Unit G: Pest Management

Lesson 4:
Managing Insects

Terms

- Ametamorphic
- Antennae
- Antibiosis control
- Beneficial insect
- Biological control
- Chemical control
- Chitin
- Clean culture
- Complete metamorphosis
- Cultural control
- Economic threshold
- Eradication
- Exoskeleton
- External feeding insects
- Genetic control
- Harmful insect
- Incomplete metamorphosis
- Insect

Terms Cont.

- Internal feeding insects
- Larva
- Mechanical control
- Metamorphosis
- Nonpreference control
- Pesticide resistance
- Pest resurgence
- Pupa
- Quarantine
- Regulatory control
- Scouting
- Subterranean insects
- Targeted pest
- Threshold
- Tolerance control
- Trap crop
- Viviparous

Insects are in the class *Insecta* and have several characteristics.

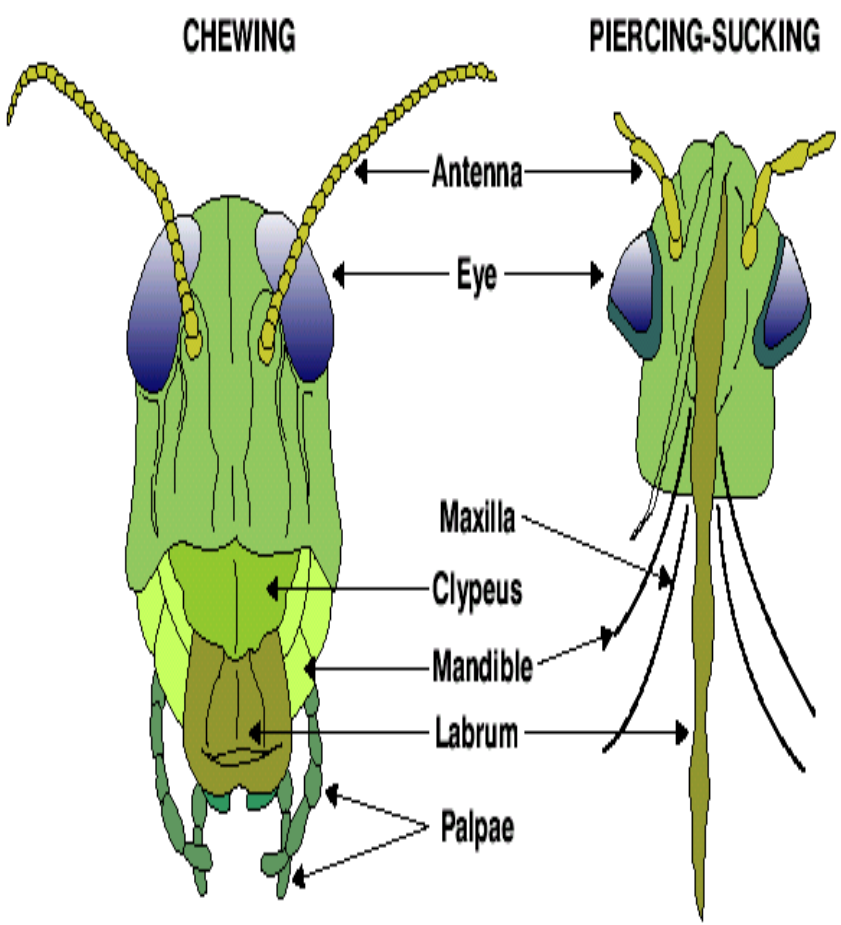
- Each has an ***exoskeleton***, made of chitin, which is the body wall of the insect. It provides protection and support for the insect.
- Muscles and organs are attached to the inside wall of the strong chitin. The ***chitin*** gives shape to the body and protects the organs.
- The number of segments in the exoskeleton varies but is about 20 in most insects.
- Some segments are easy to see, while others are fused tightly together and difficult to see.

