

Syngenta Series: Protecting our Environment through Pesticide Stewardship

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Foreword

Conservation districts, with their strong local focus on conservation and stewardship throughout the United States, are in a unique position to reinforce essential pesticide stewardship practices. These practices protect water, soil, and other natural resources.

The most common pests are insects, weeds, disease-causing pathogens, and rodents. Pesticide stewardship begins with deciding whether a pesticide is needed and continues through the complete life-cycle of the pesticide. Life-cycle management focuses on selection, transport, storage, application, cleanup, and disposal. At each of these stages, there are basic stewardship practices that must be understood and utilized.

This year, NACD is sponsoring a series of articles on these basic but essential pesticide stewardship practices. By promoting these practices, conservationists can help local pesticide stewardship practices make a national impact.

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Chapter I: IPM is fundamental wherever pests must be controlled

Integrated Pest Management (IPM) provides the framework for responsible pest management, whether managing weeds, insect pests, plant pathogens, rodents or other pests, on private or public lands, commercial sites, or in or around the home. IPM focuses on a number of principles that work together to prevent and control pests. None of these principles are more important than the others – all must be understood and used appropriately to prevent unacceptable pest impacts while protecting human health and the environment.

Here are the key principles behind a sound IPM approach:

Pest Prevention. Make an unhappy home for pests – here are three common ways:

- Sanitation: Use sanitation techniques that reduce pests, their habitat, and their alternate hosts. Where possible, remove sources of food, water and shelter for pests. Destroy insect- and disease-infested plants and plant residues. Mow or destroy weeds before they go to seed.
- Exclusion: Where the site is enclosed (building, greenhouse, etc.), locate possible points of entry and seal or screen them. Ensure that weed seeds are not transported on equipment and tools.
- Habitat Modification: Alter the environment to make it unfavorable for the particular pest. Prevent standing water to help avoid mosquito problems, and use mulch to inhibit germination of weeds under trees and shrubs. Avoid over-watering or over-fertilizing plants – many diseases thrive in wet, succulent conditions. Rotate crops to prevent the buildup of certain pests.

Pest Identification. Accurately identify and understand your pest(s). Some insects and pathogens cause little damage to certain plants, and some weeds are not competitive. Contact an expert (from your state's Extension Service, land-grant university, pest management association, etc.) for assistance.

Action Thresholds. An action threshold is the point at which a pest reaches an unacceptable level, requiring some type of corrective action. Know the action threshold for each pest, for the particular site and time of year.

Inspection and Monitoring. Inspect the site and know where to look to determine the presence and extent of the pest, and to correct conditions that encourage pests. Routine inspections (monitoring) are needed with pest populations that can rapidly change. Tools exist to assist in monitoring for certain pests.

Corrective Actions. When the action threshold is reached, carefully consider all options – using more than one may be appropriate. Corrective actions include:

- Physical Control: In certain situations, physical control is highly effective. Wear gloves and a dust mask to hand-pull small populations of weeds or to scrub mold or mildew off washable surfaces.
- Biological Control: Promote and protect beneficial predators and parasites that help control the pest. Monitor natural enemies at the same time that you monitor the pest.
- Mechanical Control: A variety of traps play an important role in insect and rodent pest control. Consider tillage to assist with weed and nematodes control where erosion and limited soil moisture are not concerns.
- Chemical Control: Pesticides are an integral part of many IPM programs but they are never intended to be a substitute for other effective measures. When thresholds are exceeded and non-chemical control techniques are known to be insufficient or not practical, chemical control must be done with the utmost attention to stewardship. Pesticides should be used only when needed but not "as a last resort" (after every other corrective action has failed) because some pests are serious and/or small infestations can quickly get out of hand.

The rest of this series will deal with the chemical component of IPM, focusing on key pesticide stewardship practices from purchase to disposal. Regardless of the pesticide (conventional, organic, natural, "least toxic", etc.), these practices protect the environment and human health, when using pesticides to prevent ecological, economic, health or other negative impacts from pests.

