes doing things to attract the natural enemies of a pest, the release of insects, nematodes, fungi or other organisms that attack a specific pest or the use of biological ‘pesticides’ such as Bt, a bacterium that attacks the caterpillars of moth and butterfly pests.

- Legal – quarantines of plants or nursery stock and other legally mandate activities to prevent the movement of pests or mitigate pest damage. Pests that significantly affect public health or natural resources often result in legal strategies. Ex-
amples include inspections where food is handled for rodents, insects, mold and other pests; mandated control of mosquitoes and other organisms that vector (spread) diseases to humans, livestock or pets; control of the sale and movement of invasive and exotic species that threaten natural ecosystems and other natural resources.

**Chemical** – use of a substance or material that kills, repels or in any other way prevents or mitigates a pest’s ability to cause harm or for which such claims are made (pesticides). Pesticides may be man-made, organic, produced by biological organisms or naturally occurring substances.

**Do nothing** – Sometimes the best thing to do is nothing. Some very noticeable ‘pests’ actually cause little damage to a plant, such as the white powdery mildew on lilac leaves. Some fruit and vegetable pests look severe, but may cause only cosmetic damage with little or no effect on yield amount or quality. Some people more easily tolerate than others pest damage that is nuisance or aesthetic in nature.

A second core part of IPM is a dynamic decision-making process that requires planning, site specific information and evaluation of results. This involves knowing how to look for signs and symptoms of pests. Signs of pests include observing the pest itself, parts of a pests or substances produced by the pest (examples include honeydew from aphids, droppings from rodents). Symptoms include both how plants respond to pests and the damage pests directly cause on plants. Signs and symptoms are very useful for pest identification and timing of pest management strategies. The more site specific information a gardener has about pest signs and symptoms, weather and other environmental and plant growth conditions, plant varieties, growth stages of pests and so on the better. Maps, notes and other records can be invaluable for documenting, analyzing, evaluating and planning for pest problems.

A third core part of IPM is determining the action threshold for a specific pest on a specific plant or site. The action threshold is the level of pest infestation when a pest management tactic must be used to prevent the buildup of pest numbers that result in an unacceptable level of pest damage. Site specific information and research-based pest information are used to help determine the likelihood of preventing unacceptable pest damage for any set of pest management strategies. A second part of setting an action threshold is determining what unacceptable damage is. It can be based on health or environmental concerns, aesthetics, cost, pest visibility, nuisance factor or some other indicator as defined by a gardener and the people who use a garden or a landscape. An example of an action threshold would be detecting one mouse. Because mice can pose a health threat, action should be taken immediately. In other words, one mouse is too many.

Today there are many different definitions of IPM and models of IPM programs. But what they all have in common is the integration of various strategies - not to control or eliminate pests – but to manage pests at infestation levels below that would result in unacceptable pest damage. What all IPM programs also have in common is a series of essential steps. Gardeners not doing these steps are not doing IPM.

**The Essential Steps of IPM**

1. **Plan ahead** – think through how to manage a pest ahead of time. Prevention is often the best way to manage a pest problem and that takes planning. Being prepared to do the other essential steps of IPM requires time and effort that may not be available when a pest shows up.

2. **Monitor for pests** – knowing how and when to look for each kind of pests helps catch pest problems early when there are usually more options for successful control. Identifying pest life stage and level of infestation is key to using IPM.
3. Identify pests and learn their biology – accurately identifying a pest, understanding its life cycle and how they cause damage are essential both to matching the right tactics to a pest when they are most vulnerable and timing of tactics to prevent unacceptable pest damage.

4. Establish an action threshold – know the level of pest infestation to implement tactics to prevent unacceptable pest damage. Recognize that acceptable damage may be highly variable from site to site, the garden plant involved and the goals, needs and values of the gardener.

5. Select management strategies acceptable and practical for the gardener – Cost, convenience, equipment available and health, safety and environmental concerns all may limit what pest management strategies a gardener may be able or willing to use.

6. Evaluate and record results – as a dynamic system IPM is built on site specific experience. Knowing what has work under what conditions helps planning for the next season and allows gardeners look for better ways to management.

