

INTEGRATED PEST MANAGEMENT (IPM) BASICS FOR GARDEN INSECT PESTS

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- ▶ IPM requires knowledge of insects, plants, and control strategies.
- ▶ IPM does not mean zero pests.
 - ◊ It requires some level of insects within the landscape, both as predators or parasitoids and food for predators or parasitoids.
- ▶ IPM aims to prevent pest problems.
- ▶ IPM may take longer for control to be noticed, but it can help reduce pesticides applied to the environment and help maintain beneficial insect populations.
- ▶ IPM utilizes all available control tactics: cultural, mechanical or physical, biological, and chemical control—only after careful monitoring of insect populations.

MONITORING

- ▶ Many insect pests are small and live in hidden locations.
- ▶ Monitoring needs to be thorough and happen on a regular basis.
- ▶ When thinking about a pest, think about what type of insect it is, where it is located, and what it is doing. The insect may not be causing a problem due to the type, location, or activity.
- ▶ Once an insect is determined to be a pest, consider the location and size of the pest population. What is drawing in the insects? Remember, they require food, water, and shelter for survival.
- ▶ Recommended monitoring tools: hand lens or magnifier, knife, sticky traps, collection containers, and field guides for identification.

CULTURAL CONTROL

- ▶ Cultural control requires modifications to routine plant care that can help reduce or avoid pest



It is important to monitor your garden regularly for pests to determine numbers of pests present as well as if there are beneficials taking care of the problem.

All photos courtesy of Wizzie Brown

populations. Simply put, the healthier plants are, the more they can withstand pest pressure.

1. Soil preparation is important to provide the requirements plants need to grow. It can help improve drainage and provide nutrients. Turning the soil can help to reduce overwintering pests. Crop rotation by plant family may help cut down on pest populations from year to year, especially in vegetable gardens.
2. Choose plants and varieties that are native or adapted to the local area. Use United States Department of Agriculture (USDA) Hardiness Zones and planting guides to ensure planting during the proper window. Install plants in areas with proper lighting to suit their requirements and group plants with similar

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Choosing healthy plants can be a great way to start your landscape. Choose plants that are native or adapted to your area as well as ones that are pest- and disease-free.

water requirements. Resistant varieties may be available to ward off certain types of pests. Space plants to allow room for growth.

3. Inspect plants before bringing them home to ensure healthy plants are introduced into the landscape. Consider quarantining new plants in a specific area for a few weeks before planting them in the landscape.
4. Watering and fertilization are key to making plants healthy. Know the level of water being provided and how well the soil drains. Good soil drainage is necessary to provide nutrients from fertilizers.
5. Garden clean-up, or sanitation, helps remove locations where pests can overwinter as well as reduces plants that compete for resources. Weed garden areas to reduce unwanted plants, turn over mulch to expose insects, and dry out overly wet areas. Wear gloves while cleaning up the landscape to avoid any bites or stings. Clean pruning equipment with a 10 percent bleach solution between plants to avoid spreading diseases.



Pulling weeds can reduce areas where pests hide as well as reduce plants that pests may feed on early in the season before moving into the garden.



When pruning, make sure to clean tools between plants with a 10 percent bleach solution or a similar product to reduce the transfer of plant diseases within the garden.

MECHANICAL/ PHYSICAL CONTROL

- ▶ Mechanical control uses labor, materials, and machinery to reduce pest populations. Squishing a bug is a form of mechanical control.
 1. Mulch can help reduce weed growth, keep soil temperatures at a more stable level, and reduce



Pruning can physically remove pests from plants as well as increase air circulation to reduce fungal diseases.



A way to remove pests without spraying pesticides is to tap pest insects into a jar filled with isopropyl alcohol. You can also hand pick and throw pests into a bucket of soapy water.



Traps can not only allow you to monitor pest populations, they can also reduce the population.

water loss from the soil via evaporation. It also can reduce plant fungal diseases by not allowing fungal spores to splash from the soil onto the plant. Other benefits of mulch are improving soil structure and water movement through the soil.

