

Greenhouse Insects

Curriculum



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Greenhouse Insects Curriculum

These lessons will introduce students to a variety of common greenhouse insects in order to prepare them to identify them, distinguish between sucking and chewing types of insects, and make the best management decisions to control them in a greenhouse setting.

Curriculum Structure

The curriculum is composed of the following lessons. Approximate lesson times are included.

Lesson	Title	Approximate Time
One	FOCUS: Introduction to Greenhouse Insects	15-20 minutes
One	LEARN: Greenhouse Insect Identification	30-40 minutes
One	REVIEW: Greenhouse Insect Quiz	15-20 minutes
	Total	60-80 minutes

Lesson Structure

Each lesson begins with an overview, lesson objectives, and a Lesson at a Glance table which lists the lesson activities, materials required, suggested preparation steps, and approximate class time.

Lesson Sections

The actual lesson follows the overview, which will contain some of the sections described below. Most lessons are designed to be completed within 45 minutes.

FOCUS

Every lesson begins with a FOCUS activity intended to capture participants' attention. This may be in the form of a small or large class discussion, a game, a review of previous lesson information, or a demonstration. During this activity, participants are introduced to the topic of the lesson.

LEARN

The LEARN activity in each lesson varies in its presentation mode. It may be a slide presentation, group activity, or demonstration.

REVIEW

The majority of lessons end with a REVIEW activity intended to briefly review the lesson's key messages or main points.

Lesson One – Greenhouse Insects

Lesson Overview

Use this lesson to introduce the common types of insects seen in a greenhouse setting and learn how to identify them.

Lesson Objectives

After completing this lesson, participants will be able to:

- Define the term pest as it relates to greenhouse insects
- Identify 8 common greenhouse insects
- Classify each insect into a proper group of either sucking or chewing insects
- Understand the difference in body anatomy
- Learn about damage done by each insect to common greenhouse crops

Standards:

- Predict pest and disease problems based on environmental conditions and life cycles
- Describe pest control strategies associated with integrated pest management
- Identify plant pests and disorders
- Identify major local weeds, insect pests, and infectious and noninfectious plant diseases
- Describe damage caused by plant pests and diseases
- Diagram the life cycle of major plant pests and diseases

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Greenhouse Insect</i> slide presentation • <i>Greenhouse Insect Identification Scavenger Hunt</i> worksheet • <i>Greenhouse Insect Identification Scavenger Hunt – Answer Key</i>	1. Print/photocopy <i>Greenhouse Insect Identification Scavenger Hunt</i> worksheet (one per participant) 2. Prepare <i>Greenhouse Insect</i> slide presentation for viewing	15-20 minutes
LEARN	• Greenhouse Insects Kit • <i>Greenhouse Insects Flash Cards</i> • <i>Greenhouse Insect</i> slide presentation • <i>Who did this?</i> Worksheet	1. Print/photocopy <i>Who did this?</i> worksheet (one per participant) 2. Prepare <i>Greenhouse Insect</i> slide presentation for viewing	30-40 minutes
REVIEW	• <i>Greenhouse Insect Identification Quiz</i> • <i>Greenhouse Insect Identification Quiz – Answer Key</i>	1. Print/photocopy <i>Greenhouse Insect Identification Quiz</i> (one per participant)	15-20 minutes

Lesson One – Greenhouse Insects

FOCUS: Introduction to Greenhouse Insects

15-20 minutes

Purpose:

Participants will begin to gain an understanding of the common types of insects seen in a greenhouse setting and learn to identify them.

Materials:

- *Greenhouse Insect* slide presentation
- *Greenhouse Insect Identification Scavenger Hunt*
- *Greenhouse Insect Identification Scavenger Hunt – Answer Key*

Facilitation Steps:

1. Hand out the *Greenhouse Insect Identification Scavenger Hunt* worksheet.
2. Present the *Greenhouse Insect* slide presentation notes and use it as a discussion with the entire class.
3. Have participants complete the *Greenhouse Insect Identification Scavenger Hunt* during the presentation.
4. Reference the *Greenhouse Insect Identification Scavenger Hunt – Answer Key* to help answer any questions after discussing the slide presentation.