3. Growing a Healthy Garden

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A healthy, vigorously growing plant can often outgrow damage from insects and diseases and quickly recover from environmental and other stress factors. Plants have natural defenses against insects and disease organisms. These defenses are at their strongest when plants are stress free and healthy. Many common garden problems can be reduced in severity or avoided altogether by properly caring for garden plants.

The Proper Plant in the Proper Spot

Very few plants do well in all environments. Most plants are specialized to live in one set of conditions. Although they may survive in other environments, they will be under stress, may not grow as vigorously, and are often more susceptible to pest problems.

Carefully observe your garden or proposed garden location. Note how many hours of sun the garden receives in a day. Pay attention to changes in light over the full growing season. Consider how exposed or sheltered the site is. Is the site very wet or dry? Does the soil moisture change over the growing season? Once you know more about your garden, you can choose plants that are suited to the environment in your garden. These plants will be naturally healthier.

- **Light** - In the garden center, the plants light requirements should be listed on the label. - Full sun plants need 8 hours or more of direct sunlight each day.
  - Partial shade/partial sun plants need 4-8 hours of direct sunlight each day.
  - Full shade plants need less than 4 hours of sunlight each day.

- **USDA Hardiness Zone** - indicates the low temperature limit for the plant. (If you live in Zone 4, plants from Zones 4 and lower will survive in your garden, plants rated Zone 5 and above are not adapted to survive the winter
in your area.)

- Exposure - Plants exposed to extended periods of wind or sun:
  - Dry out faster and may need to be watered more frequently.
  - Are more susceptible to cold damage and may need extra protection in the cold months of the year.

Water Wisely

Many plant pathogens need moisture on leaves and stems in order to infect and cause disease. Watering to keep leaves dry can greatly reduce disease problems in the garden.

- Water the soil not the leaves – use a soaker hose, drip irrigation, or direct water to the base of the plant.
- Water plants early in the morning so that leaves dry quickly in the sun.
- Allow space for air to move around plants - consider the size of the mature plant when choosing a planting site, do not place plants too close to buildings or other plants.

Fertilize for Fitness

Plants need certain nutrients to grow healthy and strong. Most of these nutrients are taken up from the soil by the plant roots. Garden soils naturally contain some of the nutrients a plant needs. Additional nutrients can be added to the garden through fertilizer, compost, or other organic amendments like manure.

A plant that is lacking in one or more nutrients is under stress and can be more susceptible to attack by insect and disease. Too much of any one nutrient, however, can also increase disease problems in the garden, so fertilizer and other amendments must be added with care.

The best way to apply fertilizer, whether it be organic compost, or store bought fertilizer, is according to recommendations from a soil test. The University of Minnesota provides soil testing services for a fee. The procedure for submitting a soil sample is outlined below.

Submitting a soil sample

1. Scrape off any surface leaves or organic debris.
2. Take a small amount of soil from the top 6” of the garden or lawn.
3. Collect soil from 5 random locations in your garden or lawn.
4. Mix soil from all 5 random locations and put about 1 pint into a clean container.

Send the sample to:

Soil Testing Laboratory
University of Minnesota
1902 Dudley Ave.
St. Paul, MN 55108
Prices for soil testing are listed at the web site. Expect results and fertilizer recommendations for your lawn or garden within a few days to a week.

The Marvels of Mulch

Mulch is a protective covering applied over garden soil. Mulches can be organic matter like dried leaves, straw, or wood chips. Plastic sheets can also be used as mulch.

- Mulch improves garden soil by reducing erosion.
- Organic mulches add organic matter to the garden and improve soil structure.
- Mulch helps to control weeds by preventing germination of many weed seeds.
- Mulch lessens plant stress by conserving soil moisture and keeping soils cool.
- Mulch reduces plant disease by reducing the humidity in the plant canopy and preventing water from splashing disease organisms from the soil onto the leaves.
- Organic mulch encourages beneficial insects to live in the garden.

Tread with Care

The bark of a tree and the cuticle of a leaf are protective layers that prevent many garden pests from causing a problem. Open wounds or bruised plant tissue are often attractive to garden pests and offer easy access to the less protected inner parts of the plant. Environmental problems like hail or wind storms can damage plants, and so can human activity.

To reduce the likelihood of wounds and/or bruising:

- Use extreme care around garden plants when using mowing and weeding equipment. Wounds from these kinds of equipment are common entry sites for pathogens and insects.
- Try not to use heavy equipment or walk excessively in gardens or around the root zone of trees and shrubs especially when soils are wet as this causes soil compaction which reduces the health of the roots.