Chapter II: Purchasing pesticide the right way

There are thousands of pesticide products registered in the United States, for a wide variety of uses. We are most familiar with pesticide use on crops, lawns, and gardens, but pesticides are used in buildings and on animals, aquatic sites, forests, golf courses, industrial sites, natural areas, parks, rights-of-way, seeds, etc...virtually any "site" where a pesticide is considered necessary to control a harmful pest.

Before purchasing a pesticide, there are important things you need to know.

- Arrive at the store knowing what pest(s) you are trying to control. The [Cooperative Extension Service](#) or other trained professionals can help.
- Make sure the pesticide product controls your pest(s). Check the label to see if the pest(s) are listed and under what conditions they will be controlled. For example, a postemergence herbicide will not control weeds that are too large, and a contact insecticide with no residual (lasting) activity will not control insects that are not currently on the site. No product will control pest populations that have developed resistance to the pesticide active ingredient.

- Determine that the pesticide is registered for the "site" that you want to treat, and that you are willing (and able) to follow all directions for use. The label must specifically list the site you want to treat, and you must follow all application directions – product rate, timing, placement, weather conditions, etc.
- Ensure that you can comply with all other label instructions as well. The label will list any required protective clothing, all precautions for protecting the environment, first aid procedures in case of an accident, re-entry intervals after treatment, and storage and disposal requirements. Not following the label may result in criminal charges and fines, as well as personal injury if the required protective clothing is not used, cleaned, stored, and discarded according to its directions.
- Know when you are buying a pesticide. Any chemical making a pest control claim should be registered as a pesticide with the Environmental Protection Agency (EPA). This includes all products that contain a pesticide, such as flea collars, "weed and feed" fertilizers, insect repellents, mold and mildew killers, many insect and rodent baits, and some swimming pool chemicals.
- Confirm that you are buying a pesticide that has a current EPA registration number on the label. Sellers do not always know or follow the requirements of selling a pesticide so, if you see a counterfeit product for sale, notify your [Pesticide Regulatory Agency](#). Pesticides sold over the Internet are not exempt from federal and state pesticide laws – yet some are illegal, falsely-advertised, and improperly labeled.
- Buy small amounts – preferably what you can use in one year or less. This reduces the need to store, dispose, or transfer pesticides.
- When buying a pesticide, be careful about whom you ask for advice. The best source of information is your Cooperative Extension Service. Store employees, family members and friends may not know the correct answers to your questions, and you are ultimately responsible.
- Understand what a "premix" is, so you can determine its value in your situation. A premix contains more than one active ingredient and will control more pest species. It may also reduce the chance of pest resistance developing if the active ingredients act in different ways on the same pest.
- Never try to purchase a "restricted use" pesticide unless you have been legally certified to buy and use it for the particular category of use. Applicators can be certified in various categories, such as agricultural crops, structures, turf and ornamentals, and public health. You do not have to be certified to purchase a "general use" pesticide.

Responsible buyers ensure that they are buying the right product and can meet every label requirement before they leave the store. If in doubt, do not buy the product until you know it will control the pest(s) on your site, and that you can comply with the label, because the label is the law.

Chapter III: Considerations when hiring a pest management professional

Many people decide to leave the application of pesticides in or around the home, business, or landscape to a hired professional. Pest management professionals (PMPs) treat a wide range of indoor and outdoor pests, such as insects, rodents, weeds, and disease-causing pathogens.

Make a well-informed decision when hiring a PMP:

