# Integrated Pest Management (IPM) for Pollinator Conservation in Home Gardens and Small Farms

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## INTRODUCTION

Beneficial insects, including bees, wasps, butterflies, moths, flies, and beetles, provide important ecosystem services, such as pollination and natural pest control, in gardens and agricultural systems. Over 80% of fruits, vegetables, and native plants rely on pollinators to produce fruits and seeds (Ollerton et al., 2011). In addition to being vital for plants, pollinators are considered a keystone species group (many species rely upon them for survival) and indicator species (the health of their populations can give a view into ecosystem health). Unfortunately, many pollinators are in decline because of habitat loss and fragmentation (habitat is divided into smaller sections), pathogens and parasites, pesticide use, pollution, and climate change (Potts et al., 2010).

***Figure 1.*** **Perennial plants, like prairie coneflower (*Ratibida columnifera*), attract pollinators and other beneficial insects to your garden (photo by Melissa A. Schreiner).**

## ENCOURAGING POLLINATORS AND BENEFICIAL INSECTS

In the urban landscape, home gardeners and farmers can help wild pollinator populations by providing habitat and selecting management practices that promote pollinators and other beneficial insects. While specific habitat requirements vary by species, all pollinators need food, shelter, and water.

Plant a diversity of flowers, and include flowers that bloom in different seasons. Lepidopteran pollinators (butterflies and moths) need host plants for their larval (caterpillar) stage; however, some caterpillars may also be considered pests. Consider planting extra plants to allow for some feeding by caterpillars, and also consider your own threshold for feeding damage.

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***Figure 2.*** **Solitary vespid wasps act as pollinators and predators and nest in bare ground (photo by Melissa A. Schreiner).**

***Figure 3.*** **Planting several types of crops and plants (polyculture) can help to mimic natural ecosystems and provide habitat for beneficial insects (photo by Melissa A. Schreiner).**

On small farms, areas with flowering non-crop plants or cover crops can help to increase ecosystem services provided by beneficial insects (Carrié et al., 2012).

Pollinators also need a place to call home. This can include bare ground for ground-nesting bees, dried stems or logs for stem-nesting bees, and protected places for butterfly chrysalides. Pollinators have evolved with native plants, which are best adapted to the local growing season, climate, and soils. Planting native plants can invite native beneficial insects to the garden or farm, such as pollinators, seed dispersers, and decomposers (Figure 1). Many native plants are perennial and will come back year after year to provide floral resources. Habitat in home gardens and small farms can greatly assist beneficial insects; however, land and pest management decisions can adversely impact beneficial insect populations (Mata et al., 2017). For example, management practices that frequently disrupt the soil, such as tilling, may discourage ground-nesting bees from nesting in an area, or may impact existing populations in addition to disturbing other beneficial soil fauna (Sivakoff et al., 2018).

## INTEGRATED PEST MANAGEMENT (IPM)

Integrated pest management (IPM) combines cultural, mechanical/physical, biological, and chemical control strategies. It puts an emphasis on preventing pest issues and using chemical alternatives to reduce chemical use when pest issues do occur. By practicing IPM, you can help to promote pollinator habitat in gardens and small farms. IPM is not a one-size-fits-all form of management, and IPM strategies should be tailored to the target pest while also considering your farm/garden and surrounding habitat. Financial savings, chemical reduction, and environmental benefits can be a result of focusing treatments on target pests. To learn more about implementing IPM practices, see NMSU Extension Circular 655, *Integrated Pest Management (IPM) for Home Gardeners* (https://pubs.nmsu.edu/_circulars/CR655/).

Chemical control involves the application of pesticides, whether conventional or organic, to plants, soil, and other surfaces to control pests, including weeds, insects, fungi, and diseases. Pesticides have the potential to negatively impact pollinators in different ways. Insecticides can directly kill pollinators. Herbicides can reduce the abundance and diversity of the flowering plants that pollinators rely on. Early lab studies show that glyphosate, a broad-spectrum herbicide, may impact microorganisms that live in the honey bee gut, leaving honey bees more susceptible to disease (Motta et al., 2018). Fungicides can indirectly affect bee health and can result in death. Often times, the effects of pesticides on native bees are unknown and may be more harmful to solitary bees than honey bees, which pesticides are tested on. Additionally, the effects of adjuvants (substances added to the pesticide formulation) and the impacts of tank mixes (combining one or more pesticides in solution) on insects are often unknown. Organic pesticides can also impact pollinators and beneficial insects, so be sure to research before using any pesticides, whether conven-

tional or organic. To learn more about using organic insecticides, see NMSU Extension Guide H-168, *Selection and Use of Insecticides for Organic Production* (https://pubs.nmsu.edu/_h/H168/).

It is important to note that "do-it-yourself" and "homemade" pesticides, such as dish soap and vinegar, are usually ineffective and have a high risk of causing negative impacts on pollinators and their habitat, as well as pet and human health. We do not recommend the use of these products, and they should not be considered a "safer" or less-toxic option for pollinators.

Pollinators forage across the landscape and do not recognize human-defined boundaries, so a large-scale landscape approach should be considered for pollinator management. Building a balanced garden by providing pollinators access to diverse plants and habitats should be a part of your IPM program. Consider all suitable IPM practices for controlling pests. Use practices that discourage pest infestations, and carefully diagnose your pest problems early on. Determine the need for treatment through pest scouting or monitoring. Table 1 lists different actions that can be taken in your IPM plan.