These segments form the three major body sections:

- The head contains the brain, mouthparts, and most of the sensory organs, eyes, and antennae.
- The ***antennae*** are segmented appendages that act as sensory organs.
- The thorax provides locomotion and has wings and pairs of legs attached to it. The abdomen contains organs for food digestion, respiratory, reproduction, and excretion.

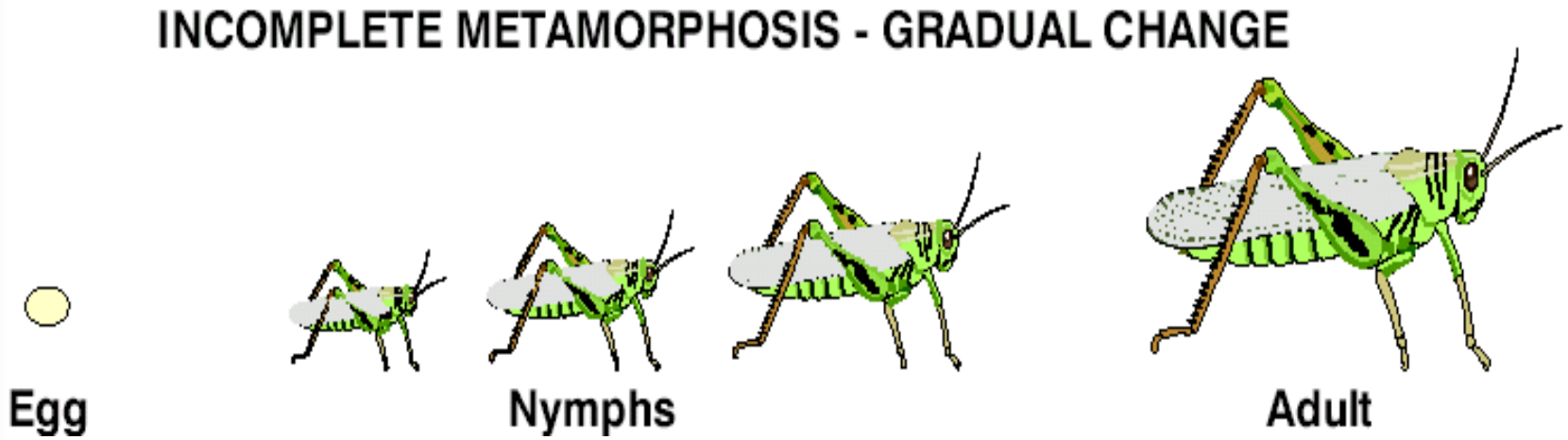
The mouthparts of insects tend to be one of two types:

- A chewing insect bites off, chews, & swallows plant parts. Holes in leaves, buds, flowers, or other plant parts indicate that damage was done by a chewing insect.
- A sucking insect pierces the outer layer of a plant & sucks sap from it. The insect makes a tiny hole & uses the plant juice as its food.



