

# A CLASSROOM

# INDEPENDENT INVESTIGATION

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LIFE SCIENCE CURRICULUM FOR GRADES 3-5



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# Background Information

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STEM Magnet Lab School, Adams 12 Public Schools District, Colorado

All lessons in this resource as well as updates and links can be accessed online at:

<http://ipm.agsci.colostate.edu/>



# GETTING STARTED

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# GETTING STARTED

## Introduction

### Overview

As a teacher, perhaps you've had to shoo a wasp out of the classroom or report a trail of ants to the school janitor. Maybe you've spotted mouse droppings beneath the classroom sink. Perhaps you've noticed signs warning of weed spraying on school grounds. Indeed, pests are a common problem anywhere humans live and work together. This is why we remind students to put their sticky wrappers in the trash and be cautious around anything that crawls, stings, or may cause a rash.

By definition a pest is any organism that has a detrimental effect on people or the environment. Some pests carry harmful diseases or cause allergic reactions. Others are merely irritating or unsightly. So what can we do about pests? One of the major benefits of science is that it gives us the tools to effectively answer such questions. This curriculum is designed to promote 3-5th grade students' use of science skills to gather knowledge about and address the real-world problem of pests. The Next Generation Science Standards were used to guide its construction, and the activities were crafted to promote learning through social, creative, and thoughtful problem solving.

Through this curriculum, students will be better prepared to promote and maintain a healthier classroom, school, and world. They'll see bugs, plants, and environments differently. Hopefully, they'll also be more inclined to clean up those food messes!

### What is IPM and why does it matter?

Nowadays we are looking at the organisms in our environment, including pests, in new ways. Research has revealed the various health risks posed by pests, pest allergens, and the chemical treatments to control them. This has led to the development of an approach called integrated pest management (IPM), which is a decision-making process that emphasizes prevention and non-

chemical treatment methods. Inspection, monitoring and record-keeping are used to determine if, when and which treatments are needed. Generally, IPM involves six steps:

1. Accurately identify the pest
2. Understand the biology and ecology of the pest
3. Monitor the environment to determine the pest levels
4. Determine when action is required
5. Select an appropriate course of action
6. Gather data and evaluate results

Within this curriculum these steps have been simplified to four "inPESTigation" steps: identify, decide, act, and evaluate.

Pest management is improved when more individuals within a particular environment, like a classroom or school, are involved in the process. Students and teachers primed to spot the signs of pests can help janitorial staff. Community participation is especially crucial for initiatives to prevent the environmental conditions for the emergence of pests.

Teachers can play a significant role in shaping students' participation in collective efforts of social concern. It wasn't that long ago that recycling was a novel practice. Now the recycling bin is ubiquitous in our homes and workspaces. Most schools have recycling programs that teachers help to implement in their classrooms, which encourages children to look at their trash differently and sort it accordingly. One goal of IPM is to similarly socialize children to be thoughtful about the effects of their everyday actions on the living world both inside and outside the classroom. Guided by their teachers, students will become "inPESTigators" who see pests and human spaces differently and can develop ways to ensure the healthiest spaces possible.

# GETTING STARTED

## Introduction

### Teaching science through IPM

IPM presents an opportunity for the application of a scientific way of thinking to a real-world problem. The overarching goal of this curriculum is to prepare students to be informed, thoughtful, and proactive participants in the spaces they inhabit, including the classroom, school, and home. Students will learn that part of that participation involves careful inquiry so pests can be managed in ways that promote their own and others' health and wellbeing.

Such inquiry involves engagement with the core ideas, skills, and language of science addressed by the local, state, and national standards, including the Next Generation Science Standards. The core scientific ideas covered by this curriculum include the structure and function of living things, features of habitats, and the interdependent relationship of living things within ecosystems. Students will also practice using the scientific skills of gathering, sorting, and interpreting data as evidence to test claims. They will consider how evidence is important for making sound decisions about pests. The language demands required for successful, equitable participation in an IPM inquiry, including the linguistic structures for sharing ideas and communicating cause-and-effect, are also addressed in the lesson plans.

### Curricular design and use

The curriculum is built upon problem and inquiry based design principles that emphasize empirical observation and prior knowledge as starting points for engaging scientific investigation that leads to learning. Each lesson is framed by guiding questions derived from specific learning goals. To promote and assess learning, students are asked to document and share their thinking as much as possible. The lesson plans have questions embedded within them for teachers to use to elicit

and probe students' thinking. Also, the worksheets employ sentence stems to guide student responses, especially with making evidence-based claims. Finally, all handouts have been developed for easy insertion into science notebooks.

The curriculum is comprised of five 50-minute lessons that require minimal supplies and preparation time. In the first lesson, students consider what a pest is and why they are problem. From there they consider the properties of living things and the key features of insects and plants as they work to accurately identify and organize common pests into a dichotomous key. The third lesson discusses habitats and how organisms are suited to survive within them. The fourth lesson introduces students to the IPM steps, and then puts their inPESTigation knowledge and skills to the test through real-life case studies. In the final lesson, students inPESTigate their classroom and develop a plan to keep their classroom pest free.

Though designed as a stand-alone unit, this curriculum can be integrated with other life science and health curricula. For example, you may find that the second and third lessons on properties of living things and habitats overlap with other life science curricula that you use. Instead of teaching the IPM versions, you may choose to adapt lessons from your curricula to address the IPM learning goals (see Curricular Connections in appendix).

### Have fun inPESTigating!

Pests are no fun, but it can be fun to study and understand them. By choosing to implement this curriculum you have signaled your commitment to teaching students how they can work together to establish happy, healthy environments through the use of science. We hope the experience proves rewarding!

For more information on school IPM, please visit:

- <http://ipm.agsci.colostate.edu/>
- <http://schoolipm.wsu.edu>
- <http://npic.orst.edu/pest/schoolipm.html>

# GETTING STARTED

## Curriculum Overview

The overall goal of the curriculum is to assist with preparing students to be informed, thoughtful, and proactive participants in their physical environments, both in the classroom and school as well as at home. Students will learn that part of that participation involves helping to manage pests in ways that promote their own and others' health and well-being.