No Pests Allowed – Buying Healthy Plants

Although some pathogens and insect pests are common in every garden, some are brought into the garden on infected plants, and stay to create problems for many years. To avoid bringing problems into your yard and garden, carefully inspect every plant you purchase.
• Look at the upper and lower surfaces of the leaves - avoid plants that have damaging leaf spots, insects, or are off colored and damaged.

• Examine the stem - avoid plants with open wounds or sunken discolored areas. Look for dried or running sap as this may indicate a wound or disease problem.

• Pull the plant out of the pot and look at the roots - avoid plants with dark sunken lesions or soft mushy areas on the roots. Roots should be white or light beige in color.

• Don’t buy plants with roots that completely fill the pot and tightly wrap around the edge of the container to the point that no soil is visible.

• Plants in garden centers often share water, fertilizer, and cultural practices. If most of the plants in a group look unhealthy, don’t buy any of them. The one ‘healthy looking’ plant will probably also become unhealthy over time.

Keep it Clean

Promptly removing diseased or insect infested plants or plant parts from the garden can help stop the problem from spreading to other garden plants. Scout your garden once every 1-2 weeks - look at leaves on all parts of the plants, both sides of the leaves, and the stems. Leaves with a few spots can be removed from the garden and composted or disposed of. A few insect pests can be squashed, picked off, or knocked into a bucket of soapy water (be sure you are removing insect pests and not beneficial insects!). Plants that are severely infested with insects can be removed from the garden. Keep the garden weed-free throughout the season. Many pests and pathogens survive on weeds before moving to garden plants to cause problems. When plants dieback at the end of the season, stems and leaves of diseased plants should be removed from the garden and destroyed. Removing and destroying diseased plants will reduce the number of pests surviving to the next year. From February through early April, scout trees and woody ornamentals for galls, cankers, or other wounds. Prune out any problem branches and dispose of them.

Plant Diversity

Many plant disease organisms and insect pests only attack one kind of plant or a group of plants that are closely related. By growing a diversity of plants in the garden, it is less likely that one insect or disease organism will be able to cause a problem on all of the garden plants. If only a few plants are affected by the problem, it is easier to manage or tolerate.

Mixing different plants together in the same garden can also help to stop the spread of disease. Many disease organisms move quickly from plant to plant when they are close together. If susceptible plants are separated by several resistant plants, it is harder for the disease organism to spread through the garden.

In addition, beneficial insects are attracted to flowering plants in the garden. A diversity of plants that flower throughout the year will encourage beneficial insects to remain in the garden.

Knowing Who’s Who

A wide variety of living creatures share our gardens. Many of them are desirable like lady beetles, lacewings, ground beetles, and parasitic wasps. In addition, many abiotic factors such as drought, herbicide injury, and salt can cause damage to plants that may look like disease or insect damage. Before using any pest control strategy, make sure you know what the pest is and if it is really a problem or not.
Proper identification of a problem is one of the most important steps to finding a solution. When scouting the garden look for plant damage. Use the following chapters to determine if the plant damage is caused by an insect, a disease organism, or an abiotic factor such as drought. Read about the pest’s importance, biology, and control. When choosing a management strategy, consider its effect on the environment, beneficial organisms in the garden, and personal health and safety.

4. Introduction to Pesticides

The best policy is to avoid all unnecessary pesticide use through a well designed IPM program emphasizing the pest management strategies outlined above in section 3. Growing a Healthy Garden. But there are times when these non-chemical tactics are not enough and the need to manage a pest is strong enough to justify the use of a pesticide. Only use pesticides within an IPM program.

A Pesticide May Not Be What You Think It Is

Pesticides are legally defined as substances or mixtures of substances used to prevent, destroy, repel, mitigate, or control pests. Not all pesticides are designed to kill. Many are used to repel or otherwise manage a pest or reduce the damage caused by pests. In the home, lawn, and garden pesticides are not just for insects but also include substances used to manage weeds, diseases, rodents and any other pests. In practice, a pesticide is any substance for which someone makes a pest management claim — whether or not it is effective.