- Various state websites and the [National Pest Management Association](#) list many licensed PMPs. In addition, your state [Pesticide Regulatory Agency](#) and Better Business Bureau may be able to provide information on known violations and complaints. Ask for and check references.
- The PMP should involve you in pest management where appropriate. A healthy lawn that is properly mowed, fertilized and watered competes well with weeds. You will attract fewer insects, rodents and disease if you promptly remove food sources, diseased plant debris and standing water. Repairs to cracks, screens and leaks can also reduce or eliminate certain pests, as can adequate ventilation.
- Consider only a PMP who does an inspection before providing a proposed service plan and price estimate. Discuss the target pests, infestation levels, affected areas, and your desired level of control. For example, a small population of annual weeds remaining in a lawn that is mowed regularly to prevent seed production may be acceptable.
- Ask for copies of pesticide labels, even if the contract guarantees "green," "organic," "safe" or "nontoxic" solutions. If you are concerned that certain label directions and precautions cannot or will not be followed, ask questions before the application. For example, the contract should indicate who is responsible for prompt clean-up of granular products that reach concrete surfaces.
- Review the PMP's re-treatment plan, which in most cases should not be on a calendar (pre-set) schedule. A careful PMP will monitor for pest recurrence and infestation level (or show you how to monitor) and use that information to decide when to re-treat.
- Understand the reasons for the PMP's proposed approach to your pest problem. The PMP should also be able to tell you what level of control to expect if you request a certain type of pest management approach or delay treatment.
- Review the PMP's license/certification, general liability and worker's compensation insurance, and certification to apply pesticides. States have different requirements for licensing and certifying PMPs and their technicians.
- Ask who will make and supervise any pesticide applications. Some states allow for a trained, non-certified technician to apply pesticides, but it is important (and usually required by law) that they are under the supervision of a certified applicator.
- Obtain several bids, carefully compare the contracts, and never make a decision based solely on price. Do not hire a PMP who pressures you or cannot answer your questions.

- Make sure your copy of the contract contains the company's contact information, non-chemical and chemical treatment plan, your role (pre- and post-treatment), guaranteed level and length of control, and monitoring plan. Proof of license, certification and insurance, as well as exclusions, cancellation policy and arbitration clause, should also be included in the contract. In some states, you can request a state inspection if you have concerns about the PMP's activities or results.

Be an informed shopper when hiring a pest management professional. And if you decide that you have the time and skill to identify the pests and control them without a PMP, consult with your Cooperative Extension Service, other experts, and/or up-to-date resources from reliable sources.

Chapter IV: Reading the pesticide label

One of the most difficult comments to hear from a customer is "I don't read the label." The pesticide label is a legal document, and it is a violation of federal and state laws to disregard it. Understanding the label is essential to control pests and protect human health and the environment.

- Read the label when making a purchase, and at every use. Product labels can change at any time. Brands and packaging may look similar, but contain different active ingredients or different concentrations. Once you make the purchase, read the label every time you use it – never rely on your memory.
- Check that the site is on the label. There are many potential treatment "sites," such as food crops, turf, ornamentals, foundations, and indoor surfaces. Sites not on the label cannot be treated. If they are, the product may pose toxicity, residue or other concerns.
- Ensure that your pest is controlled. Look at what weeds, insects, pathogens or other pests are on the label, get an accurate identification of the pest(s) you have, and use the label rate.
- Only mix products that are compatible. The label may list what products can or cannot be mixed, and how to test for compatibility with products not listed. Various websites also indicate how to do a "jar test" to determine compatibility.
- Apply the product in the right place and at the right time. Insects and pathogens that are on leaves will require different placement than those in the soil. Many herbicides control only small weeds. Some insects are only pests in the larval stage. Insecticides and fungicides often indicate a maximum number of applications and minimum interval between them.
- Know the signal word and what it means. The signal word (Caution, Warning, or Danger) reflects the most toxic category resulting from dermal, oral, inhalation or eye contact with the product formulation. If the signal word is warning or danger, the label will indicate what type(s) of contact are moderately or highly toxic, respectively.

- Use the required personal protective equipment (PPE). You are putting yourself at risk if you don't wear the specified respirator, glove type, etc. Employers must follow all appropriate laws concerning their employees' use of PPE.
- Review the first aid instructions and keep first aid supplies immediately accessible. Proper first aid depends on the product and type of exposure. When immediate medical attention is required, never wait for symptoms to appear.
- Understand all possible hazards to people, domestic animals and the environment (water, soil, wildlife, and microorganisms), and any fire, explosion or chemical hazards. If any of these hazards exist, they will be indicated in the Precautionary Statements on the label.
- Follow all storage and disposal instructions. Pesticide labels will often indicate temperature requirements, security needs and what should not be stored with the product (food, feed, seed, etc.) The label may give disposal options for containers, excess product and anything contaminated by the pesticide, or refer the user to other applicable laws.

Each label contains a wealth of product-specific information, such as when not to treat (wet surfaces, presence of pollinators); ways to avoid off-target movement (spray drift, surface runoff); and how long to wait (before entering the treated area, planting certain species into treated soil, or harvesting a crop for food or feed). Nothing should ever be ignored on the pesticide label.