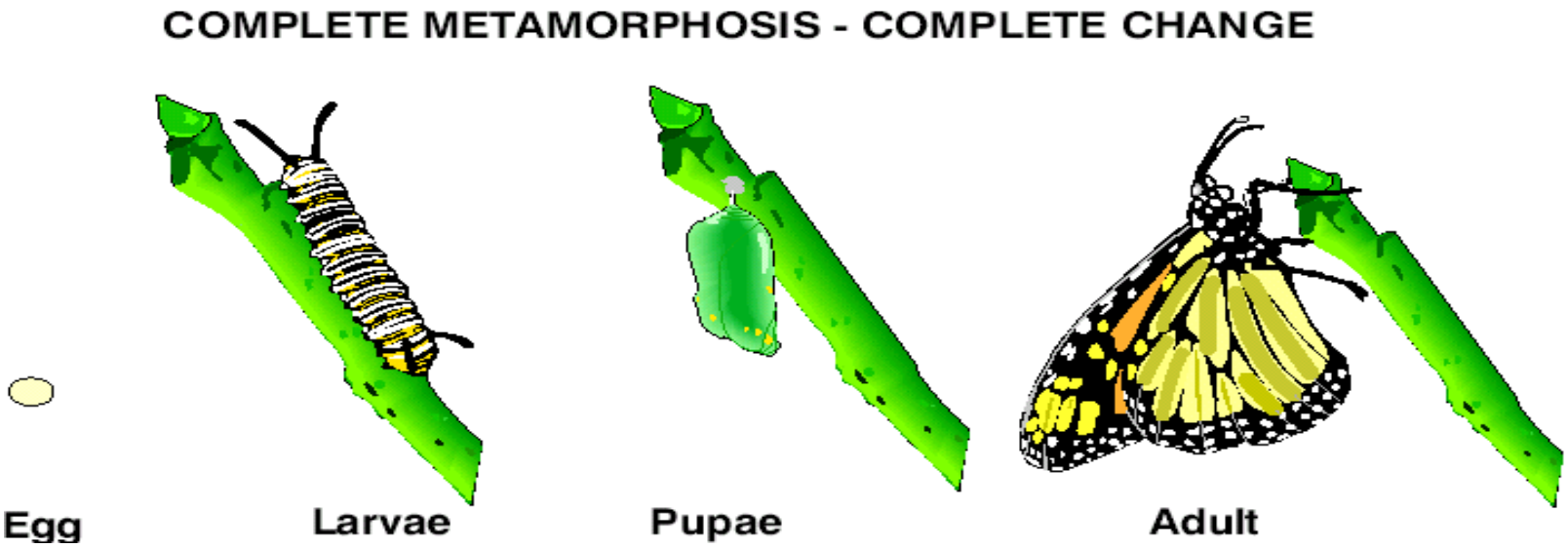
- Most insects reproduce sexually but differ in their development from the young to the adult stage. Insects go through stages of development known as ***metamorphosis***. The changes are distinct as they go from egg to adult.

- ***Incomplete metamorphosis*** has three stages of development: egg, nymph, and adult.
- Eggs hatch into nymphs, which are immature forms that resemble the adult. Nymphs usually molt, and lose and regrow their exoskeleton several times before reaching adult stage.



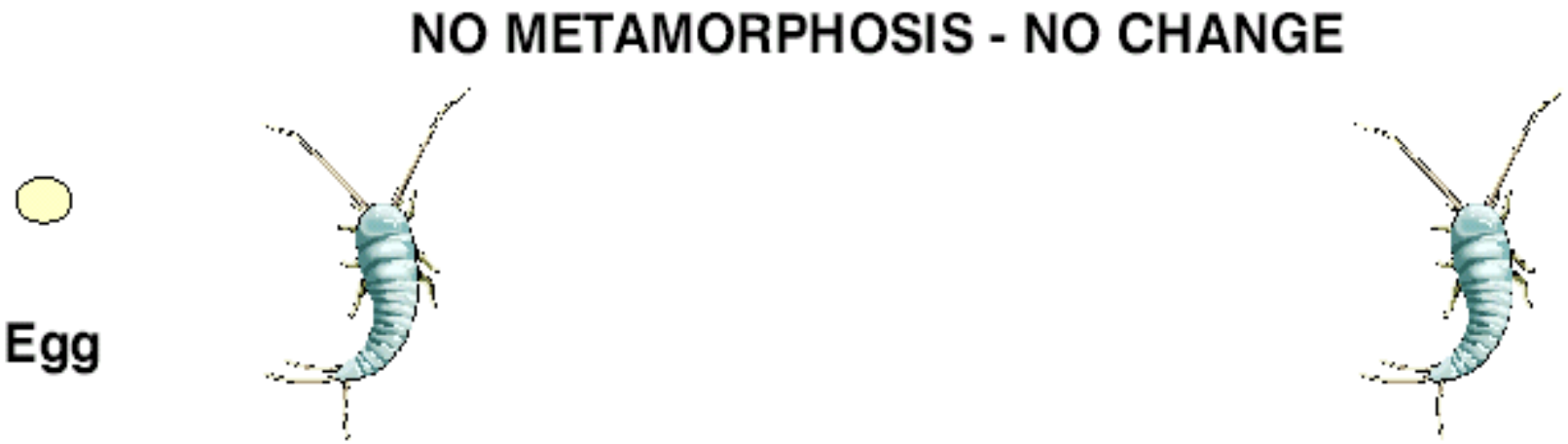
Complete metamorphosis has four stages of development:

- ***Larva*** are segmented, wormlike forms that often inflict considerable damage on plants. After an active larva stage, a pupa is formed.
- The ***pupa*** is a resting stage before it becomes an adult. Most pupae are surrounded by a cocoon or protective case.

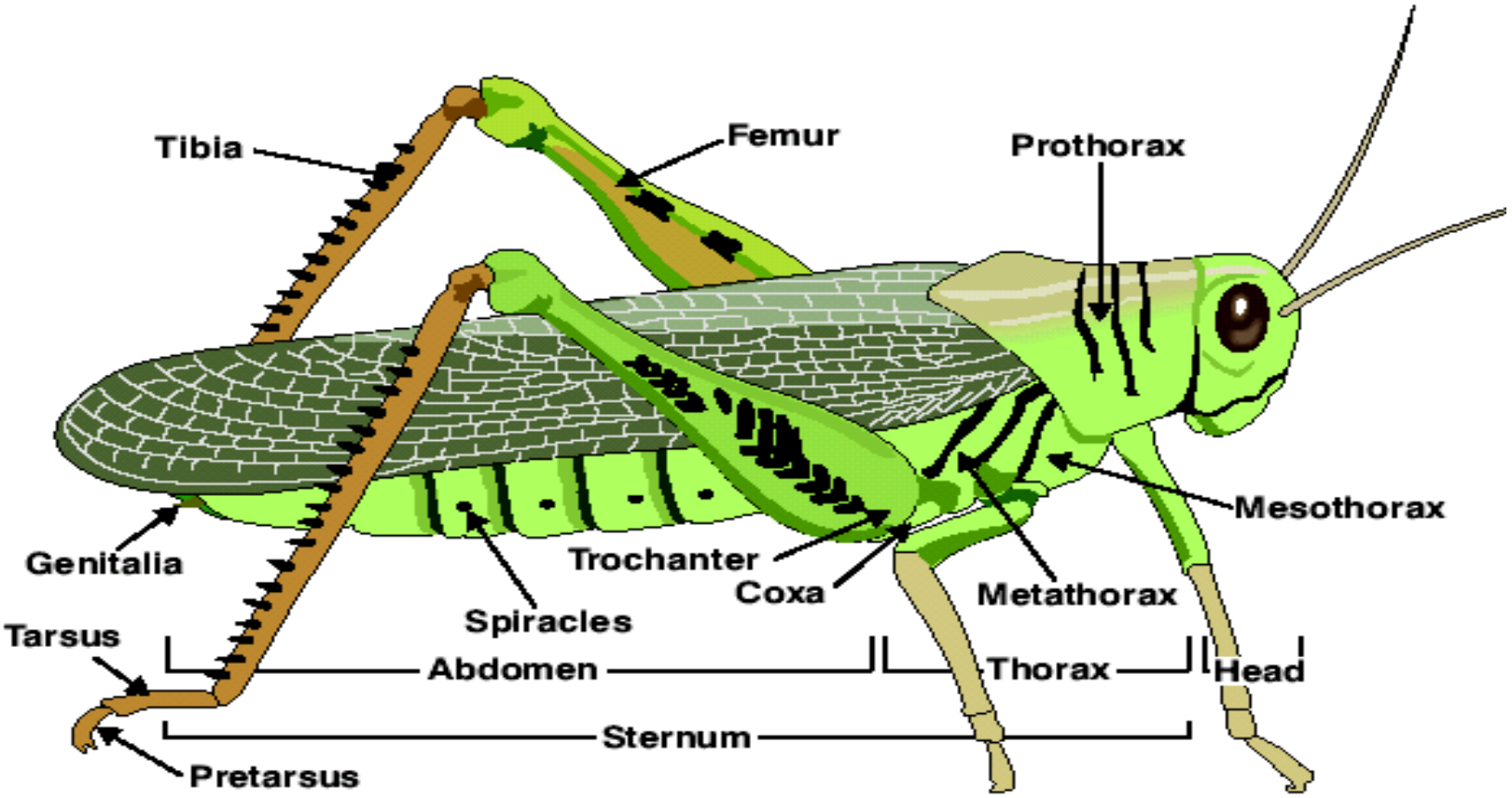


- Some insects are ***ametamorphic*** (without metamorphosis). The insect hatches from the egg as a very small replica of the full-grown adult.

- Ametamorphic insects can also be ***viviparous***, giving birth to live young with no egg stage; and parthenogenic, reproducing asexually.

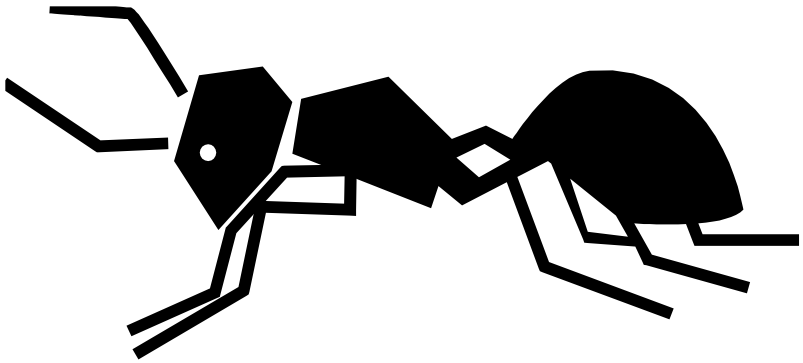


MAJOR PARTS OF AN INSECT



How are insects classified?

- An ***insect*** is a small boneless animal whose body is divided into three sections. Insects are classified in many ways.



Scientific classification of insects

- The Arthropoda phylum includes animals with exoskeletons and segmented bodies.
- The phylum is further divided into classes, with insects being in the *Insecta* class.
- The class has several orders, with each of these having families, genus, and species.
- The genus and species form the scientific names of insects.
- These divisions within the Insecta class are based on similarities and differences among the animals.

Benefit classification of insects.

- A ***beneficial insect*** is one that is of value for the role it fills in the environment.
- These insects perform activities that help humans in providing for their needs.

BENEFICIAL INSECTS

Common Name	Benefit
bees, butterflies, moths, and flies	pollinate plants
honeybees	produce honey and beeswax
ants	aerate soil
ladybug beetles, mantids, and lacewings	prey on harmful insects
silkworm moth	cocoons provide silk fiber
honey ants, flying ants, and grasshoppers	human food
scarab beeetles	help decompose carrion (dead flesh), dung, and vegetation

Benefit classifications of insects

- A ***harmful insect*** is one that causes damage to plants, animals, or property. It injures or destroys what it attacks.
- Harmful insects damage food, feed crops and ornamentals, attack man and his domestic animals, attack stored products, transmit disease, and are a nuisance.

HARMFUL PLANT INSECTS

Common Name	Damage Caused
grasshoppers, aphids, some beetles, and caterpillars	feed on plant foliage
ear worms and bud worms	feed on fruit and buds of plants
some weevils	feed on grain and other fruit, such as cotton bolls
ants, including fire ants	undermine plant root systems, damage turf and ornamental plants

Insects can be classified according to mouthparts.