Topic	Learning Objectives	NGSS Standards	Guiding Questions	Lesson Overview
<b>Lesson #1:</b> Pesky Pests	<ul style="list-style-type: none"> <li>• Students can show that they understand that a pest is any organism that has a detrimental effect on people or the environment.</li> <li>• Students can explain that some pests are harmful to human health, especially as carriers of disease.</li> <li>• Students can show that they know that some viruses and bacteria are pathogens that can cause disease.</li> </ul>	4-LS1-1 4-LS1-2	<ul style="list-style-type: none"> <li>• What is a pest?</li> <li>• Why are pests a problem?</li> <li>• What experiences have we had with pests? When we've come across pests, what have we done or seen done?</li> </ul>	Students start their journey to becoming trained "InPESTigators". They begin by considering what makes a plant or animal a pest and why we care about pests. Then they establish criteria for classifying organisms as pests and use clues to decide if an organism is a pest or not. This will require them to support their claims of pest/not-pest with evidence.
<b>Lesson #2:</b> What type of pest is it?	<ul style="list-style-type: none"> <li>• Students can demonstrate that they understand that living things 1) have a life cycle of birth, growth, reproduction, and death and 2) need water, food, and shelter to survive.</li> <li>• Students can show that they can identify specific pests based on their physical and behavioral features. This includes               <ul style="list-style-type: none"> <li>• showing that they can use basic insect parts to identify and differentiate the insect pests;</li> <li>• showing that they know that organisms produce chemicals called pheromones that act as signals for behavior (i.e., "Follow me!").</li> <li>• showing that they know that some organisms live in social groups of various sizes to enable survival.</li> <li>• showing that they know that we often don't see pests because they are nocturnal and active at night.</li> </ul> </li> </ul>	3-LS1-1 3-LS2-1 4-LS1-1 4-LS1-2 5-LS1-1	<ul style="list-style-type: none"> <li>• What makes something alive?</li> <li>• What do we need to know to accurately identify pests?</li> <li>• What are some common pests where we live and go to school?</li> </ul>	In this lesson students learn that good inPESTigators can identify specific pests. First they will decide what makes something alive and consider basic survival needs. Then they will work with a partner to match pictures of pests to their descriptions. With these pest pictures they will create dichotomous keys that organize the pests based on their characteristics. Students will use basic physical features, including the names of insect parts, to justify their organizational choices. Students will demonstrate their identification skills by using their keys to describe and pose questions about pests while playing the game I Spy.

# GETTING STARTED

## Curriculum Overview

Topic	Learning Objectives	NGSS Standards	Guiding Questions	Lesson Overview
<p><b>Lesson #3:</b> Why does it live here?</p>	<ul style="list-style-type: none"> <li>• Students can show that they understand how organisms can live within certain ecosystems because they offer good habitats that are sufficiently warm or cool and meet an organism's needs for water, food, and shelter.</li> <li>• Students can demonstrate that they know how ecosystems provide good habitats for some creatures and not others.</li> <li>• Students can show that they understand how a classroom can be a habitat more or less suitable for the survival of pests.</li> </ul>	3-LS4-3	<ul style="list-style-type: none"> <li>• What do living things need to survive?</li> <li>• What makes a place a good habitat for survival?</li> <li>• How can a classroom be a good habitat for pests?</li> </ul>	<p>In this lesson students learn that good inPESTigators understand the habitats that pests prefer, which can help them to control pests. Students will first consider what a habitat is and how ecosystems compare. Then they will imagine that they have discovered a mystery creature and must decide where it might have lived based on its survival needs. Finally, they will consider how their classroom may be a habitat for pests.</p>
<p><b>Lesson #4:</b> Managing Pesky Pests</p>	<ul style="list-style-type: none"> <li>• Students show that they understand the IPM steps of identify, decide, act, and evaluate by successfully using them in simulated inPESTigations. As evidence of understanding, student will demonstrate that they               <ul style="list-style-type: none"> <li>• can use evidence to designate a living organism as a pest and accurately identify it;</li> <li>• can use evidence to decide whether or not the pest poses a health risk and needs to be managed</li> <li>• know that there are various ways of managing pests;</li> <li>• know how to monitor a proposed method for managing a pest and decide whether or not that method is working.</li> </ul> </li> <li>• Students demonstrate that they can share the findings of their inPESTigations with others.</li> </ul>	3-LS4-4 5-ESS3-1	<ul style="list-style-type: none"> <li>• What can we do if we spot a creature or plant that we think is a pest?</li> <li>• What are the different ways to manage a pest?</li> <li>• What is the best way to control a pest?</li> </ul>	<p>In this lesson students will use knowledge from the first three lessons to address case studies from the InPESTigator Files. They will learn the basic steps for successful IPM by engaging three of the Files and discussing their strategies. First, the whole class will consider the same File and establish the InPESTigation steps. Then students will work together to address two more Files by using the steps and justifying their choices. By successfully completing the third file, students will earn an official InPESTigator badge.</p>

# GETTING STARTED

## Curriculum Overview

Topic	Learning Objectives	NGSS Standards	Guiding Questions	Lesson Overview
<b>Lesson #5:</b> A Classroom InPESTigation	<ul style="list-style-type: none"><li>• Students will show that they can use the inPESTigation steps to identify and assess the scope of any pest problems in their classroom and. Students will be able to<ul style="list-style-type: none"><li>• discover potential pests;</li><li>• determine if organisms are pests or not.</li><li>• use evidence to estimate the number of pests and how much of a problem they pose;</li><li>• propose and justify ways to manage pests;</li><li>• suggest ways to monitor and assess whether or not proposed ways for managing pests are working.</li></ul></li><li>• Students demonstrate that they can share the findings of their inPESTigations with others.</li><li>• Students can show that they know ways to address and reduce classroom pests.</li></ul>	3-LS4-4 5-ESS3-1	<ul style="list-style-type: none"><li>• What do we do if we find pests in our classroom?</li><li>• What can we do to manage pests and keep them out of our classroom?</li></ul>	In this lesson students will conduct an InPESTigation of their classroom. They will review the InPESTigation steps and consider the places within the classroom that may be most suitable for pests. Then they will work in pairs to explore the classroom and consider what to make of the various pests and pest clues that have been placed throughout the classroom by the teacher. Students will formulate plans to address the discovered pests and report them to the class. Students will conclude the lesson and unit by creating a Pest-free Classroom poster with strategies for handling pests and keeping pest out.

# GETTING STARTED

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Timing Key (20 : 0 / 20 / 50 minutes)

Total time for section

Minute to begin on

Minute to end on

Total minutes in lesson

# LESSON #1

## Pesky Pests

### Overview:

In this lesson students start their journey to becoming trained “InPESTigators”. To start they will consider what makes a plant or animal a pest and why we care about pests. They will also consider how pathogens cause disease. They will establish criteria for classifying an organism as a pest, and then do an activity where they use clues to decide if an organism is a pest or not. They will need to support their claims of pest/not-pest with evidence.

### Learning Objectives:

1. Students can show that they understand that a pest is any organism that has a detrimental effect on people or the environment.
2. Students can explain that some pests are harmful to human health, especially as carriers of disease.
3. Students can show that they know that some viruses and bacteria are pathogens that can cause disease

### Preparation :

- Have the Guiding Questions and Vocab Words visible in the classroom.
- Have a copy of InPESTigator File #1 ready to read to the class.
- Have the Pest/Not-pest Checklists and Pest/Not-pest Data Sheets copied (1 per student).
- Cut out the Pest/Not-pest cards. Tape them to the Pets/Not-Pest Data Sheets in the appropriate box.

### Guiding Questions :

1. What is a pest?
2. Why are pests a problem?
3. What experiences have we had with pests?

### Materials :

- InPESTigator File #1 – More Challenging
- Handout – Pest/Not-pest Checklists
- Handout – Pest/Not-pest Data Sheet
- Markers or pencils safe for making marks on paper taped to students’ backs
- Scotch tape and masking tape

### Language & Literacy

**Essential Vocab:**  
pest, disease

**Useful Vocab:**  
pathogen, organism

### Language Demands:

To successfully participate in this lesson, students will need to have the language for communicating that something, like an organism, is or is not something.  
They will also need to understand the syntactic structure of using evidence to support a claim (i.e., “I think \_\_\_\_\_ because of X, Y, and Z.”).