Name: _____ Class: _____

Greenhouse Insect Identification Scavenger Hunt

Use the slide presentation and manipulatives to find the answers to the following questions.

1. List 3 damage results from pests:

2. Which 4 factors make a greenhouse the perfect place for pests to live?

3. Give 3 examples of control methods for common greenhouse pests:

4. Insects are categorized by their _____ and identified as either _____ or _____ insects.
5. Aphids are also known as _____.
6. Fungus gnats are usually seen first on the _____.
7. Shore flies are often confused with _____ but have _____ eyes and dark bodies.
8. The thrip has _____ wings that are lined with _____.
9. Whiteflies are often found on the _____ of leaves.
10. The _____ has a waxy covering and is small, round and often looks like scale.
11. Varying the _____ and _____ will help control the life cycle of the spider mite.
12. The _____ leave trails on the leaves and interrupt photosynthesis.
13. Why is it important to be able to identify common greenhouse pests?

Greenhouse Insect Identification Scavenger Hunt – Answer Key

Use the slide presentation and manipulatives to find the answers to the following questions.

1. List 3 damage results from pests:

Increase expense, crop loss, time/labor increase, additional disease

2. Which 4 factors make a greenhouse the perfect place for pests to live?

Warm, humid, abundant food, stable environment

3. Give 3 examples of control methods for common greenhouse pests:

Sanitation, soil/media choices, insect identification, chemical and biologicals

4. Insects are categorized by their **mouthparts** and identified as either **sucking** or **chewing** insects.

5. Aphids are also known as **plant lice**.

6. Fungus gnats are usually seen first on the **soil surface**.

7. Shore flies are often confused with **fungus gnats** but have **red** eyes and dark bodies.

8. The thrip has **4** wings that are lined with **hair**.

9. Whiteflies are often found on the **undersides** of leaves.

10. The **mealybug** has a waxy covering and is small, round and often looks like scale.

11. Varying the **temperature** and **humidity** will help control the life cycle of the spider mite.

12. The **leafminers** leave trails on the leaves and interrupt photosynthesis.

13. Why is it important to be able to identify common greenhouse pests?

Proper identification leads to understanding their life cycle and being able to properly control them while understanding the potential damage

Lesson One – Greenhouse Insects

LEARN: Greenhouse Insect Identification

30-40 minutes

Purpose:

Participants will read the scenarios in *Who Did This?* and come up with important facts about the situation through research and inquiry-based learning.

Materials:

- Greenhouse Insects Kit
- *Greenhouse Insects Flash Cards*
- *Greenhouse Insect* slide presentation
- *Who Did This?*

Facilitation Steps:

1. Hand out the *Who Did This?* worksheet.
2. Have the *Greenhouse Insect* slide presentation, Greenhouse Insects Kit, and *Greenhouse Insects Flash Cards* available for the participants to reference.
3. Either have each participant complete all scenarios, or put the participants into 8 groups and assign each particular scenarios to complete.
4. If time allows, have participants present the information about the scenarios to the class.

Name: _____ Class: _____

Who did this?

Directions: Use the clues below, along with the slide presentation and manipulatives, to identify the culprit to each mystery, then learn more about each pest through the “questions to consider.”

Situation 1: You are in the greenhouse and notice tiny, yellowish-green specks on the underside of the newest leaves on your peppers and tomatoes. There is a sticky residue on the leaves. After obtaining a magnifying glass to take a closer look, you discover a wingless creature with three sets of legs and two other protrusions near the rear.