## OTHER NMSU EXTENSION RESOURCES

- For more information on New Mexico's native bees, see *Pocket Guide to the Native Bees of New Mexico* (https://pubs.nmsu.edu/bees/).
- For recommended annual plants for conservation biological control, see NMSU Extension Guide H-169, *Using Insectary Plants to Attract and Sustain Beneficial Insects for Biological Pest Control* (https://pubs.nmsu.edu/_h/H169/).
- To learn more about beneficial insects, see *Pocket Guide to Beneficial Insects of New Mexico* (https://pubs.nmsu.edu/insects/), and NMSU Extension Guide H-172, *Backyard Beneficial Insects of New Mexico* (https://pubs.nmsu.edu/_h/H172/).

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| Table 1. Suggested IPM Practices to Protect and Encourage Pollinators in Small Farms and Gardens* | | |
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| **Practices** | **Gardens** | **Small Farms** |
| **Prevention and Planning:** Plan in advance to reduce future problems. | • Select plants appropriate for your environment.<br>• Plan out your space.<br>• Rotate crops when possible.<br>• Learn about pest/disease susceptibility in the plants you want to grow. | • Select pest- and/or disease-resistant crops.<br>• Implement crop rotations.<br>• Learn about pest/disease susceptibility in your selected crops. |
| **Monitoring:** Document and identify pests accurately. | • Monitor plants for signs of pests and damage. Consider how much damage you think is an acceptable level.<br>• Monitor flowers for pollinator presence.<br>• Use proper sanitation when using insect hotels or native bee homes. Be sure to clean or replace them after a few seasons to avoid the eventual buildup of parasites and pathogens. | • Monitor pest populations and damage to crops. Consider economic threshold levels and when more drastic treatments may be necessary.<br>• Monitor flowers for pollinator presence.<br>• Use proper sanitation if using mason bees, bumble bees, or honey bees for pollination services on a farm, indoor grow facilities, or orchard systems. |
| **Cultural:** Manipulate the landscape to make it more suitable for pollinators and less suitable for pests. | • Provide water for bees.<br>• Leave bare ground for habitat to be used by ground-nesting bees and wasps (Figure 2).<br>• Leave perennial stems in the fall for stem-nesting bees.<br>• Keep plants healthy. This will make plants able to withstand some insect feeding and make them more nutrient-rich for pollinators.<br>• Utilize minimum tillage systems to limit impact on ground-nesting bees. | • Plant flowering cover crops that can have the dual benefit of improving soil health and providing floral resources for pollinators.<br>• Reduce tillage in areas where bees are nesting, if possible.<br>• Leave some perennial stems in the fall for stem-nesting bees. Provide hollow twigs, rotten logs, stumps, and bare ground.<br>• Utilize trap crops (crops planted to attract insect pests away from other crops).<br>• Plant many kinds of plants (polyculture; Figure 3) instead of just one kind of plant (monoculture). |
| **Mechanical/Physical:** Directly remove or reduce pests, or create a protective barrier between plants and insects. | • If mowing your yard, be careful to avoid mowing when flowers are blooming and insects are active.<br>• When cleaning/pruning, leave pollinator habitat intact (e.g., perennial stems, leaf piles). | • If using barriers, use one with mesh with holes large enough to allow small bees to enter, or remove barriers when pollination services are needed.<br>• Use traps and lures specific to the target insect pest. |

| Table 1 (continued). Suggested IPM Practices to Protect and Encourage Pollinators in Small Farms and Gardens* | | |
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| **Practices** | **Gardens** | **Small Farms** |
| **Biological:** Introduce natural enemies into the system (augmentative biocontrol) or enhance habitat for beneficial insects (conservation biocontrol) to suppress pest populations. | • Plant a diversity of flowers to attract and support natural enemies; use different flower forms and colors.<br>• Provide flowers from spring to fall that provide abundant sources of pollen and nectar. | • Plant insectary plants—practices that support natural enemies will also support pollinators.<br>• Create pollinator refuge areas and provide overwintering habitat, e.g., strip cropping with wildflowers to provide floral resources to adult stages of beneficial insects. |
| **Chemical (organic and conventional):** Avoid or limit chemical use, including herbicides, fungicides, and insecticides. If chemical interventions are deemed necessary (i.e., action threshold is reached), follow these practices. | • Read the label and check for pollinator protection statements.<br>• Choose pesticides that are less toxic to pollinators (organic pesticides can still be toxic to pollinators).<br>• Check the label for the "Bee Hazard" warning.<br>• Adjust application timing to when pollinators are less active (e.g., spray during the very early or late hours of the day).<br>• Do not spray when flowers are blooming.<br>• Avoid chemical drift onto nearby flowers.<br>• Do not use do-it-yourself or homemade pesticides. | • Read the label and check for pollinator protection statements.<br>• Choose pesticides that are less toxic to pollinators (organic pesticides can still be toxic to pollinators).<br>• Check the label for the "Bee Hazard" warning.<br>• Adjust application timing to when pollinators are less active (e.g., spray during the very early or late hours of the day).<br>• Do not spray when flowers are blooming.<br>• Avoid chemical drift onto nearby flowers.<br>• If chemical applications are warranted (needed), consider what is blooming in or near the application site and what pollinator activity is nearby. Mow or remove flowering weeds to discourage pollinators from moving into target areas during applications.<br>• Consider spot spraying. By selectively choosing what plants to spray during an application, producers can attempt to limit exposure to pollinators.<br>• Avoid tank mixing pesticides. |
| *This table lists suggested management practices for gardens and small farms to protect and encourage pollinator populations in your landscape. Practices in each column may be suitable for both gardens and small farms. Choosing the best practices for the pests that are actually present is key. Some methods may not be appropriate for all situations. | | |