# LESSON #1

## Pesky Pests

### Opening (15: 0/15/50 minutes)

#### Engage

Begin by reading the more challenging InPESTigator File #1 to the class. After reading the story, pose the following questions and solicit responses from students (at this point in the unit, do not offer identifications of the pests or affirm/deny students' ideas):

- What do you think is causing the problem? How do you know what it is?
- What do you think should be done about the problem?

#### Lesson and Unit Goals

Explain how this unit is about pests and how we can effectively control them. Their job is to learn enough about pests to successfully solve some pest problems and become an official "InPESTigator". Show the inPESTigator badge. Explain that, once they have earned their badge, they will be able to effectively inPESTigate their classroom.

Today they will take their first step to becoming an InPESTigator by showing that they know what a pest is and is not and why pests are a problem.

#### Defining "pest"

Write the word "pest" somewhere where students can see it. Ask students what they know about the term. How would they define it? Write down their thoughts, and offer the definition that scientists use:

**A pest is any living thing that causes harm to people or the environment.**

Have them share their personal experiences with pests.

#### Pest vs. Not pest

Before handing out the Pest/Not-pest Checklists, gather student ideas by asking, What do you think makes something a pest? How do you know a pest when you see one? Document students' idea up on a board or overhead. After considering the pros and cons of their ideas, hand out a checklist to each student (if using notebooks, have them paste in the sheets). Students should add criteria from the class discussion to their checklists.

#### Defining "pathogen"

One of the major criteria for classifying pests is if they cause disease. Ask students about being sick – it's yucky! Ask if they know how people get sick. Building on their ideas, explain that "pathogens" make us sick:

**A pathogen is a microorganism such as a viruses or bacteria that causes disease.**

It is not crucial that students accurately define pathogen; more important is that they understand how some pests can make us sick. They can also trigger allergies.

# LESSON #1

## Pesky Pests

Activity (25: 15/40/50 minutes)

### Pest or Not a Pest?

#### Setting up the Idea

Explain that students will use their pest checklists to examine clues and determine if a plant or animal is a pest or not. Explain that the clues will be on a card/form that they will have taped to their back. Students will NOT know what their plant or animal is on their back and should not look at it until after the activity.

Explain that they need to walk around and visit as many members of the class as they can within 8-10 minutes. They should read the clues on the Pest Card and decide if the person is a pest or not. They should carefully use a pencil or marker to mark their decision on the person's Pest/Not-pest Data Sheet in the table.

Remind them to make up their own mind. Even if several people have decided that an organism is a pest, they should feel free to disagree and mark it as "not-pest". Explain that there are no right answers in this activity, only decisions or claims based on evidence.

#### Go to it!

Have students line up. Tape the Pest/Not-pest Data Sheets with the Pest Cards attached to students' backs. Once everyone is "taped", have students walk around, looking at one another's cards and deciding if the person is a pest or not.

Note! It is not necessary that the students read and classify all of their peer's Pest Cards. The goal is for each student to have enough data from their peers to consider.

#### Data counts

Once the time is up, have them remove the Pest/Not-pest Data Sheets from their backs. Have them take a seat and count up the number of marks in each column of their table.

#### Analysis

Have students write short responses to the following prompt on their data sheets:

\_\_\_\_\_ students decided that I was a pest, and \_\_\_\_\_ decided that I was NOT a pest.

I think that I (circle one) am / am not a pest because \_\_\_\_\_.

\_\_\_\_\_ students decided that I was a pest, and \_\_\_\_\_ decided that I was NOT a pest.

I think that I (circle one) am / am not a pest because:

# LESSON #1

## Pesky Pests

### Conclusion (10: 40/50/50 minutes)

#### Group results

Gather some quick data and write it where all students can see it, including:

- How many total pest and not-pest marks did they count in their data tables?
- How many of them agreed with their classmates' assessment of them as a pest or not pest?
- Which plants and animals proved most difficult to classify as pest vs. not pest? Where is there the most disagreement?

#### All class discussion

Review the group results and have students share explanations for discrepancies. NOTE that students may not know what certain organisms are or whether or not they are dangerous. That's okay. Explain that this is why it is important to correctly identify and study organisms that we don't know. They will learn to identify pests in the next lesson.

Then have students share their short responses. Did they agree with their classmates? Why or why not? Also, have them discuss the plants and animals that seemed most difficult to classify.

#### Wrap up

Conclude by reviewing what a pest is and why it matters that we work to classify pests. Mention that we don't want to harm or kill helpful plants and animals! But we also don't want certain plants and animals to be harmful to people and the environment.

# Pest/Not-Pest Checklists

## Is it a pest?



Consider these questions:

- Is it bothering me?
- Is it in my living space?
- Was I told to be scared of it?
- Can it sting or bite me?
- Is it poisonous?
- Does it carry disease or make me sick?
- Does it give me a rash?
- Is it pushing out other things that are living there?
- Is it destroying my house or school?

*If you answered "yes" to any of these questions, then you may have spotted a pest.*



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# LESSON #1

## Pesky Pests

### Pest-Non-Pest Materials

#### Instructions

This activity will require students to:

1. Decide if the organisms displayed by fellow students on their backs are pests or not, and
2. Mark these decisions in the table on the data sheets.

After cutting out the cards, tape them onto the Pest/Not-pest Data Sheets. These sheets will then be taped onto students' backs

**Pest/Not-Pest Data Sheet:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Tape Pest Card Here

Look at your data table. Count the marks and complete the following statements:

\_\_\_\_\_ students decided I WAS a pest, and  
\_\_\_\_\_ students decided I WAS NOT a pest

I think that I (circle one) **am** / **am not** a pest because:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Pest	Not Pest

**Step 1:**  
Tape Pest Cards  
onto data sheets

#16



I am a **field mouse**.

You saw me run across the road  
into a bunch of wild grass.

**Step 2:**  
Tape data sheets onto students' backs.  
This may require masking tape to stay  
stuck during the activity. Also, it may  
help to fold the data sheet in half.

# Cut Out the Pest Cards

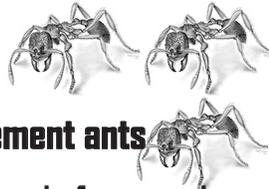
#1



I am a **pavement ant**

You saw me crawling along the sidewalk by myself on your way to school.

#2



We are **pavement ants**

You saw several of us crawling on a sticky table in the classroom.

#3



I am a **moth**.

I landed on your arm out on the playground.

#4



I am a **butterfly**.

I landed on your arm out on the playground.

#5



I am a **bed bug**

You found one of me crawling on the back of a classmate's shirt. The classmate has red bumps.

#6



We are **fruit flies**.

You see many of us landing on a banana peel on the floor in the classroom.

#7



I am a **mosquito**.

You saw me on your arm.

#8



I am a **wolf spider**.

You saw me in the grass next to the school.

#9



I am a **black bear**.

You saw me by some trash cans on your way to school.

