


Garden Insects

The Good, the Bad, and the Beautiful


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Agenda

- What Is an Insect?
- Life Cycle
- Roles of Insects in the Garden
- Identifying Insects
- Common Insects
- Gardening with Insects




What Is an Insect?














What Is an Insect?


















An Insect Is...

- Small animal
- External skeleton
- Three body segments
- Six jointed legs
- Up to two pairs of wings
- Usually has antennae



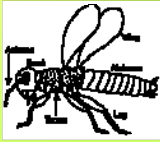
Cabbage White Butterfly

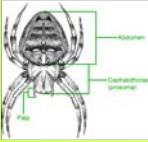
Insects and Other "Bugs"

Phylum of Arthropods

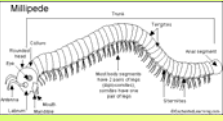
Insects




Arachnids



Others










Amazing Facts about Insects!

- Evolved over 600,000,000 years ago!
- Up to 30 million different species!
- Almost every habitat on Earth!
- About 10 quintillion insects in the world (1.46 million per human)!
- 1 out of 4 animals is a beetle!

More Amazing Facts about Insects!




- Fastest: Dragonfly @ 36 mph!
- Heaviest: Goliath Beetle @ 3.5 oz!
- Longest: Walking Stick @ 13"!
- Fastest wing beat: Midge @ 1,046/sec!
- Longest lived: Queen Termite @ 50 yrs!

Life Cycle - Metamorphosis



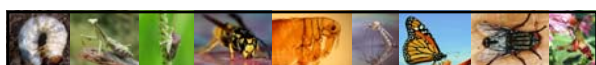
"Change of shape"

Life cycle of insects characterized by distinct change of form in each stage






Metamorphosis



- *Why is it important?*
 - It's amazing!
 - Helps with identification and management of insects

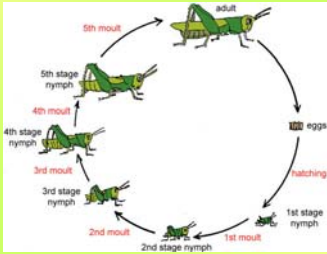

Two Main Types of Metamorphosis

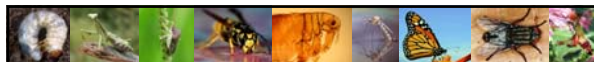


Simple	Complete	
Egg	Egg	Fertilized cell multiplies into independent individual organism
Nymph	Larva	Eats, eats, eats! Major growth period.
	Pupa	Juvenile changes to adult form
Adult	Adult	Reproduce!

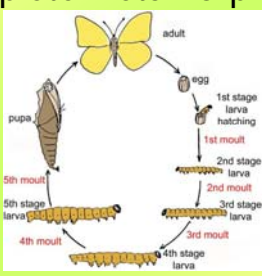

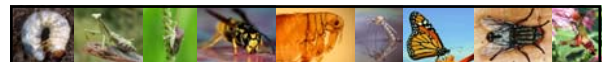



Simple Metamorphosis

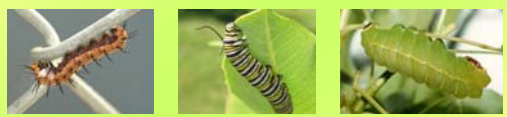


Complete Metamorphosis


Larvae - Caterpillars

Adults are butterflies or moths



Gulf Fritillary Butterfly Monarch Butterfly Luna Moth

- Six true legs + prolegs




Larvae - Grubs

Adults are beetles



Japanese Beetle Black Vine Weevil Firefly

- Usually six true legs, no prolegs




Larvae - Maggots

Adults are flies



Seed Corn Fly Cranefly Mosquito

- No legs

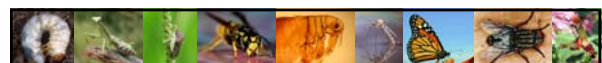



Pupae - Chrysalises & Cocoons


Butterflies and Moths




Black Swallowtail Butterfly Monarch Butterfly Hawk Moth Polyphemus Moth


Other Pupae



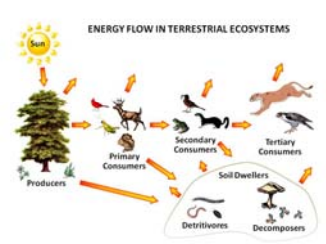
Japanese Beetle Mealworm Beetle Ladybird Beetle Rhinoceros Beetle