If you still have questions after reading the label, call the pesticide manufacturer, your county or regional extension office or your [State Pesticide Regulatory Agency](#).

Chapter V: Storing a pesticide takes preparation and oversight

No matter how few or how many pesticides you purchase, proper storage is a must to protect people, animals and the environment. One nationwide study conducted by the Environmental Protection Agency (EPA) indicated that 47% of surveyed households with children under the age of 5 had at least one pesticide stored within their reach.

Always follow government regulations and label requirements when storing pesticides. In the absence of more specific laws and label directions, here are some core principles:

- **Location.** A separate building is preferred – away from people, animals and sensitive areas. If a separate building is not possible, specify one area on the ground floor for pesticide storage. Select a location that is not prone to flooding and not on the upslope from water sources that could be affected by a spill or leak. **Security.** Keep the building, storage area or cabinet locked at all times, and allow access only to those with

appropriate training. Post required signs – at minimum, "Pesticides – Keep Out" and "No Smoking Allowed."

- Environment. The storage area must be adequately ventilated and dry. The temperature range for liquid pesticides is usually 40° to 100°F, but there are exceptions. The Storage and Disposal section of the label will provide any important information about storage temperatures. Pesticides should always be stored off the floor, with liquid and "Danger – Poison" formulations on the lowest shelves and with large bags on pallets.
- Isolation. Do not keep food, feed, seed, personal protective equipment (PPE) or anything other than a pesticide in the pesticide storage building, storage area, or cabinet. Seal any floor drains; in some cases, removable caps can be used when sealing drains is impractical.
- Containers. Pesticides must be stored tightly closed in their original container. Consider putting a tray under liquid pesticides that can provide containment in case of a leak. A pesticide in a leaking container must be transferred promptly to a new container and affixed with the original label or with key identifying information. If the label becomes illegible for any reason, obtain a replacement label immediately from the dealer, retailer or manufacturer. Mark containers with the date of purchase, and use older inventory first. Inspection. Check regularly for any problems with the product containers, labels, or building, storage area, or cabinet, and take all necessary steps to correct them promptly. Maintain a storage inspection log. Accurate inventory records prevent over-purchase, lengthy storage, container deterioration and the need to locate suitable disposal sites. When possible, purchase only product quantities that you plan to use in a 12-month period.
- Protection. Have personal protective equipment, a first aid kit, an eyewash dispenser, soap and clean water immediately accessible, but protected from possible pesticide contamination.
- Preparedness. Depending on the law and the products and quantities stored, you may be required to maintain an up-to-date inventory, safety data sheets and emergency phone numbers in the event of a fire, flood, spill or leak. The fire extinguisher must be inspected annually. A readily-available spill cleanup kit and absorbent material will allow you to control, contain and clean up a small spill. Make sure the floor, shelves and pallets are nonporous and easy to clean.
- Assistance. Numerous resources exist to assist you in proper storage of pesticides. Your Cooperative Extension Service and state regulatory agency can help. Various pesticide storage checklists have been developed to help you review basic needs.

Government regulations, pesticide labels, climate and other factors will impact storage requirements. Do not purchase a pesticide if you are not going to be diligent about pesticide storage.

Chapter VI: Always be wear protective equipment

Personal Protective Equipment (PPE) includes apparel and devices worn to protect the body from contact with pesticides or pesticide residues, including aprons, chemical-resistant suits, coveralls, footwear, gloves, headgear, protective eyewear and respirators. It is very important to select, use, clean, maintain and store PPE correctly – here are some fundamentals:

- If you don't have the PPE required by the pesticide label, don't apply the pesticide.
- Follow the PPE section of the specific label, even if another brand name is the same, because different formulations often require different PPE.
- The required PPE may be different for different tasks, such as mixing, application, and early entry into a treated area.
- Each time you purchase a pesticide or PPE, read the instructions on the label and in the PPE package, because new research can result in changes.
- A "water-resistant" material is different than a "chemical-resistant" material. Chemical-resistant PPE is not equally resistant to all pesticides, under all conditions, and for the same length of time.
- Use one of the glove examples specified on the label. Wear sleeves outside the gloves if spraying below the shoulders and inside the gloves if spraying overhead. Use duct tape where the gloves and sleeves meet, if spraying both overhead and below the shoulders.
- Always wear pant legs outside footwear. Clean exposed footwear after each day's use and remove it before going indoors.
- If a respirator is required, use the exact type specified on the label and make sure it is NIOSH-certified. An initial medical evaluation is strongly advised, even if not required by law. Certain respirators must be fit tested by a trained person before the first use, annually, and when there are significant changes in weight, facial hair, etc. In addition, conduct a seal check before every use, according to the PPE instructions. Replace respirator filters, canisters, cartridges, etc. according to the PPE instructions and whenever there is equipment damage, breathing resistance, odor, taste, irritation or soiling.
- Remove PPE as soon as the task is completed. Wash gloves with soap and water, even if they are disposable, and then remove other PPE while still wearing the gloves. Then wash gloves again with soap and water before removing them.
- Follow the specified cleaning and maintenance instructions for reusable PPE, and check for any type of deterioration or damage before and after each use. Never reuse "one-time use" PPE.
- Wash regular work clothes that have been exposed to pesticides as soon as possible, separately from other laundry and using detergent and hot water.
- Follow the manufacturer's storage instructions. Keep PPE in its sealed package until use, never store with pesticides or personal clothing, and protect from conditions that will reduce shelf-life.
- Dispose of PPE carefully to avoid contamination to yourself, others or the environment. Properly cleaned PPE can be disposed as regular garbage. In the absence of specific label

directions or government regulations, dispose contaminated PPE as household hazardous waste at an appropriate waste collection event or disposal site.

- Hot weather is never a good excuse for not using the required PPE. Take all necessary steps to avoid heat stress, including frequent rest breaks in shaded areas and drinking plenty of water (not caffeinated drinks), and don't work alone.
- If an accident results in pesticide exposure, immediately follow the exact first aid instructions on the label, even if you do not have any symptoms.

Your personal safety is essential – never take short cuts that bypass the correct use of personal protective equipment.

Chapter VII: Weed and feed your lawn responsibly to protect the environment

Saving time is always a goal, making "weed and feed" products attractive to anyone who wants to fertilize their lawn and control weeds at the same time. Weed and feed products may be granular or liquid formulations, applied in the fall or spring. Remember these principles of responsible pesticide use when using a weed and feed product.

- Know how many weeds you have. You may not need an herbicide at all, if you mow regularly at the correct height, maintain a dense, healthy lawn to compete with weeds, or have used an herbicide for several years. If you have only a few weeds, you can remove them by hand or hoe to prevent their spread by seed or perennial plant parts.
- Accurately identify your weeds. An herbicide will control certain weeds but not others. Ask an expert, such as your Cooperative Extension Service, if you don't know what weeds you have.
- Make sure the weeds are at the right stage. Preemergence weed killers must be applied before the weeds emerge, while postemergence weed killers must be applied on emerged, actively-growing weeds.
- Know your turfgrass. Cool-season turf species, such as tall fescue, Kentucky bluegrass and perennial ryegrass, should be fertilized primarily in the fall. Warm-season grasses like bermudagrass should be fertilized in late spring or early summer. If the right time to fertilize your lawn is not the right time to control your weeds, do not apply the weed and feed product.
- Read and follow the label. Always do this first, even before you purchase the product. The label is the law, and you are legally obligated to read and follow the entire label. The directions for use, precautions and other information are equally important.
- Measure and apply precisely. To control your weeds, use the exact application rate specified on the label, at the recommended growth stage. Accurately measure the size of the lawn.

- Sweep it up. Sweep or blow any weed and feed granules that fall on your driveway or sidewalk back onto the lawn. If you don't, they can easily travel with rainfall into storm drains, ditches, creeks and other waterways.
- Avoid drift. Consider the wind speed and direction when applying a liquid weed and feed product. Sensitive plants in the area must be protected, even if it means delaying the application.
- Know what won't work. Emerged weeds won't be controlled by a preemergence weed and feed product. A patch of perennial weeds with creeping root systems, rhizomes or tubers may need to be spot sprayed with an herbicide rather than a broadcast weed and feed product. Consult with your Cooperative Extension Service or visit Extension websites for advice on how to best treat the weeds you have.
- Treat weed and feed products like all your pesticide-containing products – be diligent in their purchase, storage, application, cleanup and disposal.

