

Beneficial Invertebrates in Urban Agriculture



Introduction

Decision-making on farms and gardens of any size can be a balancing act, often with limited time, labor, and resources. Supporting beneficial invertebrates on farms through habitat installation comes with many benefits. Lacewings, predatory and parasitic wasps, flies, beetles, native bees, and other beneficial invertebrates play vital roles, day and night, in the production of agricultural crops through pollination, pest control, and building healthy soils. Many of the foods, vitamins, and minerals we consume on a regular basis are enhanced thanks to the free services of invertebrates. In addition, habitat for these wild animals boosts nutrient recycling, reduces farming costs, and acts as an alternative to insecticide use—and adds beauty, educational opportunities, and stability in urban agriculture.

Urban agriculture spaces with habitat on site (or nearby) and pesticide protection methods in place can support a diverse community of invertebrates throughout their life cycles. In turn, these important animals contribute to the health of the farm or garden. This factsheet is an introduction to the beneficial invertebrates that can be found in urban agriculture and the contributions they add to a farm or community garden. For more detailed information, read *Insects at Work: Beneficial Insects in Small-Scale Farms and Community Gardens* (see [Further Reading](#) for details).

What Is an Invertebrate?

All insects are invertebrates, but not all invertebrates are insects. Invertebrates are animals that do not have a backbone, comprising ~97% of animal species, including insects, worms, spiders, and mollusks. Insects are a specific class of invertebrates, defined by having six legs, three body regions (head, thorax, abdomen), and often wings.

TOP TO BOTTOM—A green lacewing resting on vegetation¹; squash bees are important pollinators of pumpkin, squash and gourds²; A margined leatherwing feeding on cilantro flowers³. (Photos: Xerces Society / Sarah Nizzi^{1,2}; Scott Sherrill-Mix, Flickr [CC BY-NC 2.0]³).

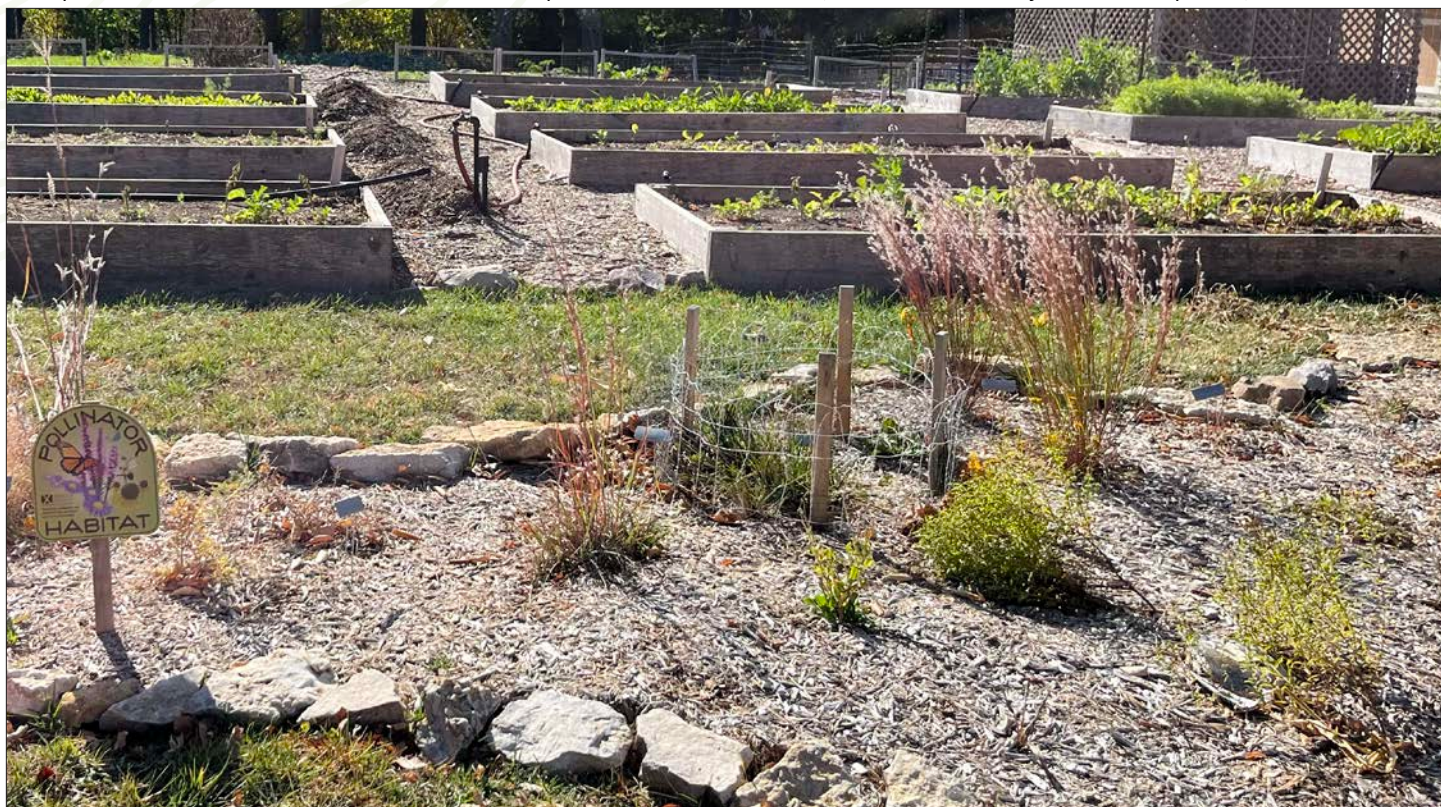
What Role do Beneficial Invertebrates Play in Urban Agriculture?