Questions to consider:

- What insect is making its presence known in the greenhouse?
- What about this description helped you to identify the culprit?
- Research the life cycle and identify the best way to stop reproduction

Situation 2: You are doing the daily watering in the greenhouse today and notice that some of the plants look a bit wilted, even though the soil feels moist to the touch and you just watered yesterday. As you investigate further by looking at the plants showing the symptoms, you notice something flying up from the soil as you brush the leaves. It seems to be on a wide variety of plants.

Questions to consider:

- What insect is making its presence known in the greenhouse?
- What about the description helped you identify the culprit?
- How would you explain the wilting as a symptom even though your plants are well watered?

Situation 3: Your spring crop of flowers looks great, but you notice tiny specks of black on your leaves and pots. You are worried that your crop is in danger of a pest. You haven’t really been doing anything different, but you notice in the greenhouse that there is plenty of standing water where the floor doesn’t slope well to the drain, along with a few corners of algae growth.

Questions to consider:

- Could this be a pest problem?
- What damage could this cause in the future?
- What methods would help control or prevent this in the future?

Situation 4: It is late winter and time to get cuttings and plugs from a local distributor. Upon arrival to your 60-degree greenhouse you notice that some of the leaves seem deformed. You recognize a brownish colored insect with hairy wings and immediately you are concerned.

Questions to consider:

- What is the insect most likely to be?
- What factors about the life cycle of the thrip are so concerning?
- What can you do to prevent this insect from causing damage to your future crops?

Situation 5: Geraniums are your number one crop in the greenhouse as people love them in hanging baskets. You are doing your daily health inspection when you notice a tiny white moth-like insect sitting on a leaf. Upon moving, you also see a small white cluster on the lower leaf. Not thinking much of it, you proceed with health checks, making a note but not doing anything about this critter. A week later, you return to see many of them same insects, along with yellowing of some of your plant leaves. You decide it is time to dig a bit deeper.

Questions to consider:

- What is this insect most likely to be?
- What factors about the life cycle of the whitefly are most concerning?
- How would wasps be beneficial to introduce to your greenhouse when controlling whitefly?

Situation 6: After several requests from the community, you decide this is the year to grow and sell perennial plants as well as the normal hanging baskets and vegetable crops. A few weeks have gone by and just when you think you have smooth sailing with a new venture, you notice that small, white, scaly insects have infested your perennial plants, but nothing else in the greenhouse. They seem to have a wax-like covering and are very slow. You decide this could be important to know more about.

Questions to consider:

- What is this insect?
- What can be done to control or prevent this species from infestation in the future?
- What interesting details about the life cycle of the mealybug could be important to know?

Situation 7: This small and sneaky insect will hide on the underside of a leaf and feed on most greenhouse crops. You have had your fair share of insect issues and want to be sure this one does not invade your crop. There are several different kinds of this insect; their biology is very important to know in order to control them. They thrive on different temperature and humidity levels.

Questions to consider:

- Who is the mystery culprit?
- What are the most common types of mites present in greenhouses?
- What is the relationship of temperature and humidity to their lifecycle?
- What is the specific damage from this insect?

Situation 8: Ever heard of gophers in the greenhouse before? This specific insect larvae bores tunnels in the middle layers of the leaves of plants, appearing just like gophers in the lawn. Adult females will then lay their eggs in the tunnels for them to hatch and carry out the work of eating. Most often, they will be recognized on vegetable crops and make the leafy greens unsalable. Other plants will be stunted in growth due to the interruption of photosynthesis production.

Questions to consider:

- Who is doing the damage in this situation?
- How does the name of this pest relate to the damage it does?
- What would be important about the life cycle of this pest in order to control it?

Who Did This? – Answer Key

Situation 1: You are in the greenhouse and notice tiny, yellowish-green specks on the underside of the newest leaves on your peppers and tomatoes. There is a sticky residue on the leaves. After obtaining a magnifying glass to take a closer look, you discover a wingless creature with three sets of legs and two other protrusions near the rear.