- 1. Insects are classified on the basis of feeding, such as chewing or sucking.
- 2. Insects are classified by the kind of metamorphosis they have.
- The stage of development of an insect is important in assessing the damage they cause plants. The stages also influence the methods used to manage insect pests and control the damage they cause.

Insects can be classified by where they feed on plants.

- 1. ***External feeding insects*** chew or suck from the exterior of the plant. They feed on the leaves, stems, buds, or fruit.
- 2. ***Internal feeding insects*** are of the chewing type that make an opening in the plant and go inside. They feed internally on plant tissues.
- 3. ***Subterranean insects*** are species in the soil that attack the roots of plants. In some cases, they may attack root-type structures.
- 4. Both chewing and sucking insects may be involved. The damage is not readily apparent.

How are nematodes classified and what is their biology?

- Many plant pest nematodes are so small that they can only be seen with a microscope.
- Nematodes that cause damage live in the soil, though some are on leaves, stems, and buds.
- Species that attack above ground plant parts are known as foliar nematodes.
- Nematodes damage plants by piercing and sucking juice or tunneling inside the roots. They secrete a substance that injures roots, allowing bacteria and fungi to enter, which can cause disease.

Preventing damage by insects and nematodes requires good information.

- The presence of insects alone does not provide enough information.
- Selecting and using the correct method of insect and nematode management is important. Management measures are expensive and have other effects, such as killing beneficial insects. Proper identification of the pest is essential. Measures are based on the species and the way it feeds. Select a method that is appropriate.
- Damage by pest should be at a level that merits action. Minor damage may not justify using pesticides. Some methods of pest management can be dangerous to people, other living organisms, and the environment.

Two methods are used in determining if & when to take action against insect pests.

- ***Scouting*** is the process of visually inspecting for the presence of insect pests and damage.
- Look at plants closely for evidence of damage or for the eggs of pests; open leaf folds and areas around buds.
- Use sweep nets or traps to collect samples of insects.
- ***Threshold*** is the density of the pest population that will justify using pest management measures.
- ***Economic threshold*** is the balance of cost with returns. Minor damage or a low population density does not usually justify spending money on management.

Many different methods can be used to manage insects & nematodes.

- ***1. Biological control*** is the use of living organisms to reduce pest populations. These beneficial organisms are natural enemies of pests.
- 2. ***Chemical control*** is the use of pesticides to reduce pest populations. ***Pesticide resistance*** is the ability of an organism to tolerate a lethal level of a pesticide. ***Pest resurgence*** refers to a pest's ability to repopulate after control measures have been eliminated or reduced.

Methods to manage insects & nematodes cont.

- 3. ***Cultural control*** is used to make the crop environment unsuitable for pests to feed, live, or reproduce, and to improve the health of the crop.
- 4. ***Clean culture*** refers to any practice that removes breeding or over-wintering sites of a pest. A ***trap crop*** is a susceptible crop planted to attract a pest to a localized area, where the trap crop is either destroyed or treated with a pesticide.

Methods to manage insects & nematodes cont.

- 5. ***Mechanical control*** is used to physically remove or exclude pests. It includes hand destruction as well as the use of screens to keep out insects, and traps to catch them.
- 6. ***Genetic control*** of plant pests involves the use of a genetically modified organism (GMO). Plant breeders are constantly working to develop varieties and hybrids that are resistant to, or tolerant of, pest feeding.

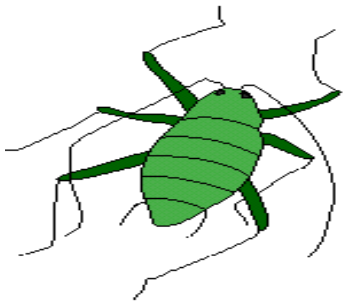
Genetic control of insects and mites can be divided into three groups.