#10



I am a **raccoon**.

You saw me walking along the side of a creek.

#11



I am a **big brown bat**.

You noticed guano (bat poop) by the school door.

#12



I am a **big brown bat**.

You spotted me one evening flying around eating bugs, like mosquitoes.

#13



I am a **wasp**.

You saw me building a nest near the door to the school.

#14



I am a **honeybee**.

I was buzzing around a light in your classroom.

#15



I am a **honeybee**.

You saw me land on some flowers growing next to the school.



# Cut Out the Pest Cards

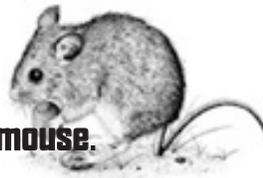
#16



I am a **field mouse**.

You saw me run across the road into a bunch of wild grass.

#17



I am a **field mouse**.

You found several of my poops under the sink in your classroom.

#18



I am a **house sparrow**.

You saw me hopping around under a picnic table eating crumbs.

#19



I am a **house sparrow**.

You saw me fly into a nest above the school door. I pooped on the door handle.

#20



I am a **northern flicker**.

You heard me banging on the side of your school.

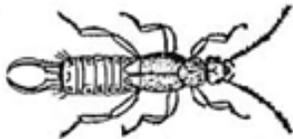
#21



I am a **northern flicker**.

You saw me in a tree near your school.

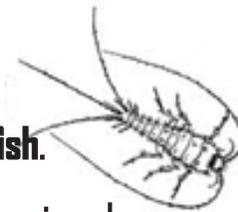
#22



I am an **earwig**.

You saw many of me crawling on plants in the vegetable garden.

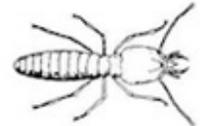
#23



I am a **silverfish**.

You saw me running along the floor next to the drinking fountain.

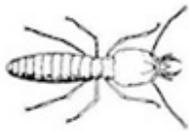
#24



I am a **termite**.

You found me hiding underneath a dead log in the forest.

#25



I am a **termite**.

You saw me in a corner of your classroom.

#26



I am **purslane**.

You saw me growing in the cracks in the school parking lot.

#27



I am **St. John's wort**.

You saw my pretty yellow flowers in a neighbor's garden.

#28



I am **St. John's wort**.

You noticed many of me along the road on the way to school.

#29



I am a **dandelion**.

You saw many of me growing in cracks on the sidewalk in front of the school.

#30



I am a **dandelion**.

You saw me in a baseball field near the school building.



# Pest/Not-Pest Data Sheet:

Tape Pest Card Here

Pest	Not Pest

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Look at your data table. Count the marks and complete the following statements:

\_\_\_\_\_ students decided I WAS a pest, and  
\_\_\_\_\_ students decided I WAS NOT a pest

I think that I (circle one) **am / am not** a pest because:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Pest/Not-Pest Data Sheet:

Tape Pest Card Here

Pest	Not Pest

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Look at your data table. Count the marks and complete the following statements:

\_\_\_\_\_ students decided I WAS a pest, and  
\_\_\_\_\_ students decided I WAS NOT a pest

I think that I (circle one) **am / am not** a pest because:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# LESSON #2

## What Type of Pest is it?

### Overview:

In this lesson students learn that good inPESTigators can identify specific pests. First they will decide what makes something alive and consider basic survival needs. Then they will work with a partner to match pictures of pests to their descriptions. With these pest pictures they will create dichotomous keys that organize the pests based on their characteristics. Students will use basic physical features, including the names of insect parts, to justify their organizational choices. Students will demonstrate their identification skills by using their keys to describe and pose questions about pests while playing the game I Spy.

### Learning Objectives:

1. Students can show that they understand that living things 1) have a life cycle of birth, growth, reproduction, and death and 2) need water, food, and shelter to survive.
2. Students can show that they can identify specific pests based on their physical and behavioral features. This includes
  - showing that they can use basic insect parts to identify and differentiate the insect pests;
  - showing that they know that organisms produce chemicals called pheromones that act as signals (i.e., "Follow me!");
  - showing that they know that some organisms live in social groups of various sizes to enable survival;
  - and showing that they know that we often don't see pests because they are nocturnal and active at night.

### Guiding Questions :

1. What makes something alive?
2. What do we need to know to identify pests?
3. What are some common pests where we live and go to school?

### Materials :

- Handout – My Dichotomous Key
- Handout – Insect Parts Guide
- Sets of 8 Pest Pictures & Descriptions

### Preparation :

- Have the following ready for each pair of students:
  - Sets of 8 **Pest Pictures & Descriptions** in envelopes or sandwich bags. Color copies are better for identification.
  - Copies of **Insect Parts Guide**.
- Copies of **My Dichotomous Key** (1 per student)
- Have the **Dichotomous Key Example** ready to show students (e.g., on a document camera). Cut out the four example creatures on the example.

### Language & Literacy

#### Essential Vocab:

dichotomous key, life cycle, pheromones, social group, nocturnal

#### Useful Vocab:

insect parts (antenna, head, thorax, node, abdomen, mouth parts, wings)

#### Language Demands:

Students will need descriptive language for size and shape as well as color. This lesson uses a definition of "key" that is different from the more familiar definition as something used to open locks. Finally, students will need to have the language for using evidence to support a claim (i.e., "I think the animal/plant/insect is a \_\_\_\_\_ because of X, Y, and Z.").

# LESSON #2

## What Type of Pest is it?

### Opening (10: 0/10/50 minutes)

#### Engage

Begin by posing the following scenario to students:

*A friend runs up to you and says that he has found a really cool brown bug crawling on the playground. He wants to know if you will pick it up for him because he wants to bring it in to share with the class. Will you help him?*

Students may have a range of responses based on their comfort with insects. Guide them to ask the question: What kind of bug is it? Mention that it helps to know what the bug is and what danger it may pose if it is handled and brought into the class.

#### Lesson and Unit Goals

Read the guiding questions for today's lesson. Today they will further their inPESTigation skills by identifying and grouping specific pests by their behaviors and physical features.

#### Activate prior knowledge about what makes things alive

Begin by explaining that before we group pests, it is important to keep in mind that pests are living things. Ask students, What makes something alive? After collecting students' ideas, ask them, Are rocks alive? After they say "no" ask, How do you know?

Collect student responses. Then pose the question: So what clues can help us decide that something is alive? Collect students' ideas. Be sure that the list includes the basic components of the life cycle (birth, growth, reproduction, and death) and necessities of food, water, and protection (or shelter).

# LESSON #2

## What Type of Pest is it?

**Activity** (30: 10/40/50 minutes)

### Identifying Pests

#### Setting up the Idea

Explain to students that there are two parts to this activity, a matching activity done in pairs and the creation of a dichotomous key done individually.

#### Part 1 - Matching (10 minutes)

Explain that their task is to match 8 pictures of pests to descriptions that include behaviors, preferences, and common signs. To complete this task they will need to reference the Insect Parts Guide, which lists the basic physical features of insects. Hand out the guides. Discuss the insect parts and how the ant and wasp are similar and different.