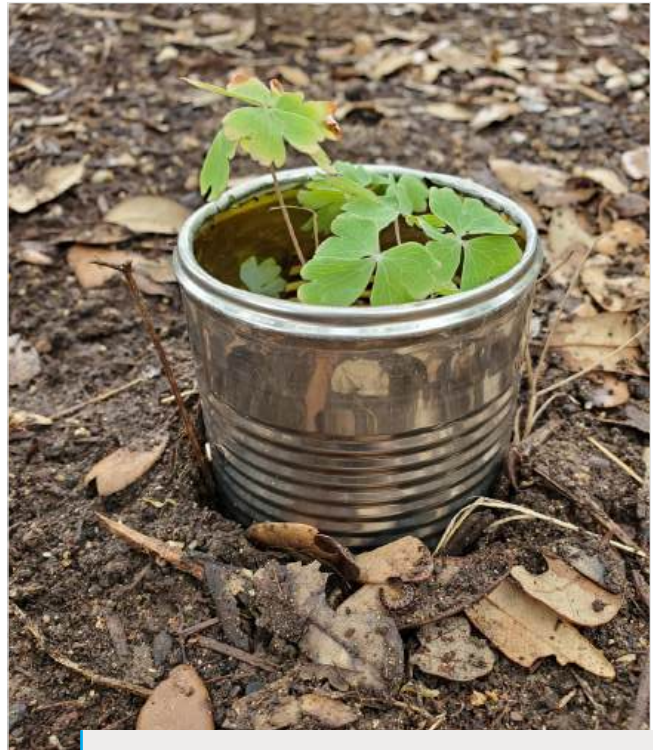
- a. Reflective mulch is a shiny, flexible material laid down over the soil surface before planting seedlings. It causes sunlight to reflect onto the undersurface of leaves and can help reduce insect populations that usually seek these areas out as shelter, such as aphids, spider mites, and whiteflies.
2. Physical removal of insects is a direct way to reduce populations quickly without the use of pesticides. Depending upon the equipment, materials, and garden environment, it can be done in a variety of ways.
 - a. Hand picking is an effective way to reduce pests quickly. It requires removing pests from infested plants by hand and either squishing the pests or putting them into a bucket of soapy water to kill them. This

typically works best for pest populations that are in low numbers, not capable of stinging, and on plants that are not harmful. Wear gloves while removing insects to avoid being bitten, stung, or sprayed with scent glands.

- b. If there are larger populations of pests or larger plants to remove insects from, one may want to try the sheet pan method. This method requires placing a sheet pan filled with isopropyl alcohol on the ground below

the infested plant. Then firmly grasp a main stem of the plant and shake it quickly to dislodge pests from the plant. Insects often drop to the ground when startled, so this method causes them to drop into the sheet pan with alcohol, which then kills the insects.

- c. Vacuuming is another method that allows the rapid removal of pests from the landscape. It requires a cordless, handheld vacuum that is dedicated for garden use. Cordless allows the vacuum to reach more space in the landscape. Choose a model that has suction, but not so much that it will suck up the whole plant. Any insects that aren't killed by the suction of the vacuum can be dumped into a bucket of soapy water to kill.
3. Exclusion of insects is a way to keep them from reaching the plant that they want to feed on. The two most common methods used are plant collars and row cover. Plant collars are buried partially in the ground and typically protect seedling plants from ground-dwelling pests. They can be made from a variety of materials—either recycled or purchased—such as toilet paper rolls, tin cans with the tops and bottoms cut out, or sections of PVC piping. Row cover is a thin, flexible material that is placed over a frame that surrounds the plants wanting to be protected. The row cover allows light and water to penetrate but does not allow insects through. Row cover must be fixed firmly to the ground so that pests cannot crawl under, and it must be placed over plants before they are infested with pests. Row cover can be purchased for extended beds or as floating row cover for individual plants.
4. Trapping can be used as a monitoring tool and to remove pests from the landscape. It is important to choose the correct trap for the pest and place it in the correct location. Most often, sticky traps are used, and these can either be made using poster board and adhesive spray or purchased. Various colors of traps will be attractive to different kinds of pests, so research what will work best. Traps should be placed where insects will contact them. This could be hanging the trap from a branch or even placing it on the ground for some pests. Trap cropping is a different method that uses plants to draw insects to a specific area of the landscape to keep them away from plants you don't want them on. The trap crops can either be treated for the pests in



Plants collars can physically block ground-dwelling pests that can chew on plants. Collars can be made of upcycled toilet paper tubes, aluminum foil, or reused fruit or vegetable cans. Make sure to bury part of the collar in the soil to keep it stable.



Row cover is a way to keep insect pests from reaching plants. It is important to cover plants before they have pests and to make sure the row cover is tight against the ground so insects cannot crawl under it.