Chapter VIII: Ensure pesticide spray drift does no harm

Pesticide spray drift is the physical movement of spray droplets from the intended target. Drift is not just about crop injury; it can negatively impact workers, organic crops, beehives, animals, aquatic areas and other sensitive habitats, even if the effects are not immediate or obvious. Some labels provide a detailed list of required drift management techniques and/or specify a maximum wind speed. Labels may also require a certain size buffer zone between the target site and sensitive sites. It is critical to read the entire label.

Registries in certain states enable applicators to determine sensitive crops in close proximity to their planned treatments. Application technology and buffer size calculations are also becoming more sophisticated, but ultimately it is the applicator who must take every necessary precaution.

When applying a pesticide, follow the label and all government regulations and carefully assess the following:

Non-Target Sites. Know what is downwind of your application. A small amount of spray drift to a tolerant, labeled crop on your land may be acceptable, but many types of drift are illegal.

Buffers. Establish buffers, which are areas or strips of land intended to intercept spray drift. Tolerant fast-growing trees, grassed buffer strips and uncropped field borders are examples of buffers that can be positioned downwind of areas that will be treated. When no buffer exists (or an existing buffer is insufficient under the particular application conditions), create the needed buffer by leaving a portion of the target site untreated. If a certain buffer size is not specified on the label, the applicator must decide based on the pesticide and local conditions. Never use someone else's land as your buffer.

Weather. Wind is the most important weather factor affecting spray drift. Apply pesticides only when winds are light and blowing away from sensitive areas. A general rule is to spray when the wind speed is 3-10 mph, but the upper limit must be modified based on all application-specific factors influencing drift. Accurately measure wind speed and direction before and during the application. If a change in wind speed or direction results in unacceptable drift, immediately adjust the buffer size or location as necessary, or stop the application.

Calm conditions or variable winds can actually increase the chance of spray drift. Calm conditions might indicate a temperature inversion (a trapped layer of air). Inversions are most common during the early morning or evening, and favor horizontal movement of pesticides. High temperatures and low relative humidity may also increase the chance of spray drift.

Application Equipment. Spray pressure and volume, droplet size, nozzle type, boom height and additives can all influence spray drift. Within the constraints of the label:

- Reduce spray pressure to produce larger spray droplets.
- Increase spray volume, which allows the use of nozzles that produce larger droplets.
- Use low-drift nozzles, such as those with air-induction technology. Replace all worn nozzles.
- Keep the spray boom as low as possible without detrimentally affecting spray coverage. Consider boom shields and windscreens.
- Include a drift control agent in the spray tank.

Some of these spray drift-reducing tactics cannot be used for every pesticide application because pest control will be reduced. But, if you cannot follow the label AND avoid drift, select a different product or formulation. Granule formulations are sometimes available alternatives to eliminate drift.

Flexibility before and during treatment, and communicating with neighbors, are key ways that applicators can prevent problems from spray drift. Applicators are legally responsible for these problems and must do everything necessary to avoid spray drift.

Chapter IX: Preventing contamination of surface and groundwater

Some pesticide applications are purposely made to water, for good reason. Infestations of water hyacinth can double in size weekly and a four-inch shoot of hydrilla can grow by 3,200 inches in just 35 days. But if a pesticide is applied to control pests over, on, or in the soil, there are important best management practices that must be implemented to prevent the pesticide from reaching surface and groundwater.

Surface water such as lakes and rivers can be contaminated by pesticides that "runoff" *across* the soil surface with water or eroding soil particles, or move with the air as "drift" during application. **Groundwater** such as wells and aquifers can be contaminated as pesticides "leach" with water *down* through the soil profile.

Many practices protect both surface and groundwater. **First determine whether a pesticide is needed.** Do the past and/or current weather conditions favor a major infestation? Is the crop already close to harvest? Can you accept superficial damage to your plants or absolutely no damage at all?