Flower Fly House Fly



Roles of Insects in Ecosystem



- 35 – 50% of Earth's plant mass (energy from sun) passes through insects
- 80 – 85% of flowering plants are pollinated by insects

In the natural ecosystem, there are no good or bad roles



European Honey Bee



Eastern Tent Caterpillars

Beneficial Garden Roles

- Beauty
- Pollination
- Weed Control
- Aeration
- Sanitation
- Pest Control
- Education
- Fertilization



The beauty of a Luna moth

"Pest" Garden Roles


- Herbivory
- Physical destruction
- Disease transmission
- Biting, stinging



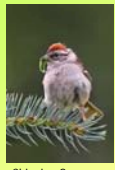
Japanese Beetles on Soybean Leaf

But most of them are good!

- Fewer than 1% of insects are considered pests
- More than 97% are considered beneficial



Bumblebee



Chipping Sparrow


Identifying Insects: What Taxonomy

- Class *Insecta* has 33 Orders
- Wings, mouth parts, food
- Other anatomical features




Identifying Insects: Why?

- Satisfy curiosity
- Separate "good" from "bad"
- Attract good, control bad







Identifying Insects: How

• Number of Wings	• Hair/Bristles/Spines
• Size	• Legs
• Color	• Waist
• Antennae	• Body Type
• Tails/Stingers	• Location
• Food	• Behavior



It's easy to confuse them!

- *Secret relatives:* children don't always look like their parents
- *Evil twins:* some bad insects look a lot like good ones

Secret Relatives



Secret Relatives




Evil Twins







Evil Twins



Spined soldier bug
feeds on insects




Brown stink bug feeds
on plants

Common Garden Insects


- Butterflies



Red Admiral



- Diurnal
- Colorful
- Club-like antennae

- Moths



Illa Underwing


- Nocturnal
- Less colorful
- Thread-like or feathery antennae



Butterflies and Moths

- Four, scaled wings
- Complete metamorphosis
- Sucking mouthparts
- Important pollinators
- Important food source for birds
- Some pests (tomato worm, tent caterpillars, clothes moths, pantry moths)
- Best way to attract them is with host plants for caterpillars and nectar-producing flowers


and skippers, too!



Delaware Skipper

- Bees



- Wasps



Chewing/sucking mouthparts. Social/communal or solitary. Complete metamorphosis. 2 pairs of wings.

- Plump, hairy
- Adults and larvae eat nectar and pollen
- Die after stinging
- Important pollinators


- Slim, smooth
- Adults eat nectar, sugary liquids
- Larvae are fed other insects
- Do not die after stinging
- Incidental pollinators
- Important predators/parasites





Honey Bees





- European, not native to U.S.
- Heavily used in agricultural pollination, but not required
- Only bee to produce commercially viable honey
- Not important to native ecosystem
- Naturalized populations devastated by Colony Collapse Disorder
- Managed hives can be treated


- Ants




- Termites






- Related to wasps and bees
- Complete metamorphosis
- Chewing mouthparts
- Form complex societies
- Improve soil more than earthworms
- Important scavengers
- Distribute seeds
- Can be aesthetic nuisance






- Separate Order of insects
- Complete metamorphosis
- Chewing mouthparts
- Form complex societies
- Contribute significantly to decomposition of plant materials/cellulose
- Can be destructive pest in homes