Photo by Bob Kunkel



Biological control is using natural organisms to manage pests. The aphids in this image are being controlled by ladybug larva (black and orange), syrphid fly larva (green), and parasitic wasps that turn aphids into “mummies” (the puffed up brown aphids).

that location or sacrificed. Otherwise, the insect population will build up on the trap crops and move into plants they should not be feeding on.

BIOLOGICAL CONTROL

- ▶ Biological control utilizes other organisms to help manage pest populations within the landscape. There are three types of biological control:
 - ◊ Conservation biological control requires utilization of IPM to help maintain populations of beneficial organisms that already occur in the environment.
 - ◊ Augmentation biological control is releasing beneficial organisms into an environment to increase their populations.
 - ◊ Importation biological control is carried out by governmental agencies and universities to help combat invasive species. This method requires much research on predators and parasites that occur in an invasive pest’s native range and the effects those organisms may have if they are released into the new environment occupied by the invasive pest.
- ▶ Control organisms are broken down into three basic categories: predators, parasitoids, and pathogens.
 - ◊ Predators attack, kill, and feed on multiple prey items throughout their lifetime. These are often the most well-known and obvious to find in the landscape. These can be specialists that target a particular type of insect or insect stage, or they can be generalists that capture and feed on whatever they can find. Well-known predators

include ladybird beetles, assassin bugs, praying mantids, and spiders.

- ◊ Parasitoids are insects that lay their eggs on or in another insect and use the host to complete their lifecycle. Parasitoids only have one host per lifetime as they kill the host once they reach maturity. Most parasitoids are very small wasps that are solitary and won’t sting humans, but there are also some flies that are parasitoids.
- ◊ Pathogens are things that cause disease. Examples are fungi, bacteria, nematodes, and viruses. While gardeners typically try to avoid pathogens directly infecting plants within the landscape, these specific pathogens attack insects and related arthropods instead of plants. Many pathogens are labeled and packaged very similarly to chemical pesticides.
 - *Heterorhabditis* spp. and *Steinernema* spp. are entomopathogenic nematodes and target arthropods. Nematodes require certain soil temperatures and moisture levels to be active and move through the soil to seek out hosts.

CHEMICAL CONTROL

- ▶ Chemical control utilizes pesticides, either naturally derived or synthetic, to manage pest populations.
 - ◊ Naturally derived pesticides come from natural sources such as plants, pathogens (see above), or byproducts of soil-borne microorganisms. They tend to have a short residual, breaking down quickly in the environment.
 - ◊ Synthetic pesticides are made in a laboratory, either by modifying the chemical structure of a naturally derived pesticide to make it last longer in the environment or by creating new products with novel chemistries.
- ▶ When choosing a pesticide, try a low-impact or targeted product first. Target the treatment area to conserve beneficial organisms, and read and follow all label instructions. Consider applying pesticides in the evening after most pollinators are no longer foraging.
- ▶ Remember that pesticides are meant to kill, so all should be used with caution.
- ▶ Categories of insecticides:
 - ◊ Insect growth regulators (IGRs) and chitin synthesis inhibitors (CSIs) are synthetic pesticides that mimic hormones that control the molting process of insects and other arthropods. These are low-impact pesticides because mammals do

not have the hormones that are targeted.

- ◊ Microbially-derived pesticides contain active ingredients like *Bacillus thuringiensis* (*Bt*) and *Beauveria bassiana*. These products are naturally derived, degrade quickly in the environment, and typically kill hosts through infection. *Bt* has different subspecies that target specific pests and must be consumed to be effective.
- ◊ Organic toxins are pesticides that come from natural sources that have toxic qualities. Avermectins and Spinosad are two examples that are derived from bacteria. Spinosad is selectively active and helps conserve beneficial insects in the landscape. Another active ingredient that is relatively new is made from spider venom.
- ◊ Botanical products are made from plants and can include active ingredients like azadirachtin (a.k.a. neem), pyrethrins, or limonene. These pesticides

break down fairly rapidly in the environment but are broad-spectrum contact products, so they kill any insect that comes into contact with them.

- ◊ Minerals and natural materials are active ingredients such as diatomaceous earth (DE), sulfur, and potassium salts of fatty acids (a.k.a. insecticidal soap). DE and sulfur typically come in dust formulations and are ineffective when wet or in high humidity. Insecticidal soap is a broad-spectrum product but does not last very long in the environment.
- ◊ Synthetic pesticides developed from botanical products include categories such as pyrethroids, neonicotinoids, abamectin, and spinetoram. These use natural products as a base model, which is modified to obtain certain characteristics.