Pesticides also include natural materials approved for use in organic gardening, ‘home brews and remedies’ for managing pests, insecticidal soaps and oils and other ‘biorational’ materials, living organisms that control pests, ‘miracle’ products that claim to drive out rodents or solve insect or weed problems, and even certain pest repelling devices. As with traditional pesticides, each has their own set of benefits and risks. Any substances for which a pesticidal claim is made and offered for sale, whether organic, natural, man-made or other type, are pesticides and are regulated as pesticides and must comply with all pesticides laws and regulations.

One way to classify pesticides is by the pest they control. Common types of pesticides used in the home and garden include:

- Fungicides for molds and fungi;
- Herbicides for weeds;
- Insecticides for insects; and
- Rodenticides for mice, rats and other rodents
- Avicides for birds
- Germaticides for germs and other disease causing microbes;

One third of all pesticides registered for sale in the United States and in Minnesota are germaticides. They are widely used around the home often as cleaning products, in medical facilities and food handling facilities and many other places to protect human health from disease. Other pesticides used to protect human
health include those used to manage rodents, cockroaches, mosquitoes and other organisms that spread human diseases. Still other pesticides are an essential part of protecting natural ecosystems from invasive and exotic species.

Home remedies and certain ‘natural’ pesticides and other substances that are not registered with the US Environmental Protection Agency. As such they have not gone through the extensive research and review for potential health, safety, and environmental problems mandated under federal law before any pesticides can be offered for sale. The only exception are the so called 25(b) products that have been reviewed by US EPA and determined as ‘generally considered safe’ to use as pesticides. While 25(b) products are not required to be registered with US EPA or with the state of Minnesota to be sold, though- they are still pesticides and all other pesticides laws and regulations apply.

**Working With a Professional Pesticide Application Service**

Sometimes it may make sense to hire a professional pesticide applicator:

- **Expertise and Equipment.** Some pests, such as bed bugs, termites and certain tree insects may require expertise or specialized application equipment.

- **Reduce Pesticide Exposure.** Avoid handling, mixing, applying, storing and disposing of pesticides by hiring professionals, all which increase the chance of pesticide exposure to the applicator or the applicator’s family.

- **Convenience and Timing.** Many people lead busy lives and may not be able to apply a pesticide at the right time for it to be effective.

- **Comply with Use, Safety, and Environmental Regulations.** Pesticides are highly regulated. Professional applicators in Minnesota are required to be licensed, take exams and receive regular training on minimizing the hazards of pesticides and how to comply with pesticide laws and regulations. They also should have the right personal protective equipment required for each pesticide they use.

Gardeners should:

- Ask friends, neighbors, and relatives for recommendations of high quality pest management services.

- Discuss with their professional applicator any pest problems, non-chemical pest management practices, information on the specific pesticides to be used, and any needed safety precautions to reduce exposure to family members, pets, sensitive plants or neighbors.

- Ask to see the license identification card of the individual making the pesticide application. They are legally required to carry the card when making pesticide applications. Check to see the applicator is currently licensed in Minnesota in the appropriate pesticide license categories. The MN Department of Agriculture maintains a publicly accessible web site listing all licensed applicators in the state of Minnesota useful to determine if someone is licensed. Never allow an unlicensed professional applicator to work in the home, yard or garden.

- Receive, according to state and federal law, a record of each pesticide application made listing pesticides used, rates, weather conditions, applicator’s name, license number and company name and more.

**Pesticide Labels**

The most important source of information to properly handle and apply a pesticide is
found on the label attached to the pesticide container. Everyone using a pesticide must carefully read the entire label and follow all label directions.

Pesticide label directions are a legal requirements and must be carefully followed to avoid an illegal use of a pesticide. Not following all applicable label requirements may place the applicator and the applicator’s family, neighbors and environment in harms way.

The label provides information on where and how to use a pesticides, amounts to apply, safety practices to follow, protective clothing to wear, first aid in case of pesticide exposure ad much more. Applying pesticides to plants or sites not listed on the label, using rates higher than allowed by the label and not wearing protective clothing and equipment specified by the label are all illegal.

Always read and follow the label attached to the product you purchase. Labels found on the internet or from similar sounding products may differ in important ways from the one attached to a pesticide container.