Questions to consider:

- What insect is making its presence known in the greenhouse? **Aphids**
- What about this description helped you to identify the culprit? **Tiny, yellowish-green specks on the underside of the newest leaves, sticky residue on the leaves, and a wingless creature with three sets of legs and two other protrusions near the rear.**
- Research the life cycle and identify the best way to stop reproduction.

Situation 2: You are doing the daily watering in the greenhouse today and notice that some of the plants look a bit wilted, even though the soil feels moist to the touch and you just watered yesterday. As you investigate further by looking at the plants showing the symptoms, you notice something flying up from the soil as you brush the leaves. It seems to be on a wide variety of plants.

Questions to consider:

- What insect is making its presence known in the greenhouse? **Fungus Gnats**
- What about the description helped you identify the culprit? Plants look a bit **wilted, something flying up from the soil as you brush the leaves of the plants, on a wide variety of plants**
- How would you explain the wilting as a symptom even though your plants are well watered? **Fungus gnats enjoy chewing on the roots which lead to damage and the inability to pull up enough water**

Situation 3: Your spring crop of flowers looks great, but you notice tiny specks of black on your leaves and pots. You are worried that your crop is in danger of a pest. You haven't really been doing anything different, but you notice in the greenhouse that there is plenty of standing water where the floor doesn't slope well to the drain, along with a few corners of algae growth.

Questions to consider:

- Could this be a pest problem? **Likely to be shore flies**
- What damage could this cause in the future? **Little to no damage as they feed on the algae, but the black specks could lower the aesthetic value of your crop**
- What methods would help control or prevent this in the future? **Sanitation is the best prevention, keep things in the greenhouse dry and free of algae and avoid overwatering**

Situation 4: It is late winter and time to get cuttings and plugs from a local distributor. Upon arrival to your 60-degree greenhouse you notice that some of the leaves seem deformed. You recognize a brownish colored insect with hairy wings and immediately you are concerned.

Questions to consider:

- What is the insect most likely to be? **Thrip**
- What factors about the life cycle of the thrip are so concerning? **Most are females, which lay 150-300 eggs with a lifecycle between 7-14 days**
- What can you do to prevent this insect from causing damage to your future crops? **Isolate new plugs, purchase from a reputable distributor, stop the life cycle by decreasing temperatures below 50 degrees**

Situation 5: Geraniums are your number one crop in the greenhouse as people love them in hanging baskets. You are doing your daily health inspection when you notice a tiny white moth-like insect sitting on a leaf. Upon moving, you also see a small white cluster on the lower leaf. Not thinking much of it, you proceed with health

checks, making a note but not doing anything about this critter. A week later, you return to see many of them same insects, along with yellowing of some of your plant leaves. You decide it is time to dig a bit deeper.

Questions to consider:

- What is this insect most likely to be? **Whitefly**
- What factors about the life cycle of the whitefly are most concerning? **Females lay 6-20 eggs daily and develop based on temperature**
- How would wasps be beneficial to introduce to your greenhouse when controlling whitefly? **Wasps will feed on the larvae stopping the life cycle, there are both pros/cons to this biological method of control**

Situation 6: After several requests from the community, you decide this is the year to grow and sell perennial plants as well as the normal hanging baskets and vegetable crops. A few weeks have gone by and just when you think you have smooth sailing with a new venture, you notice that small, white, scaly insects have infested your perennial plants, but nothing else in the greenhouse. They seem to have a wax-like covering and are very slow. You decide this could be important to know more about.

Questions to consider:

- What is this insect? **Mealybugs**
- What can be done to control or prevent this species from infestation in the future? **Inspection of any new plants to the greenhouse, return to seller if you identify any**
- What interesting details about the life cycle of the mealybug could be important to know? **Females can lay up to 600 eggs and temperature plays a role in how many eggs are laid; some species of mealybugs are live bearers**

Situation 7: This small and sneaky insect will hide on the underside of a leaf and feed on most greenhouse crops. You have had your fair share of insect issues and want to be sure this one does not invade your crop. There are several different kinds of this insect; their biology is very important to know in order to control them. They thrive on different temperature and humidity levels.