<p>• Bugs</p>  <ul style="list-style-type: none"> • Incomplete metamorphosis • Piercing mouthparts • 2 pairs of wings • Leathery ¾-length shell • Irruptions, hibernation • Herbivores, some predators • Some are pests – herbivory, plant disease transmission • Plant damage: discoloration, deformation from sucking 	<p>• Beetles</p>  <ul style="list-style-type: none"> • Complete metamorphosis • Chewing mouthparts • 2 pairs of wings • Hard, full-length shell • Herbivores, important predators and pollinators, and scavengers • Some are pests – herbivory as adults, grubs • Plant damage: holes from chewing
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<p>• Flies</p>  <ul style="list-style-type: none"> • 1 pair of wings, 1 pair of halteres • Sucking, sponging mouthparts • Complete metamorphosis • Larvae terrestrial or aquatic • Greatest economic impact on humans of any insects • Important pollinators • Parasitism of pests and non-pests • Decomposition by maggots • Vectors for disease 	<p>• Not flies</p>  <ul style="list-style-type: none"> • 2 pairs of wings • Chewing mouthparts • Incomplete metamorphosis • Larvae terrestrial or aquatic (naiads) • Mayfly: only insect to molt after having full wings (dun/subimago) • Dragonflies and damselflies are important predators of flying insects • Lacewings are important predators of aphids
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<p>• Grasshoppers/Locusts</p>  <ul style="list-style-type: none"> • Diurnal • Short antennae • Auditory organs on abdomen • Rub hind leg against forewing • Herbivorous • Short ovipositors • Can be pests 	<p>• Crickets/Katydid</p>  <ul style="list-style-type: none"> • Nocturnal • Long antennae • Auditory organs on forelegs • Rub forewings together • Omnivorous scavengers, herbivorous, or predatory • Long ovipositors
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Chewing mouthparts.
Incomplete metamorphosis. 2 pairs of wings. Strong jumping legs.





<p>• Praying Mantis</p>  <ul style="list-style-type: none"> • Four wings • Incomplete metamorphosis • Chewing mouthparts • Related to roaches • Of Asian origin • Nondiscriminatory predator 	<p>• Aphids</p>  <ul style="list-style-type: none"> • Wingless or winged (four) • Come in many colors • Incomplete metamorphosis • Sucking mouthparts • Live birth • Sexual or asexual reproduction • Some excrete waxy defensive fluids through abdominal tubes • One of most significant pests
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Managing Insect Populations

- Attracting Good Ones 
- Controlling Bad Ones 

Attracting Beneficials

- Plant nectar-rich plants
 - Composite flowers 
Asters
 - Inflorescent flowers 
Swamp Milkweed



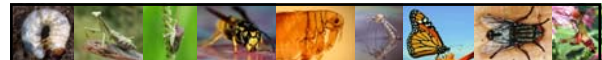


Attracting Beneficials

- Provide ground cover and leaf litter
- Set out some water
- Create a wood pile






Low-growing plants like tiarella provide cover for ground-dwelling predators, as does leaf litter

Attracting Beneficials


- Avoid pesticides
- Avoid monocultures


Attracting Beneficials

- Create a natural area or an insectary border





Controlling Pests

- Integrated Pest Management
- Spectrum of control alternatives from more to less eco-friendly




Books on Insects in the Garden

Insects and Gardens, Eric Grissell, Timber Press

The Practical Entomologist, Rick Imes, Fireside Press






Books on Identifying Insects

Field Guide to Insects of North America, Kaufman, Houghton Mifflin

Garden Insects of North America, Whitney Cranshaw, Princeton Press

Field Guide to Insects & Spiders, National Audubon Society






Books on Managing Insects

Insect, Disease & Weed I.D. Guide,
Rodale Press

*The Organic Gardener's Handbook of
Natural Insect and Disease Control,*
Rodale Press

How to Spot Butterflies, Sutton &
Sutton, Houghton Mifflin



Think before you squish!



My baby, my
beautiful
baby!