Have the following terms defined where students can reference them:

**Pheromones** are chemical signals used for communicating ("Follow me!").

A **social group** is collective of animals living and working together to survive.

**Nocturnal** creatures prefer to come out at night and sleep during the day.

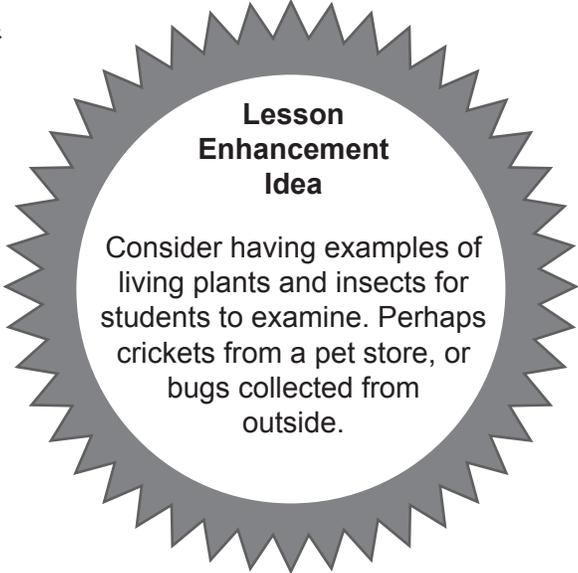
Briefly review the terms with students. Mention how some pests are nocturnal, live in social groups, or communicate with pheromones.

#### Go to it!

Put students into pairs. Give each pair a set of 8 Pest Pictures & Descriptions. Ask them to read the clues and match the pictures to descriptions.

#### Discuss matches

Once they have finished matching, discuss their decisions as an entire class to ensure accuracy.



#### Lesson Enhancement Idea

Consider having examples of living plants and insects for students to examine. Perhaps crickets from a pet store, or bugs collected from outside.

# LESSON #2

## What Type of Pest is it?

### Part 2 – Dichotomous Key (20 minutes)

Show the Dichotomous Key Example and define “dichotomous” and “key”. Then walk students through the example by moving the four creatures (snake, hen, lizard, duck) along the key from the start. At each yes/no question, divide the creatures accordingly. Continue until they are in the right boxes.

**Dichotomous refers to dividing things into two groups.**

**A key is a way that scientists organize and group things to tell them apart.**

**A key reveals how things are similar and different so they can be identified.**

### Go to it!

Once students seem to understand the process, explain that they will create their own key with 4 pests. They should split the 8 pests shared with their partner during the matching activity into two groups, one for each partner. Hand out the My Dichotomous Key forms to students. Mention that they will divide their 4 pests by coming up with yes/no questions.

Show students how to place their 4 pests in the boxes in the bottom, just as in the example. At each division point, they will pose a yes/no question that divides the pests into two groups. They should move the pests up along their key as they pose questions and divide their pests. Have them start by asking a yes/no question that splits the 4 pests into two groups of two pests each. Students should continue posing and writing down yes/no questions to split up their pests until each pest is by itself. You may choose to have students glue or tape their pests to their keys if you don't plan on reusing the pest cutouts.

NOTE: Students may ask a first question that divides the pests into groups of three and one. This will lead to a key that looks different than the template. You may choose to permit some students to do this, though we recommend having students follow the template. Also, depending on your students and the amount of time you have, you may decide to have them do a larger dichotomous key with 8 or more pests. This can be done on a sheet of poster paper.

### Share dichotomous keys

Have volunteers share their keys with the group, and invite comments about differences between the keys

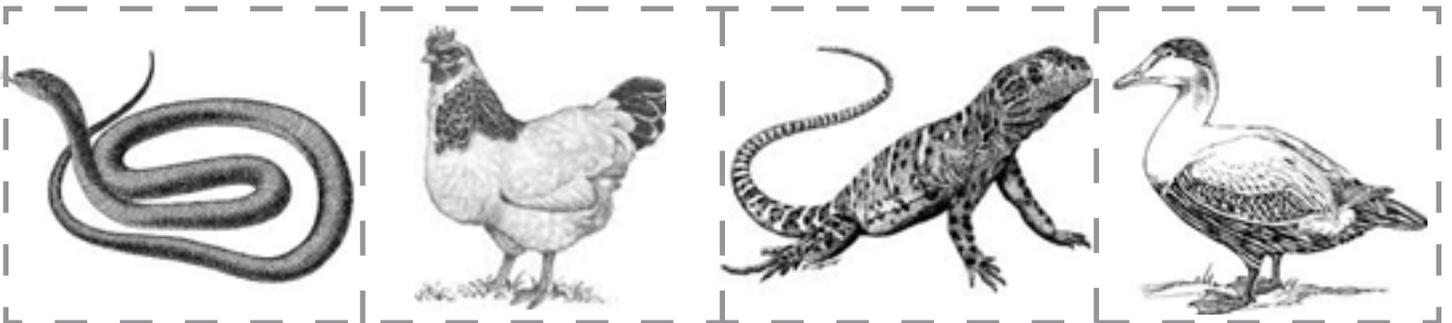
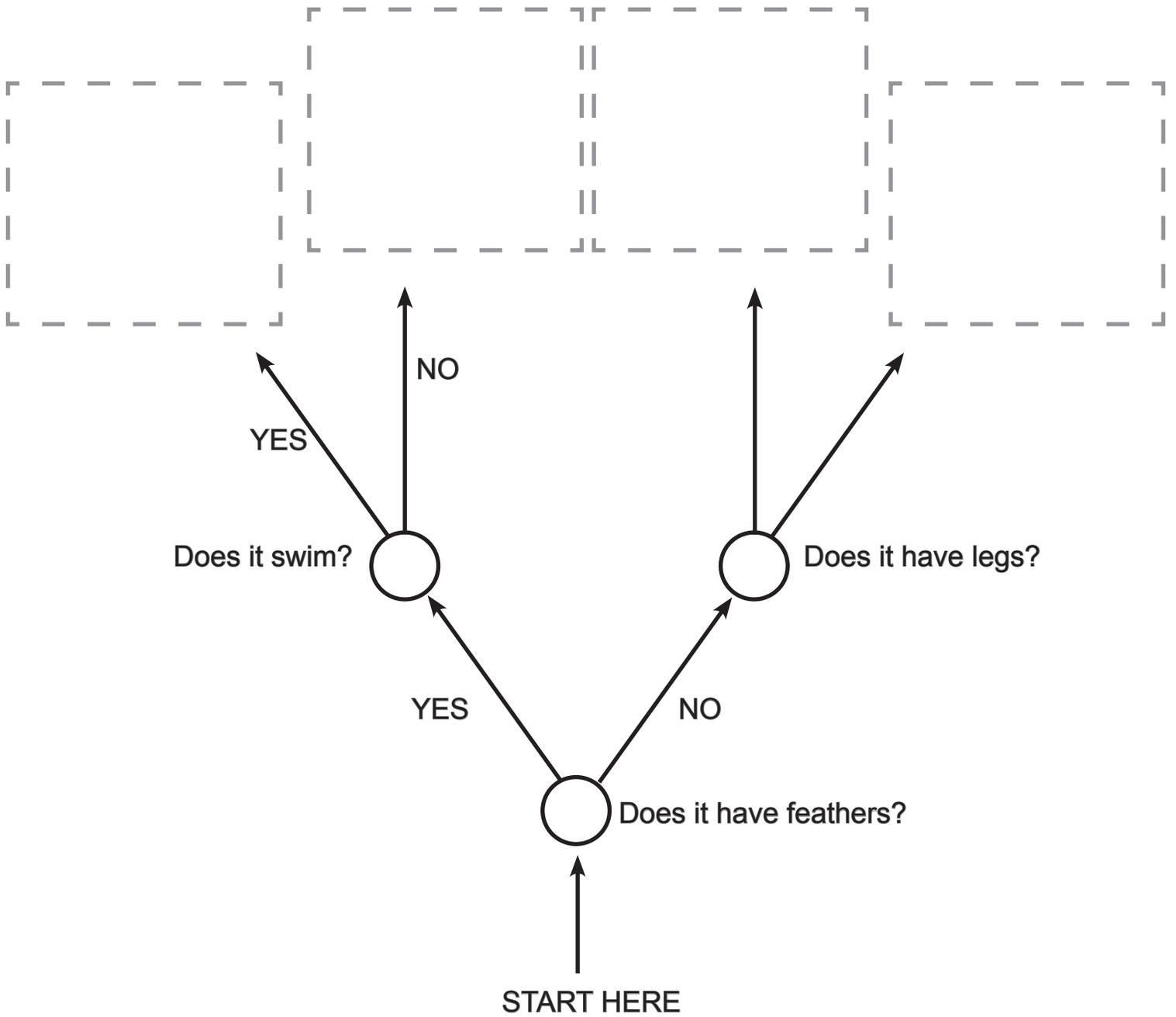
### Closing (10: 40/50/50 minutes)