**Safety Practices**

Some pesticides are more toxic than others, but toxicity is not the only factor that creates a health risk. The risk of pesticide poisoning depends on the following conditions:

**Risk = Toxicty X Exposure**

Where toxicity of pesticide is based on the chemical make-up of the pesticide and exposure is both the dose - the amount of pesticide that enters the body. It is very possible that a moderately toxic pesticide which has low exposure may actually be safer to use than a lower toxicity pesticide which results in higher exposure.

Pesticides can enter the body through the skin, mouth, lungs and eyes. Toxicity can vary by route of exposure into the body. There are a number of things you can do to reduce pesticide exposure when handling and applying pesticides.

The following safety practices will help gardeners reduce pesticide exposure to themselves, their families and the public, minimize damage to the environment, and keep pesticides secure and away from children, pets, vandals and others who should not have access to pesticides.

**Personal Protective Equipment and Clothing**

Label-required protective clothing and equipment must always be worn by anyone working with pesticides. At minimum, whenever handling or applying any pesticide (including organic, natural and low-toxic pesticides) wear:

- Liquid-proof, chemically-resistant, unlined gloves – nitrile, butyl, and neoprene are the best materials for gloves.

- Long-sleeved shirt plus long pants with pant leg placed over footwear – not tucked in.

- Shoes plus socks – rubber boots are even better.

When working with undiluted pesticides, such as mixing pesticides and then filling application equipment, also wear at minimum:

- Liquid-proof chemically resistant full apron or coveralls.
• Safety goggles (regular glasses do not provide enough protection).
• Liquid-proof boots.

If there is a chance of spraying at head height or higher, wear a liquid-proof, broad-brimmed hat with safety goggles or face shield.

After use, wash goggles, liquid-proof boots, reusable gloves and other protective equipment with soap and warm water and then rinse and dry. Store equipment in plastic bags to keep it clean.

For clothing worn while applying pesticides:
• Wash separately from the rest of your family’s laundry.
• Wash contaminated clothing as soon as possible.
• Wear liquid-proof, chemically resistant gloves when handling clothing contaminated with pesticides.
• Pre-soaking helps remove pesticide residues in the wash.
• Use the highest water level, hottest water, and longest wash cycle on your washing machine.
• Do not over load the washing machine.
• Use heavy-duty liquid detergent.
• Wash heavily contaminated clothing TWICE – or discard.
• Before washing other clothing, run the washing machine EMPTY through a complete cycle with detergent and hot water.
• Line dry clothes if possible.

Applying Pesticides Indoors
• Keep baits, traps, and all pesticides out of reach of children.
• Have good ventilation.
• Spot treat whenever possible.
• Remove or cover pots, pans, dishes, toys, food, etc.
• Wash pesticide treated surfaces with detergent and water before using.
• Never treat food preparation surfaces.

Use indoors only pesticides labeled for indoor use.

Applying Pesticides Outdoors

Do not apply pesticides if the wind speed exceeds label restrictions, is blowing towards sensitive plants, off your property, or towards sensitive areas such as wetlands, surface water, children’s play areas etc.
• Leave an unsprayed buffer zone around or next to sensitive areas and property line.

• Keep people, pets, and children off treated area until the sprays have dried, dusts have settled, or as directed to by the pesticide label.

• Never apply pesticides to hard surfaces such as sidewalks and driveways, as residues can wash into local wetlands, storm drains, and surface waters.

• Follow pre-harvest intervals (time from application to harvest) on the label when applying pesticides to food plants.

• Sweep up excess granules from driveway, sidewalks, and street.

Other Safety Practices

• Do not eat, drink, or use tobacco when applying pesticides.

• Measure and mix pesticides and load application equipment outdoors whenever possible.

• Always calibrate application equipment so it applies at a proper rate and keep it in good condition.

• Wash gloves with soap and water before taking them off and then remove gloves.

• After application, wash hands, face, and any other parts of the body that may have come in contact with the pesticide with soap and water.

• Always wash hands before eating, drinking, using tobacco products (cigarettes or chew), or using the bathroom.

• To prevent tracking pesticides inside, remove or rinse boots or shoes before going indoors.

• Clean application equipment after each use and store in a secure area away from children and pets.

First Aid

When exposed to pesticides, follow general first aid guidelines. Don’t wait – apply first aid right away and call Poison Control’s toll-free telephone number for assistance: 800-222-1222.