Questions to consider:

- Who is the mystery culprit? **Spider Mites**
- What are the most common types of mites present in greenhouses? **Broad mite, carmine spider mite, cyclamen mite, the Lewis spider mite, and the two-spotted spider mite**
- What is the relationship of temperature and humidity to their lifecycle? **They favor hot and dry condition**
- What is the specific damage from this insect? **Feed on plant sap, plants turn yellow, curl and die, becoming pesticide resistant**

Situation 8: Ever heard of gophers in the greenhouse before? This specific insect larvae bores tunnels in the middle layers of the leaves of plants, appearing just like gophers in the lawn. Adult females will then lay their eggs in the tunnels for them to hatch and carry out the work of eating. Most often, they will be recognized on vegetable crops and make the leafy greens unsalable. Other plants will be stunted in growth due to the interruption of photosynthesis production.

Questions to consider:

- Who is doing the damage in this situation? **Leafminer**
- How does the name of this pest relate to the damage it does? **It "mines" through the leaf by eating all of the important parts responsible for photosynthesis, thus stunting growth and making unsightly trails on the leaf**
- What would be important about the life cycle of this pest in order to control it? **Adult leafminers lay eggs on lower leaf surfaces and these surfaces should be monitored carefully to detect early leafminer activity**

Lesson One – Greenhouse Insects

REVIEW: Greenhouse Insect Quiz

15-20 minutes

Purpose:

The purpose of this activity is to have participants review their knowledge of greenhouse insects.

Materials:

- *Greenhouse Insect Identification Quiz*
- *Greenhouse Insect Identification Quiz – Answer Key*

Facilitation Steps:

1. Hand out the *Greenhouse Insect Identification Quiz*.
2. Give participants 5-10 minutes to complete the quiz.
3. Reference the *Greenhouse Insect Identification Quiz – Answer Key* to correct as a class or collect and grade.

Name: _____ Class: _____

Greenhouse Insects Quiz

- 1. What are the two common classifications of greenhouse insects?
- 2. Using the manipulatives, identify 5 of the 8 common greenhouse pests and label each as either chewing or sucking insects.

Greenhouse Insect	Chewing or Sucking

- 3. Explain the damage done to plants by three of the common greenhouse pests.

Greenhouse Insect	Damage Done

- 4. At which stage in the life cycle does the leafminer do the most plant damage?

Greenhouse Insects Quiz – Answer Key

- What are the two common classifications of greenhouse insects? **Chewing and sucking**
- Using the manipulatives, identify 5 of the 8 common greenhouse pests and label each as either chewing or sucking insects.

Greenhouse Insect	Chewing or Sucking
Aphid	Sucking
Fungus Gnat	Chewing
Leafminer	Sucking
Mealybug	Sucking
Shore Fly	Chewing
Spider Mite	Sucking
Thrip	Sucking
Whitefly	Sucking

- Explain the damage done to plants by three of the common greenhouse pests.

Greenhouse Insect	Damage Done
Aphid	– Feed on tender, young growth – Leave sticky “honeydew” behind – Leaves will curl
Fungus Gnat	– Larvae feed on root hair, crown – Plant begins to wilt, poor vigor
Leafminer	– Feed between upper and lower layer of leaf – Leave a trail for the adult to lay eggs
Mealybug	– Feed on plant sap – Leave honeydew soot – Any plant—mostly perennials
Shore Fly	– Rare, but carries disease into greenhouse – Feed on algae or standing water
Spider Mite	– Feed on plant sap – Plants turn yellow – Curl and die – Becoming pesticide resistant
Thrip	– Rasps and feeds on leaves, buds and flowers or young fruit causing deformation
Whitefly	– Sucks sap from undersides of leaves – Adult female lays up to 150 eggs

- At which stage in the life cycle does the leafminer do the most plant damage? **Larvae**