#### Wrap up assessment: I Spy... Pests!

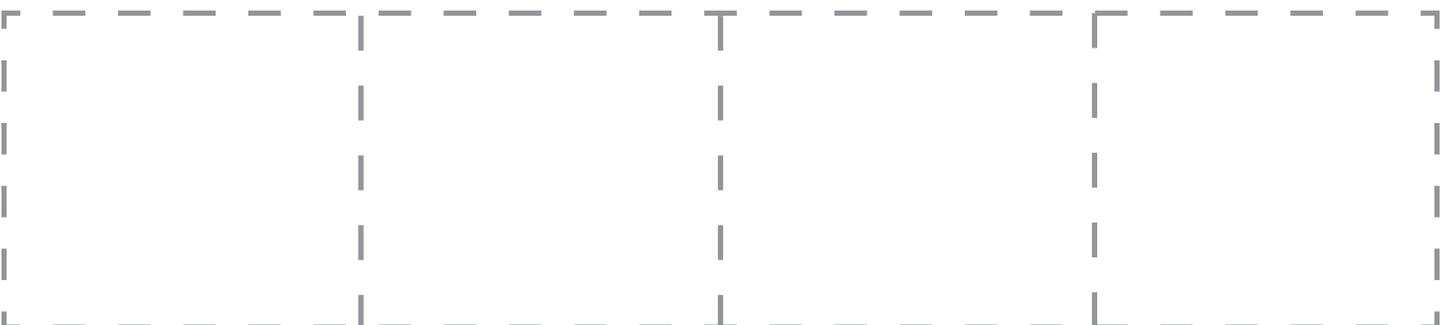
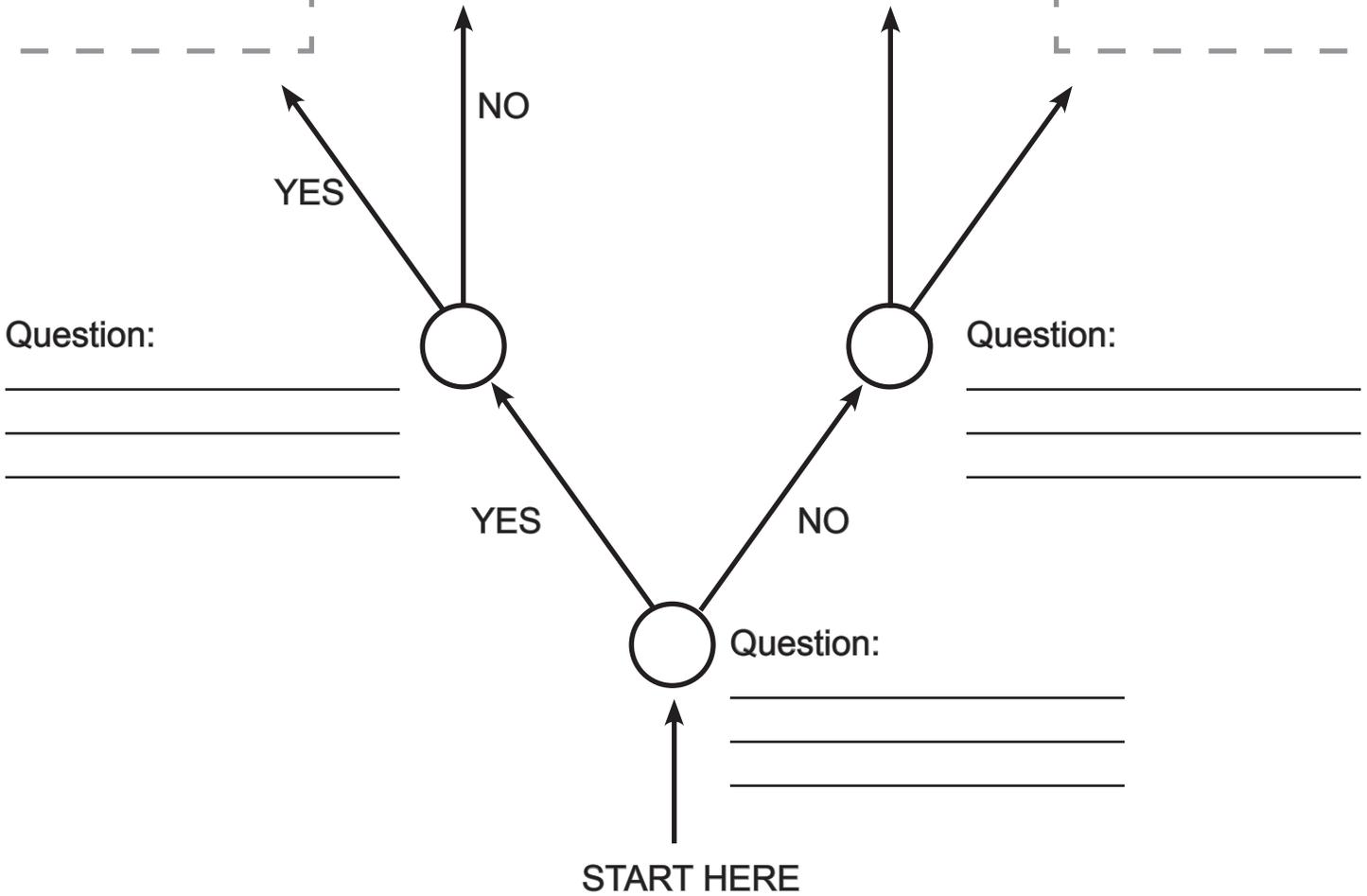
Remind them of the story of the friend who wanted them to pick up the brown bug. Ask them, *Can you identify it?* Ask them, *What would you need to know to identify the bug?*

