



Conservation Biological Control for the Home Landscape

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education

for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.

- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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Biological control is a safe, effective and environmentally friendly form of pest management that can be applied easily to the home landscape. This pest management tool uses natural enemies of pests to suppress or prevent a pest outbreak. Like all animals, insects have predators that feed upon them and parasites (parasitoids) or diseases that weaken or kill them. The most important practice a homeowner can follow in applying biological control is to encourage and enhance natural enemies already present in the landscape. This is called conservation biological control and is accomplished by attracting and protecting natural enemies in the landscape.

In a biological control program, our natural enemies include the three P's: predators, parasitoids and pathogens. These three classes of natural enemies are outlined in Fact Sheet HLA-6434. Oklahoma Cooperative Extension Service publication E-1023 and Fact Sheet EPP-7307 provide detailed descriptions and images of common natural enemies in Oklahoma. The primary agents of control include a great diversity of insects, arachnids and other arthropods. This Fact Sheet outlines conservation biological control practices that can be applied in the home landscape to encourage and protect natural enemies.

Natural enemies require food, water and shelter. In addition to feeding on prey, many predators and parasitoids feed on pollen and nectar. Attract natural enemies to the landscape and encourage their activity by providing an abundance of flowering plants throughout the year. Create natural enemy habitats to shelter these beneficial organisms year-round. In home landscapes, the activity of natural enemies is often disrupted through use of pesticides, changes in land management practices and limited availability of habitat used by natural enemies. Simple changes in landscape maintenance practices can create a more welcoming environment to natural enemies.

Protecting Natural Enemies

The primary practice homeowners can follow to conserve natural enemies in the landscape is to reduce or modify pesticide use. Many pesticides used in the landscape have a broad spectrum of activity, affecting beneficial organisms as well as the target pest. Mortality of natural enemies due to pesticide applications can often result in a significant resurgence of pests. Due to their high reproductive rates, pest populations often rebound faster than those of natural enemies following a pesticide application. Released from mortality induced by natural enemies, the pest population expands quickly, necessitating additional pesticide applications and intensifying the

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cycle of natural enemy suppression. Likewise, outbreaks of secondary pests often follow pesticide applications because the natural controls that held them in place were eliminated, allowing them to become a pest.

Reducing pesticide use can help protect natural enemy populations in the landscape. The first step to reducing pesticide use is to stop treating minor pests. Simply stated, some arthropods that live in a landscape may cause minor damage, but do not warrant a pesticide application. Understanding the common problems of landscape and food plants is essential to recognizing when the presence of a pest has reached a level of concern. Regular monitoring of the landscape will aid homeowners in recognizing pest problems and determining when management is necessary.

When pests do require treatment, begin with preventive techniques. Consider replacing pesticides with alternative control strategies, such as cultural, physical, and mechanical techniques. Fact Sheets HLA-6431 and HLA-6432 outline these alternative techniques.

There are situations where alternative control measures do not provide adequate pest suppression. If pesticides are to be applied, it is important to select products having the lowest impact on natural enemies (Table 1). Many microbial insecticides, insect growth regulators and certain botanical insecticides have minimal impact on non-target organisms. When applied appropriately, horticultural soaps and oils also have little impact on non-target species.

In addition to selective chemistries, judicious use of pesticides protects natural enemy populations. Spot-treat with pesticides or simply remove or prune out infested plants or stems from the garden. Treating individual plants or areas rather than entire gardens will preserve refuge areas for natural enemies. Be sure to use the appropriate rate of pesticides and apply at times when natural enemy activity is low, such as early morning. Finally, reduce the frequency of pesticide applications. These practices will limit the impact of pesticides on natural enemy populations when combined.

Managing the soil ecosystem also helps maintain natural enemy populations. Protect ground-dwelling predators by practicing conservation tillage or adopting no-till practices in the garden. Use mulch and compost to increase soil organic matter and provide a rich habitat for beneficial organisms. Keep the dust down in the landscape, particularly around trees and shrubs. Dust can harm natural enemies and even lead to pest outbreaks. Use mulch and wind breaks to hold soil in place.

Table 1. Pesticides compatible with biological control.

<i>Pesticide name</i>	<i>Target Pest(s)</i>
Horticultural oil	Soft-bodied insects
Horticultural soap	Soft-bodied insects
Neem oil	Soft-bodied insects
Azadirachtin	numerous
Microbial pesticides*	numerous
Spinosad	thrips, caterpillars

* See Fact Sheet HLA-6434, Table 1.

Attracting Natural Enemies

Encourage these natural enemies to be active in our landscapes by providing the basic resources of life: food, water and shelter. Also invite vertebrate predators such as birds, bats, reptiles and amphibians.

Food

Natural enemies feed upon insect populations as a source of protein, but many also need sugars and other carbohydrates. Some natural enemies feed only on nectar and pollen as adults, leaving predation to the larvae. In other species, adults require a carbohydrate source to mature eggs. Natural enemies acquire these energy resources from flowering plants.

