


A review of *Beneficial Insects*



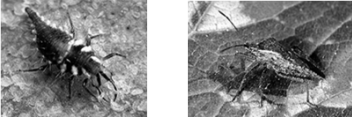
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Program Overview

- Beneficial roles of insects in a garden ecosystem
- A little about natural enemies: Predators & Parasitoids
- Some common & not-so-common beneficial insects
- Encouraging beneficial insects in the home garden

Most Insects are NOT Bad

- Over 1 million species worldwide, with over 87,000 species in the U.S. and Canada
- Only about 1% of all species of insects are serious pests




As Food for Wildlife



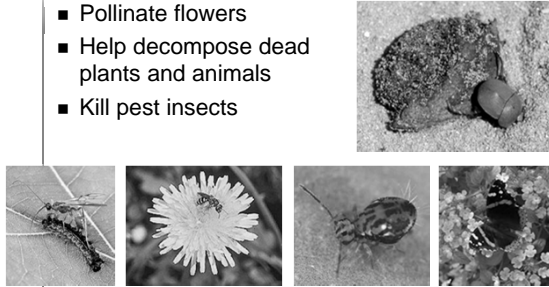
Butterflies




- Many people want to encourage these insects to visit their gardens







Beneficial Activities of Insects




- Pollinate flowers
- Help decompose dead plants and animals
- Kill pest insects







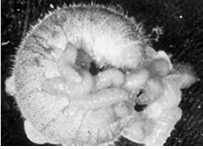
Pollinators	
<ul style="list-style-type: none"> ■ Bees ■ Wasps ■ Flies ■ Others 	
	




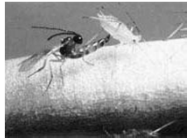

Decomposers	
<ul style="list-style-type: none"> ■ Break down dead animals and plants ■ Recycle nutrients 	
	







Natural Enemies	
<ul style="list-style-type: none"> ■ Beneficial insects or other organisms that destroy harmful insects ■ Predators eat other insects ■ Parasitoids develop in other insects ■ Pathogens cause diseases in insects 	
	



Predators	
<ul style="list-style-type: none"> ■ Eat other insects ■ Usually larger than their prey ■ Consume many prey ■ Feed as adults and/or immatures 	
	





Predators	
<ul style="list-style-type: none"> ■ Generally fairly mobile ■ Most have fairly broad host range ■ May be large, conspicuous 	
	

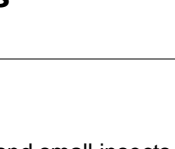
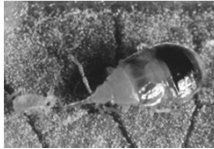

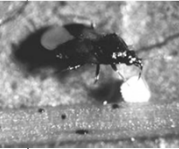
Parasitoids	
<ul style="list-style-type: none"> ■ Smaller than their host ■ Only the larval stage is parasitic ■ Immatures develop in/on other insects ■ A single host for development 	
	



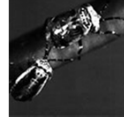
<h2>Parasitoids</h2>	
<ul style="list-style-type: none"> ■ Adults free-living, usually winged and mobile ■ Tend to be host-specific ■ Often small, inconspicuous 	
  	



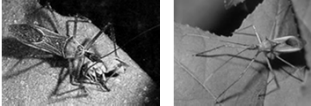
<h2>The Cast of Characters: Some beneficial insects</h2>		
		
		




<h2>Praying Mantids</h2> <p>Order Mantodea</p>	
<ul style="list-style-type: none"> ■ Generally large ■ Raptorial front legs ■ Generalist, opportunistic 	


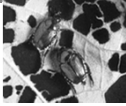


<h2>True Bugs</h2> <p>Order Hemiptera</p>	
<ul style="list-style-type: none"> ■ Sucking mouthparts ■ Simple metamorphosis ■ Many crop pests and some blood feeders, too 	
  	

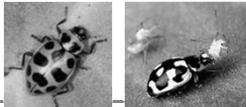
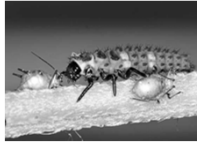




<h2>Minute Pirate Bugs</h2> <p>Family Anthocoridae</p>	
<ul style="list-style-type: none"> ■ 1-2 mm ■ Black and white ■ Feed on mites, insects eggs and small insects ■ <i>Orius</i> species 	 
	






<h2>Big-eyed Bugs</h2> <p>Family Lygaeidae</p>	
<ul style="list-style-type: none"> ■ Similar to plant bugs ■ Feed on mites, small insects ■ <i>Geocoris</i> spp. 	
 	