Finally, play a round of the game *I Spy*. Have individual student take turns “spying” a pest on their key: *I spy something brown (or crawly, or spiny, or fuzzy)*. Then invite students to ask clarifying questions based on the pest descriptions. *Does it have stripes on its abdomen? Does it fly? Is it nocturnal?*

# Dichotomous Key Example



# My Dichotomous Key



Place Your Pests in the Boxes

# Pest Pictures & Descriptions

## Odorous House Ant

- Six legs
- One node between thorax and abdomen
- Nests indoors and outdoors
- Lives in social groups
- Uses pheromones to communicate
- Produces a coconut odor when disturbed



## Pigeon

- 12-15 inches tall
- Mostly eats grain and seed
- Build nests of twigs, grass, and sticks
- Often build nests on buildings



## Pavement Ant

- Six legs
- Two nodes between thorax and abdomen
- Nests under stones and pavement
- Lives in social groups
- Uses pheromones to communicate



## House Mouse

- 5-8 inches long, including tail
- Feeds mostly at night (nocturnal)
- Builds nests of paper, cardboard, fabric, and other soft materials



# Pest Pictures & Descriptions

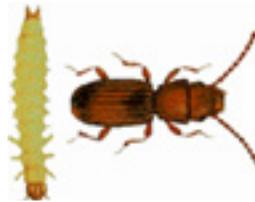
## Pharoah Ant

- Six legs
- Orange head/thorax, darker abdomen
- Two nodes between thorax and abdomen
- Likes to nest indoors in warm areas
- Lives in social groups
- Uses pheromones to communicate



## Grain Beetle

- Six legs
- Red to brown in color
- Lays eggs in grains and beans, which hatch into larva



## German cockroach

- Six legs
- Light brown with dark strips on thorax
- Will eat almost anything, including glue, toothpaste, and soap
- Prefer warm wetter areas, such as under sinks



## Yellow Jacket

- Six legs
- Thorax and abdomen are not hairy but smooth
- More yellow than paper wasp
- Smaller than paper wasp
- Eat insects and sweets



# Pest Pictures & Descriptions

## Bed Bug

- Six legs
- Drinks blood
- Feeds at night (nocturnal)
- Often found in beds



## Paper Wasp

- Six legs
- Thorax and abdomen are not hairy but smooth
- Mostly black with yellow markings
- Larger than yellow jacket
- Eats insects and sweets



## Head Lice

- Six legs
- Drinks blood
- Feeds day and night
- Lives in human hair



## Honey Bee

- Six legs
- Hairy body, including thorax and abdomen
- Makes honey
- Eats nectar and pollen
- Live in social groups within nests in hollow spaces in trees and walls



# Pest Pictures & Descriptions

## Fruit Fly

- Six legs
- Small, with large eyes and clear wings
- Adults can lay 500 eggs
- Eats rotting fruit and vegetables



## Boxelder Bug

- Six legs
- Mostly black and gray with orange and red markings
- Invades buildings in winter
- Likes to eat the seeds of boxelder trees



## Purslane

- Small leaves with reddish stems
- Can grow in hard, dry soils
- Leaves are dense and thicker
- Edible leaves

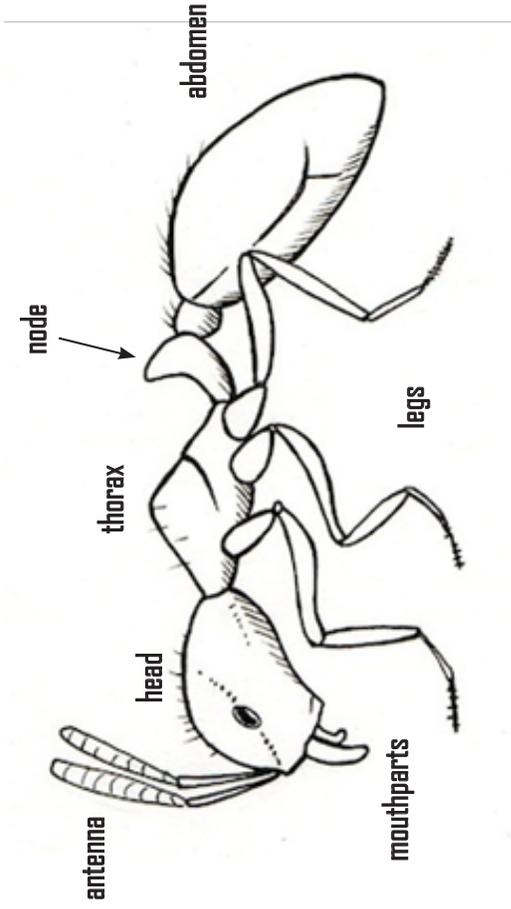


## Prostrate Knotweed

- Small leaves with greenish stems
- Can grow in hard, dry soils
- Can grow in cracks in pavement
- Leaves are spread out along stem