Read the label carefully. Precautionary and environmental hazard statements will indicate if the product is water soluble and prone to runoff and/or leaching, and whether the application should be avoided or delayed if certain site and/or weather conditions favor pesticide movement.

Choose the correct pesticide and calibrate the application equipment carefully to ensure that an excessive amount of pesticide is not applied. Never mix pesticides near a water body or wellhead. Construct impermeable pads at *permanent* pesticide mixing/loading sites and do not leave the sprayer unattended while filling. When selecting a *temporary* mixing/loading site, avoid hard-packed surfaces, since these allow leaks or spills to easily move off-site. Always keep a spill-absorbent material such as cat litter or sawdust readily available.

Don't prepare more spray solution than is needed and dispose of any excess by applying it to a registered crop or site. Do not apply a pesticide prior to heavy rainfall, or over-irrigate your field, lawn, or garden after application. Prevent drift onto adjoining water bodies. Never apply pesticides to paved surfaces with direct access to drains and ditches.

Use timings and placements that reduce the chance of pesticide movement. Where pest control will not be compromised, replace broadcast applications with in-furrow or directed applications, seed or spot treatments, and barrier or band treatments, to better target pest populations or the zone where pest control is needed. Incorporate broadcast soil-applied pesticides that are prone to runoff, *if* incorporation does not promote soil erosion at the specific site. Foliar applications to a crop canopy are much less susceptible to runoff or leaching than soil applications.

Ensure that a backflow prevention device is installed when applying pesticides in irrigation water (chemigation). Backflow or anti-siphon devices prevent pesticides from being drawn down into the well and contaminating it and the aquifer.

Practice proper storage and disposal techniques. Store pesticides downhill of water bodies in case of a leak or spill. Never pour pesticides down the drain or onto the soil to dispose of them. Runoff of pesticides with water across the soil surface is affected by many factors – such as the pesticide, formulation, topography, presence and type of plants and/or plant residue, and soil permeability. Terracing, conservation tillage, grass buffers, and cover crops are some of the

land management practices used to prevent or minimize runoff. Leaching is also affected by various factors, but not all the same as those that affect runoff. Applicators must always be diligent about understanding all these factors and protecting our surface and groundwater.

Chapter X: Pollinators and pesticide stewardship

Pesticides play an important role in controlling pests on farms and in urban landscapes. The areas treated for pests are often shared by pollinators, which are attracted throughout the growing season to a variety of blooming flowers on crops, trees, shrubs, weeds, and native vegetation. Here are some important guidelines to protect pollinators when using pesticides:

- Read and follow all pesticide label directions and precautions. Should a pesticide be potentially toxic to pollinators, the product label will list precautions that need to be taken during application. For example, a label may prohibit applications when honey bees are foraging or plants are in bloom. EPA is now also requiring a pollinator advisory box on certain labels.
- Understand the difference between contact and residual toxicity to pollinators. Some pesticides only harm pollinators that are contacted during the application, while others can harm pollinators that visit the treated area later and contact pesticide residues on the plants. A pesticide that does not have residual toxicity can often be applied after evening pollinator foraging is complete without harming pollinators that arrive the following day.
- Understand local pollinator visitation habits. Pollinators can forage several miles from their hives. The time and intensity of visitation depends on the abundance and attractiveness of the blooming plants.
- Use an Integrated Pest Management (IPM) approach. IPM considers all suitable practices for preventing and controlling pests. Use cultural practices that discourage pests from using a crop or landscape as habitat, accurately identify the pest(s), monitor the pest population to determine if treatment is necessary, select the pest control option(s) that minimize risks to pollinators, and use the lowest labeled pesticide rate for the target pests.
- Be a good pesticide steward. For example, minimize spray drift by a combination of practices, such as low drift nozzles and no-spray zones between treated areas and pollinator habitat or hives. Do not spray when the wind is blowing toward pollinator habitat or areas where beehives are located. Minimize off-site drift of seed treatment materials, by using high quality seed free from excessive dust, an appropriate coating system that keeps abrasion of the pesticide coating to a minimum, and the planter manufacturer's recommendations for the use of talc, graphite, or other seed lubricants. Plant seed at the proper depth.
- Cooperation among growers, beekeepers, applicators, and others greatly increase the likelihood of success in protecting pollinators, their hives and habitats. Growers and

commercial beekeepers should have a written agreement that designates the responsibilities for protecting pollinator hives, water, and food sources when toxic pesticides are applied by ground or air. Growers and applicators must accurately map the application site and discuss the proximity of blooming plants and hives.