The most important thing gardeners can do to attract natural enemies to the garden is to plant a wide variety of flowering plants. Select plants with different bloom cycles to ensure flowers are present throughout the season. When selecting nectar plants, look for flowers with small, numerous nectaries, such as plants in the aster or composite family. Many culinary herbs, when left to bloom, also provide rich sources of nectar. Table 2 lists beneficial plants by family.

Gardeners can also provide supplemental food sources to attract natural enemies. Spraying sugar water on plants or using commercial food attractants lure even more beneficial insects to the garden.

Water

Water is important for insects as well as birds and reptiles. A simple dish of water will help animals find a drink. A larger water source will invite a host of new life into the garden. Many aquatic insects associated with water gardens are predators. Water draws in dragonflies and damsel flies as well many beneficial animals, including frogs, toads, lizards and birds.

Shelter

Natural enemies need shelter from the sun and wind and from other predators. Many materials commonly used in the landscape provide excellent shelter for natural enemies. Ornamental grasses and woody shrubs provide shelter for insects when they are inactive. Also, ground covers such as mulch and rocks or logs provide resting places for ground-dwelling insects and spiders, many of which are nocturnal. Organic mulches such as wood chips and straw also shelter natural enemies. Turf areas shelter a variety of natural enemies including ground beetles, rove beetles and tiger beetles.

Table 2. Nectar rich plants to attract natural enemies to the garden.

Aster family (<i>Compositae</i>)	
Blanket flower	<i>Gaillardia</i> spp.
Cone flower	<i>Echinacea</i> spp.
Coreopsis	<i>Coreopsis</i> spp.
Shasta daisy	<i>Chrysanthemum maximum</i>
Calendula	<i>Calendula</i> spp.
Asters	<i>Aster</i> spp.
Zinnia	<i>Zinnia</i> spp.
Dahlia	<i>Dahlia</i> spp.
Cosmos	<i>Cosmos</i> spp.
Sunflower	<i>Helianthus</i> spp.
Yarrow	<i>Achillea</i> spp.
Goldenrod	<i>Solidago</i> spp.
Tansy	<i>Tanacetum vulgare</i>
Ironweed	<i>Vernonia</i> spp.
Carrot family (<i>Umbelliferae</i>)	
Caraway	<i>Carum carvi</i>
Coriander	<i>Coriandrum sativum</i>
Dill	<i>Anethum graveolens</i>
Fennel	<i>Foeniculum vulgare</i>
Pea family (<i>Leguminaceae</i>)	
Alfalfa	<i>Medicago sativa</i>
Clover	<i>Melilotus</i> spp.
Fava bean	<i>Vicia fava</i>
Mustard Family (<i>Brassicaceae</i>)	
Basket-of-gold alyssum	<i>Aurinia saxatilis</i>
Sweet alyssum	<i>Lobularia maritime</i>
Mustards	<i>Brassica</i> spp.
Yellow rocket	<i>Barbarea vulgaris</i>
Mint Family (<i>Lamiaceae</i>)	
Sage	<i>Salvia</i> spp.
Beebalm	<i>Monarda</i> spp.
Hyssop	<i>Hyssopus</i> spp.
Bluebeard	<i>Caryopteris</i> spp.
Hummingbird mint	<i>Agasatche</i> spp.
Other Plant Families	
Firethorn	<i>Pyracantha</i> spp.
Speedwell	<i>Veronica</i> spp.
Scabiosa	<i>Scabiosa</i> spp.
Milkweed	<i>Asclepias</i> spp.
Buckwheat	<i>Fagopyrum sagittatum</i>
Butterfly bush	<i>Buddleia</i> spp.
New Jersey tea	<i>Ceanothus americanus</i>
Stonecrop	<i>Sedum</i> spp.

Not all predators are insects. Bats, birds, toads, frogs and turtles all include insects in their diets. Provide shelter for birds and bats by including wooden houses for them in the landscape. When selecting birdhouses, choose a design supporting the desired species. Not all birds eat insects. Some helpful birds for the garden include the eastern bluebird, downy woodpecker and purple martins, among others.

Natural enemies also need a place to spend the winter. Perennials and ornamental grasses are ideal overwintering sites for predators like assassin bugs and lady beetles. Wait to cut these plants back until spring. In a vegetable garden,

cover crops can provide winter shelter for natural enemies. Maintaining a small area of the landscape in a wild or weedy state can also provide shelter to natural enemies, especially during the winter months.

Simply providing the necessary resources to sustain life will invite a host of beneficial animals into the landscape. Maintaining a diversity of plants both structurally and flowering phenology will provide the food and shelter necessary for natural enemies. Gardeners will find pest outbreaks diminish by encouraging this natural form of pest control.