Check the label for specific first aid information and call for medical help immediately. Wear any necessary protective equipment or clothing when rescuing someone to avoid becoming a victim yourself.

Pesticides on the skin...

• Remove contaminated clothing.

• Wash contaminated skin and hair with soap and water.

• Dry washed area.

Pesticides in the eye...

• Hold the eye lid open.
Flush the eye slowly and gently with water for 15 minutes.

**Inhaled pesticides...**

- Carry the victim to fresh air (do not make them walk).
- Have the victim lie down.
- Keep the victim’s chin high to keep air passages open.
- If breathing stops, apply artificial respiration.

**Pesticides in the mouth or swallowed...**

- Rinse mouth with plenty of water.
- If the pesticide is swallowed, have the victim drink up to as much as 1 quart of milk or water.
- Read the label or contact health care professionals to determine if you should induce vomiting.

**Storing Pesticides**

Avoiding the need to store pesticides by buying only the amount of pesticides needed for immediate use. All pesticides must be stored in secured and locked areas out of the reach of children.

Nationally, the most common types of pesticide poisoning are children in the home due to improperly stored pesticides. Here are some pesticide storage requirements:

Store in a dry area away from temperature extremes, 5’ or higher off the floor, and secured from children and pets. Do not store with or near food, feed for animals, medical supplies, pesticide protective equipment and clothing, fertilizers, seeds, or gasoline. ALWAYS store pesticides in their original container with the pesticide label intact and with covers tightly closed. Place pesticide containers in a plastic tub, large bucket, or other large container to catch any drips, spills, or leaks. Mark each pesticide with date of purchase. If the container leaks do NOT pour into a new container. Place the leaking container into a large container to catch the leaking material. NEVER, for any reason, put pesticides in food or soft drink containers or any other kind of containers. Label the storage area and post nearby the telephone numbers for fire, poison center, and other emergency numbers.

**Spills**

Spill need to be cleaned up immediately. Dry products can be swept up and reused. A liquid leak from a container can be controlled by placing the container in a pail. Sprinkle any spilled liquids with cat litter, sawdust, or shop absorbent and sweep it into a clearly labeled plastic bag or pail. If the spilled product cannot be reused according to its label then treat the material as waste and dispose of according to local and state regulations.

Always clean up any pesticides spilled or applied on outdoor hard surfaces. Rain or irrigation water will wash any pesticides on hard surfaces directly into local wetlands, ponds, lakes, streams, and rivers. Make sure that the pesticides are cleaned up in order to avoid runoff into these areas.
All pesticide and fertilizer spills must be immediately reported to the Minnesota Duty Officer at 800-422-0798 or 651-649-5451 at any time of the day or night. You will then be able to talk to a trained emergency responder who will assist you in cleaning up the spill in an environmentally sound and cost effective manner.

Pesticide Wastes

Many products are now ready-to-use, premixed pesticides. When pesticides require mixing with water avoid generating pesticide wastes by mixing up only what is needed to apply at any one time. Follow label use, storage, and disposal instructions.

Pressure rinse or triple rinse containers immediately after emptying. Delay in rinsing pesticide containers may result in a residue that, upon drying, is highly resistant to rinsing. Use rinse water as dilution make-up water and apply evenly over labeled plants or sites.

Contact your County Solid Waste Office or the MDA regarding disposal opportunities. Dispose of empty paper bags, plastic bags, and other types of containers at sanitary landfills. Contact County Solid Waste Office for more information.

Do not burn or reuse any pesticide container. This is illegal in Minnesota. Do not reuse pesticide containers for any reason. Most home use pesticides labeled for home use are not designed to be reused or refilled.
Source Material:

Grabowski, Michelle; Menken, Jennifer; Mugaas, Robert; Hahn, Jeffery; Herzfeld, Dean and Ciborowski, Jeanne. (2006). Managing Pests in Landscapes and Homes: A Homeowner’s Guide to Integrated Pest Management (IPM) in Minnesota. Minnesota Department of Agriculture (web: www.mda.mn.us )

Pesticide Safety & Environmental Education Program, University of Minnesota Extension (web: http://www.extension.umn.edu/pesticides/ )


Purdue Pesticide Publications. (web: http://www.btiny.purdue.edu/ppo/PPP_pubs.html )

University of Minnesota Extension. Various publications and web pages (web: www.extension.umn.edu)