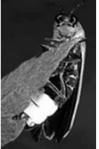

<h2 style="margin: 0;">Assassin Bugs</h2> <p style="margin: 0;">Family Reduviidae</p>	
<ul style="list-style-type: none"> ■ Relatively large ■ Raptorial front legs ■ Feed on caterpillars, other large insects ■ Includes ambush bugs 	
	


<h2 style="margin: 0;">Stink Bugs</h2> <p style="margin: 0;">Family Pentatomidae</p>	 <p style="font-size: small; margin: 0;"><i>Perillus bioculatus</i> (twospotted stink bug)</p>
<ul style="list-style-type: none"> ■ Medium sized ■ Green, brown, black ■ Produce foul odor when bothered ■ Not all predators; some important pests ■ Feed on caterpillars, beetle larvae and adults (e.g. Colorado potato beetle, Mexican bean beetle), others 	
	 <p style="font-size: small; margin: 0;"><i>Podisus maculiventris</i> (spined soldier bug)</p>




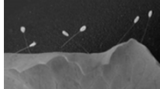

<h2 style="margin: 0;">Beetles</h2> <p style="margin: 0;">Order Coleoptera</p>	
<ul style="list-style-type: none"> ■ Largest group of animals on earth ■ ¼ of all animal species; 40% of all insects ■ 30,000 species in North America ■ Complete metamorphosis ■ Chewing mouthparts ■ Great diversity of lifestyles, includes many predators and a few parasitoids in 40 families 	
	
	

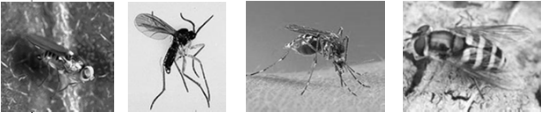
<h2 style="margin: 0;">Lady Beetles</h2> <p style="margin: 0;">Family Coccinellidae</p>	
<ul style="list-style-type: none"> ■ Many species ■ Eat soft-bodied insects, especially aphids ■ Larvae often unrecognized 	
	
	
	







<h2 style="margin: 0;">Ground Beetles</h2> <p style="margin: 0;">Family Carabidae</p>	
<ul style="list-style-type: none"> ■ 40,000 species worldwide ■ Usually dark colored, nocturnal ■ Adults feed on caterpillars, grubs, maggots, earthworms ■ Larvae also predaceous 	
	
	


<h2 style="margin: 0;">Fireflies</h2> <p style="margin: 0;">Family Lampyridae</p>	
<ul style="list-style-type: none"> ■ Adults produce light flashes ■ Larvae feed on slugs ■ Some larvae bioluminescent (= glowworms) 	
	
	






	<h2>Lacewings and Allies</h2> <p>Order Neuroptera</p>
	<ul style="list-style-type: none"> ■ Lacewings, antlions and their relatives ■ Most are predators ■ Mantidflies (Family Mantispidae) are parasitic within the egg sacs of ground-dwelling spiders
	

	<h2>Green Lacewings</h2> <p>Family Chrysopidae</p>	
	<ul style="list-style-type: none"> ■ Adults have membranous wings ■ Eggs laid on stalks ■ Larvae have sickle-shaped mouthparts ■ All larvae, some adults predators ■ Feed on aphids, other soft-bodied insects ■ Adults require honeydew or nectar 	
	  	

	<h2>True Flies</h2> <p>Order Diptera</p>
	<ul style="list-style-type: none"> ■ Complete metamorphosis ■ Many lifestyles, including predators and parasitoids ■ Predaceous as adults, larvae, or both
	

	<h2>Flower or Hover Flies</h2> <p>Family Syrphidae</p>	
	<ul style="list-style-type: none"> ■ Adults look like bees ■ Larvae look like miniature slugs ■ Larvae eat soft-bodied insects, especially aphids 	
	   	

	<h2>Other Predatory Flies</h2>
	<ul style="list-style-type: none"> ■ Bee flies (Family Bombyliidae) ■ Longlegged flies (Family Dolichopodidae) ■ Robber flies (Family Asilidae) ■ Marsh flies (Family Sciomyzidae)
	

	<h2>Tachinid Flies</h2> <p>Family Tachinidae</p>	
	<ul style="list-style-type: none"> ■ 1,300 species in North America ■ All species parasitic ■ Resemble bristly houseflies ■ Most attack caterpillars and beetles ■ <i>Voria ruralis</i> parasitizes cabbage looper 	
	  	

Sawflies, Bees, Wasps, & Ants



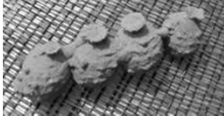

Order Hymenoptera

- 18,000 species in North
- Complete metamorphosis
- Various lifestyles, including and parasitoids
- The stingless wasps are the largest and most important group of natural enemies of insect pests