- 1. ***Nonpreference control*** allows plant breeders to alter the plant's biochemistry or constituents so that a particular variety or hybrid is less palatable to the pest. If the taste, aroma, color, or texture of the crop plant is undesirable to the pests they move to a different variety or a different host plant such as another crop or a weed.
- 2. With ***antibiosis control***, the crop plant components have a harmful effect on the growth or reproduction of the pest when it feeds on it.
- 3. ***Tolerance control*** allows the host plant not to suffer economic damage even though it may be heavily infested with the pest.

Government laws in some parts of the world

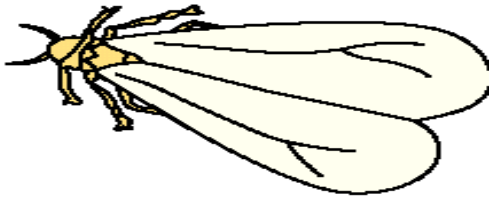
- ***Regulatory control*** is when governments have created laws that prevent the entry or spread of known pests into uninfested areas.
- A ***quarantine*** is the isolation of pest-infested material.
- A ***targeted pest*** is a pest that, if introduced, poses a major economic threat. If a targeted pest becomes established, an eradication will be started.
- ***Eradication*** means total removal or destruction of a pest. This type of pest control is extremely difficult and expensive to administer.

COMMON INSECT PESTS

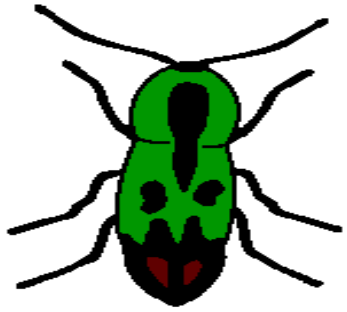


Aphid (1/10")

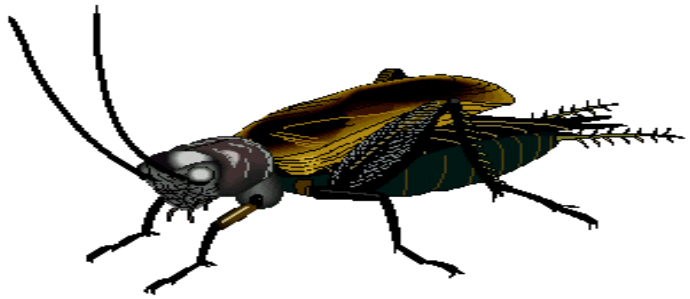
Thrip (1/32")



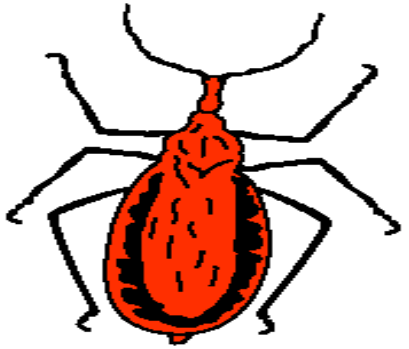
Whitefly (1/16")



Click Beetle (1/4–1")

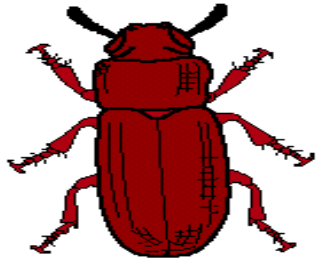


Field Cricket (7/8–2")

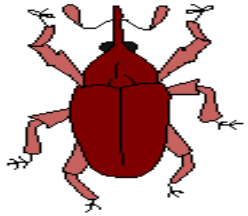


Assassin Bug (3/4

Bean and Pea Weevil (1/8")



Flour Beetle (1/7")



Rice Weevil (1/18")

Review/ Summary.

- 1. What is the biology of insects?
- 2. How do you classify insects?
- 3.What is the biology of nematodes?
- 4. What are some methods of insect and nematode management?