Similar to the multiple roles friends and neighbors play in our local communities, beneficial invertebrates can offer many services to an urban farm, such as pollination, pest control, building soil health, and feeding other wildlife. Below are descriptions of the various roles beneficial insects play throughout their life cycle.

- ☞ **Pollinators** transfer pollen within and between flowers, assisting in plant reproduction. The seeds and fruits that are the product of pollination are an important part of farm production, as well as food sources for a variety of wildlife.
- ☞ **Predators** hunt and consume other invertebrates. They help to regulate population sizes of crop and ornamental plant pests and can contribute significantly to controlling them.
- ☞ **Parasitoids** are invertebrates that lay their eggs on or inside another invertebrate. Most parasitoids are wasps, flies, or beetles. After hatching, the parasitoid larva feeds on—and ultimately kills—the host invertebrate before emerging as a fully developed adult.
- ☞ **Decomposers** feed on dead plant and animal materials. They break them down into smaller pieces that are accessible to bacteria and fungi for further consumption, releasing nutrients into the soil and making them available for plants to use.
- ☞ **Soil engineers** burrow or tunnel through the soil, improving soil structure and helping to move water and air to deeper soil layers. Soil engineers help soil fertility by mixing nutrients and minerals between soil layers and influence microbial communities by dispersing microorganisms throughout soil layers.
- ☞ **Herbivores** consume living plant material, feeding on roots or vegetation above ground. Some herbivores specialize in eating a particular part of a plant, a particular plant species, or a closely related group of plants, while others feed on a wide range of plants. Herbivores also play a role in influencing the structure of plant communities.

Beneficial invertebrates are active in many places on an urban farm. The table, [Where to Find Beneficial Invertebrates](#), shows where they may be most easily observed. For example, native bees are easiest to find on flowers, foraging for pollen and nectar.

A People's Garden urban farm in Nebraska with native perennial habitat installed. (Photo: Xerces Society / Jennifer Hopwood).





Hunting (Predatory) Wasps

Hunting wasps are a commonly misunderstood group of insects. They are very diverse and come in numerous shapes, sizes, and colors. While their appearances may seem intimidating, most hunting wasps are solitary species, meaning they provide for their young alone, and if left unbothered, are unlikely to sting humans. Hunting wasps contribute to a healthy urban farm, for example, preying on crop pests such as aphids. (Photo: Mary Keim, Flickr [CC BY-NC-SA 2.0].)

How to Support Beneficial Invertebrates

Beneficial invertebrates rely on habitat for food sources and places to shelter, reproduce, and overwinter. Many need a variety of flowering plants that provide pollen and nectar from spring through fall, or plants that support alternative prey or hosts. Cropped areas alone do not provide enough. To help support beneficial invertebrates:

- ☞ **Create permanent habitat.** Permanent habitat, even at small scales, near crops or orchards, helps these animals move into cropped areas to do their work. Examples of habitat options include native wildflower strips, perennial flowering herbs, food forests, container plantings, beetle banks, and more.
- ☞ **Create temporary habitat.** Temporary plantings in cropped areas, such as flowering cover crops or annual insectary strips (e.g., crimson clover, marigolds, zinnias, sunflowers, etc.), can offer valuable floral resources and some shelter.
- ☞ **Use invertebrate-friendly soil health practices.** Limiting tillage or rotating tilled areas, planting crops successively to reduce idle periods, and increasing crop diversity all support beneficial invertebrates.
- ☞ **Conduct soil tests.** Vacant or revitalized city lots may contain buried debris, dense sand, or gravel that can make planting difficult. Some debris may contain heavy metals, which can be harmful to both people and animals.
- ☞ **Limit pesticide use.** Many beneficial invertebrates have longer life cycles and need more time to recover from pesticide exposure. Secondary pest outbreaks, which occur when the beneficial invertebrates that were previously suppressing a certain pest are killed by pesticides, causing that pest to flourish without its natural enemy to control its population, can sometimes lead to more damage than primary pests. Steps to reduce exposure to beneficial invertebrates include:
 - Prevent pest outbreaks by reducing the conditions that favor pests,
 - Conduct regular monitoring and scouting, so you know if your pest reaches economic thresholds at which control is needed, and
 - When intervention is needed, seek the least toxic pest control method available.

See the [Further Reading on page 6](#) for more information on habitat installation and pesticide protection.



Fireflies are known for their glowing flight patterns at night. (Photo: Mike Lewinski, Flickr [CC BY 2.0].)

Where to Find Beneficial Invertebrates

LOCATION	INVERTEBRATE GROUP	ROLE
On Flowers	1 Bumble bees	Pollinators
	2 Mining bees	Pollinators, soil engineers
	3 Mason bees	Pollinators
	4 Squash bees	Pollinators, soil engineers
	5 Sweat bees, furrow bees	Pollinators, soil engineers
	6 Honey bees (European)	Pollinators
	7 Hunting (predatory) wasps	Predators, pollinators, soil engineers
	8 Scarab-hunter wasps	Parasitoids, pollinators, soil engineers
	9 Flower flies, syrphid flies	Predators, pollinators, decomposers
	10 Soldier beetles, leatherwings	Predators, pollinators
On Vegetation	11 Lady beetles	Predators, pollinators
	12 Assassin bugs, ambush bugs	Predators
	13 Green/brown lacewings	Predators
	14 Minute pirate bugs	Predators
Inside Hosts	15 Parasitoid wasps	Parasitoids
Leaf Layer	16 Fireflies, lightning bugs	Predators, herbivores, pollinators
	17 Ground beetles	Predators, decomposers
	18 Hunting spiders	Predators, soil engineers
	19 Millipedes	Decomposers, soil engineers
	20 Collembola, springtails	Decomposers
	21 Centipedes	Predators
	22 Mites	Predators, decomposers

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The photos on page 5 are not to scale.



Further Reading

- ☞ *Insects at Work: Beneficial Insects in Small-Scale Farms and Community Gardens*
xerces.org/publications/guidelines/insects-at-work
- ☞ Beneficial Insect Scouting Guides: xerces.org/publications/scouting-guides
- ☞ *Farming With Soil Life: A Handbook for Supporting Soil Invertebrates and Soil Health on Farms*
xerces.org/publications/guidelines/farming-with-soil-life
- ☞ Habitat Assessment Guides: xerces.org/pollinator-conservation/habitat-assessment-guides
- ☞ *Habitat Planning for Beneficial Insects: Guidelines for Conservation Biological Control*
xerces.org/publications/guidelines/habitat-planning-for-beneficial-insects
- ☞ *Small Habitat Plantings in Urban Areas*
xerces.org/publications/fact-sheets/small-habitat-plantings-in-urban-areas
- ☞ *Creating Perennial Pollinator and Beneficial Insect Habitat Using Plugs*
xerces.org/publications/fact-sheets/creating-perennial-pollinator-and-beneficial-insect-habitat-using-plugs

Additional Resources and Tools

- ☞ USDA People's Garden Initiative
usda.gov/about-usda/general-information/initiatives-and-highlighted-programs/peoples-garden
- ☞ iNaturalist: A Community of Naturalists
inaturalist.org
- ☞ Environmental Protection Agency (EPA): Brownfields and Urban Agriculture
epa.gov/brownfields/urban-agriculture
- ☞ Minimizing Risks of Soil Contaminants in Urban Gardens
content.ces.ncsu.edu/minimizing-risks-of-soil-contaminants-in-urban-gardens

Habitat on small-scale farms or within community gardens provides benefits to the community, wildlife, and the environment. (Photo: Xerces Society / Sarah Nizzi.)



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