Predatory Hymenoptera


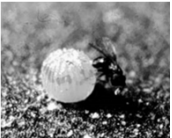

- Large wasps in Sphecidae (muddaubers) and Vespidae (paper wasps, yellowjackets)
- Ants
- Feed on caterpillars, various insects

Trichogramma Wasps

Family Trichogrammatidae

- Egg parasitoids
- Very small
- Widely used for biological control; several species commercially available
- Attack eggs of moths and butterflies, beetles, flies, wasps, true bugs

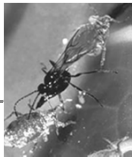








Fairyflies (Family Myrmaridae)
Scellionids (Family Scellionidae)

Braconid Wasps

Family Braconidae



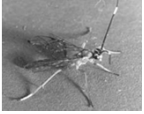
- Small adults with long antennae
- Attack caterpillars, immatures of other insects
- Many important in agriculture, especially Aphidiinae

Ichneumonid Wasps



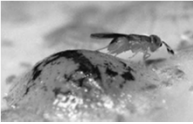

Family Ichneumonidae

- Variable in size, but generally larger than braconids
- Ovipositor often quite long
- Most attack caterpillars and larvae of beetles and sawflies


Other Important Wasps

- Family Aphelinidae
- Family Pteromalidae
- Family Eulophidae
- Family Encyrtidae


Other Predatory Arthropods

- Mites
- Spiders
- Others



Biological Control

- Purposeful manipulation of beneficial organisms
 - Predators
 - Parasitoids
 - Pathogens



Encouraging Beneficial Insects in the Garden

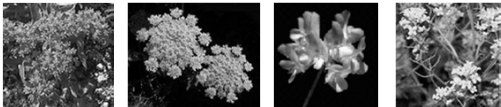
- Learn to recognize pollinators, natural enemies, and others and appreciate their role in the garden ecosystem
- Increase garden diversity to provide alternate food and shelter
- Incorporate specific flowering plants
- Avoid / reduce broad-spectrum and preventative pesticides

Reducing Pesticide Impacts

- Most insecticides are more toxic to natural enemies than to pests
- More selective materials include insecticidal soaps and microbial insecticides
- Many “botanical insecticides” such as pyrethrum are directly toxic to natural enemies, but are very short-lived
- Use “spot” treatments if possible
- Consider cultural controls and other methods besides chemicals as part of IPM

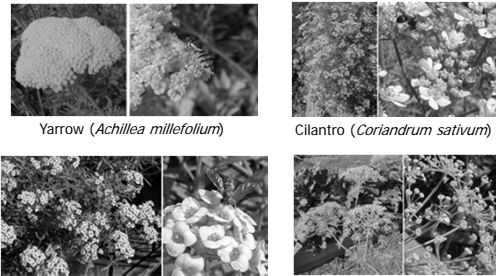
Adult Nectar Resources

- Various species
- Annuals, biennials and perennials
- Small nectaries for small insects!
- Large flowers or “platforms” for larger insects




Butterflyweed *Asclepias* Queen Anne's Lace *Daucus carota* Alfalfa *Medicago sativa* Yellow rocket *Barbarea vulgaris*

Adult Parasitoid Nectar Resources



Yarrow (*Achillea millefolium*) Cilantro (*Coriandrum sativum*)
 Sweet Alyssum (*Lobularia maritima*) Dill (*Anethum graveolens*)

	<h2>For More Information</h2>
<ul style="list-style-type: none"> ■ Extension Publications on Biological Control <ul style="list-style-type: none"> - <i>Natural Enemies in Your Garden: A Homeowner's Guide to Biological Control</i> (MSU) - <i>Biological Control of Insects and Mites: An Introduction to Beneficial Natural Enemies and Their Use in Pest Management</i>. UWEX Pub A3842 - <i>Alternatives in insect management</i>. NCR Pub 401 (Univ. Illinois) ■ Articles on the WI MG website wimastergardener.org ■ Websites <ul style="list-style-type: none"> - The Pollination Page – pollinator.com/ - Pollinator Partnership – www.pollinator.org - Biological Control News website – www.entomology.wisc.edu/mbcn/mbcn.html 	

	<h2>For Insect Identification</h2>
<p>Insect Diagnostic Laboratory PJ Liesch, Insect Diagnostician Department of Entomology 1630 Linden Dr. Madison, WI 53706 (608) 262-6510 pliesch@wisc.edu http://www.entomology.wisc.edu/diaglab/entodiag.html @WiBugGuy</p>	