Know the common symptoms of honey bee exposure to pesticides, which include excessive numbers of dead bees in front of hives, lack of the usual numbers of foraging bees, and disoriented bees that are unable to fly. Non-pesticide stressors include colony starvation and nutritional deficiency, excessive cooling or heating of the colony and brood, and parasites and pathogens.

- Check for specific local ordinances pertaining to pollinators, especially beehive locations or designated preserves, and notification requirements if pollinator toxic pesticides are planned to be applied in close vicinity to hives or active pollinator activity. Some states require that commercial honey bee operations register the location where hives are being kept.

Most pesticides can be used safely around honey bees and other insect pollinators when label directions are followed, while some pesticides require very specific practices and precautions to minimize pollinator exposure. Know the pesticide and protect our pollinators.

Chapter XI: Proper disposal of pesticides goes beyond the container

Disposal is the final step in the life-cycle management of pesticides. This includes anything that contains or is contaminated by a pesticide.

Excess Product. Try to purchase only the amount needed. Excess pesticides can be given to another qualified user, taken to an approved disposal site, or disposed of through a designated waste transporter. Product in a damaged container must be transferred to a suitable container and labeled prior to disposal.

Unused Spray or Dip Mixture. Attempt to eliminate or minimize excess spray or dip mixture by careful measurement, calibration and application. Apply excess mixture to another labeled site if possible.

Rinsate. Rinse the pesticide container or spray equipment over an impermeable surface and recover the rinsate. Rinsate without debris can be used as up to 5% of the next spray mixture of that chemical. Rinsate can also be applied to the original site, provided registered rates are not exceeded.

Never pour excess product, unused spray/dip mixture or rinsate onto a roadway or into a sink, toilet, sewer, street drain, ditch or water body. Pesticides may pollute waterways or harm non-target organisms, and many municipal systems are not equipped to remove all pesticide

residues.

Empty Containers. Rinse empty containers of liquid products thoroughly at the mixing site using the [triple rinse method](#) or a pressure rinser. Puncture the top and bottom of disposable containers to prevent reuse.

If containers are non-refillable, high-density polyethylene, there are [collection/recycling programs](#) for agricultural and commercial applicators in most states. Where there is no recycling program, deposit empty containers in a licensed sanitary landfill.

If containers are refillable/returnable, follow all rinsing and collection instructions provided by the manufacturer, distributor or retailer.

Leftover Pesticide-Treated Seed. The best way to dispose of a small quantity of leftover treated seed is to plant it in an uncropped area of the farm or garden. Use the normal seeding date, rate and depth. Do not put treated seed in your compost pile. [Additional options exist for large quantities](#), but first consult with state and local authorities.

Contaminated Clothing. Discard clothing that is heavily contaminated with concentrated product. If the pesticide is regulated as hazardous waste, the contaminated clothing may have to be disposed of as hazardous waste.

Personal Protective Equipment (PPE). Discard PPE that has been damaged or designated as one-time use, or has expired or reached its use limit. Follow the most strict disposal directions, which may be state or local laws, the pesticide label or the PPE manufacturer's instructions.

Material from Clean-up of [Spills](#) or Leaks. Absorbent material such as pet litter or sawdust can be used to contain small spills or leaks. The absorbent material and any contaminated soil must be placed in a suitable container and treated as pesticide waste. Sweep up dry product spills and return to the container if contamination with soil, etc. will not impact use. Contact your state to determine notification and cleanup requirements for larger spills or leaks.

Containment Pad/Sump Residue. Any solids left in a containment pad/sump should be dried and spread evenly over a large part of the field in accordance with label directions, or taken to an approved waste disposal site.

The Association of American Pesticide Control Officials provides contact information for [state offices](#) that regulate pesticides. State and local laws regarding pesticide disposal may be stricter and more detailed than federal requirements on the pesticide label. Also, many disposal facilities can accept only certain types of waste. For household hazardous wastes, find out if your community has a collection program.