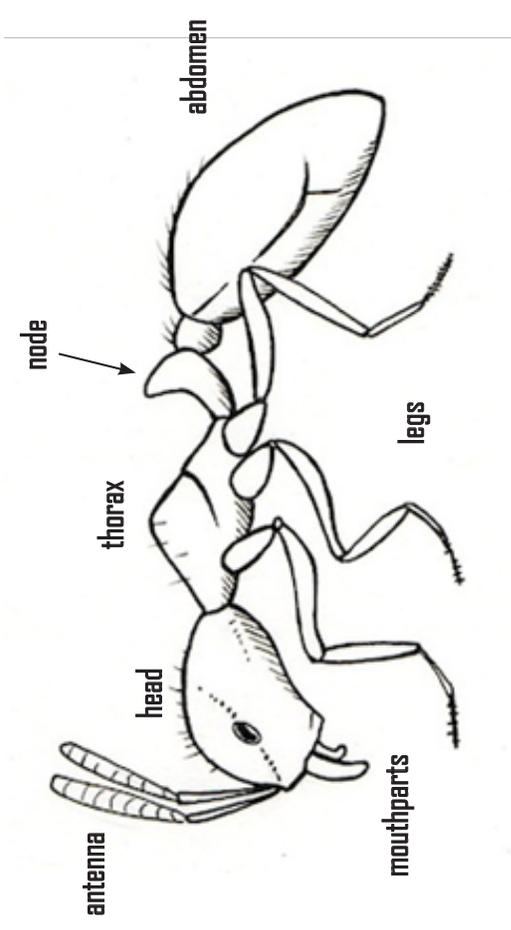


# Insect Parts Guide

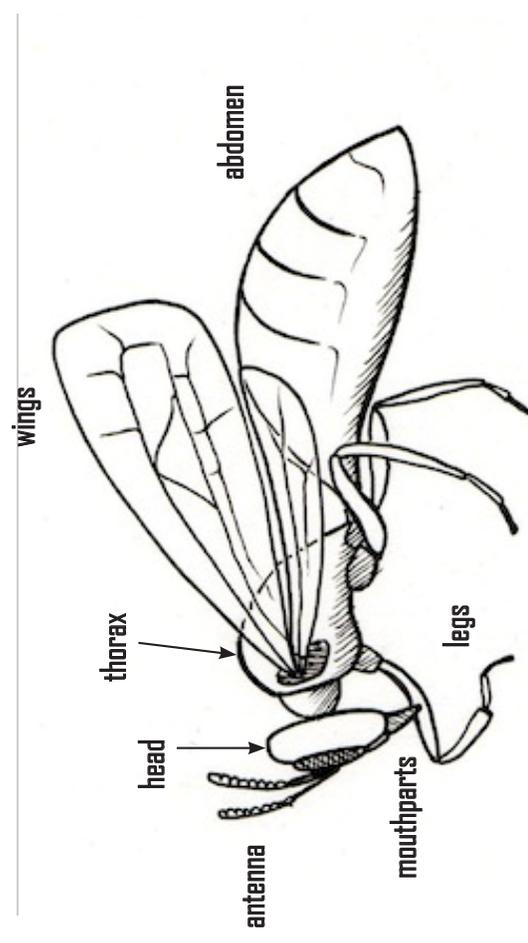
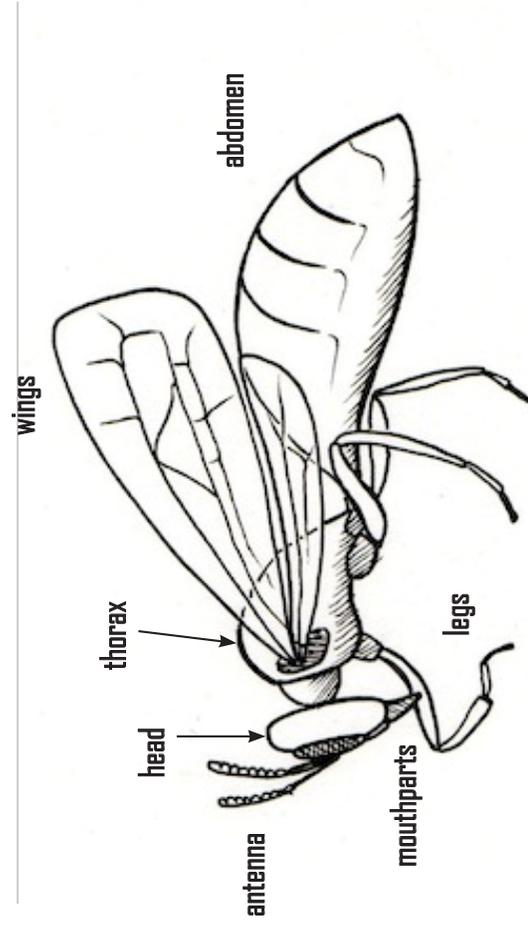


**NOTE!** Insects actually have six legs, three legs per side.

# Insect Parts Guide



**NOTE!** Insects actually have six legs, three legs per side.



# LESSON #3

## Why Does it Live Here?

### Overview:

In this lesson students learn that good inPESTigators understand the habitats that pests prefer, which can help them to control pests. Students will first consider what a habitat is and how ecosystems compare. Then they will imagine that they have discovered a mystery creature and must decide where it might have lived based on its survival needs. Finally, they will consider how their classroom may be a habitat for pests.

### Learning Objectives:

1. Students can show that they understand how organisms can live within certain ecosystems because they offer good habitats that are sufficiently warm or cool and meet an organism's needs for water, food, and shelter.
2. Students can demonstrate that they know how ecosystems provide good habitats for some creatures and not others.
3. Students can show that they understand how a classroom can be a habitat more or less suitable for the survival of pests.

### Guiding Questions :

1. What do living things need to survive?
2. What makes a place a good habitat for survival?
3. How can a classroom be a good habitat for pests?

### Materials :

- Handout – Three Ecosystems of the West
- Handout – My Mystery Creature
- Six-sided dice
- Drawing materials

### Preparation :

- Copies of the Three Ecosystems of the West and a way to show the handout to the entire class.
- Copies of the My Mystery Creature form ready (one for each student and one for the example).

### Language & Literacy

#### Essential Vocab:

ecosystem, habitat and its physical factors (e.g., temperature, presence of predators, and availability of light, food, and water)

#### Useful Vocab:

environment, conifer, suitable

### Language Demands:

Students will need language to compare relative amounts using descriptions of quantity, such as “a little” and “a lot”. Students will need language to describe a natural place and its basic natural features. As with previous lessons, students will need language to make evidence based claims (e.g., “I chose \_\_\_\_\_ because of X, Y, and Z.”).

# LESSON #3

## Why Does it Live Here?

### Opening (10: 0/10/50 minutes)

#### Lesson and Unit Goals

Remind them that in the last lesson they were introduced to a variety of pests. Today they will further their inPESTigation skills by considering why we find pests in certain locations, including human spaces like classrooms. Read the guiding questions for today's lesson.

#### Activate prior knowledge

Ask students what living things need to survive and how they are suited to get those things from where they live. Collect students' ideas about survival needs (e.g., food, water, shelter, temperature, etc.). Next, ask students, Does every place in the United States has the same food, water, etc.? The question is rhetorical, and students should say "no". Prompt them to offer examples of different types of natural places in the U.S. and the plants and animals that inhabit those places (e.g., forests, deserts, etc.). Mention that scientists call these places ecosystems:

**An ecosystem is a community of organisms and their environment. Ecosystems include all of the animals, plants, trees, water, and soil in an area.**

Within an ecosystem there can be many different **habitats**:

**A habitat is the place where an organism lives, and it can live there because that place has everything that the organism needs to survive. Each habitat is described by a set of basic conditions including: 1) water amount, 2) food type, 3) shelter type, and 4) temperature.**

# LESSON #3

## Why Does it Live Here?

Activity (30: 10/40/50 minutes)

### Mystery Creature

#### Setting up the Idea

– Hand out the Three Ecosystems of the West sheet. Read the descriptions of the ecosystems. Point out how each ecosystem contains different habitats in which a living thing could survive. Mention how the plants and animals that live in each place must be suited to survive in those conditions.

Of course, these ecosystems provide habitat for many real plants and animals that biologists can observe and study. But ask students to pretend that they have each discovered evidence of a new creature! All that they have are clues about the creature's survival needs. Their job will be to decide where their creature may have lived and what it may have looked like based on these needs.

#### Activity Steps:

##### 1. Start with an example

Make your example *My Mystery Creature* sheet visible for students as you walk them through it and fill it out.

Explain that they have discovered evidence of an ancient creature that may have lived somewhere in a plains, forest, or alpine meadow ecosystem. They have clues about the creature's survival needs, including how much water it needed and what type of food, shelter, and temperature it preferred. Their job will be 1) to place this creature in the most appropriate ecosystem and 2) draw what they think it looked like based on its survival needs.

Roll a six-sided die to determine each of the example creature's four survival needs using the table on the *My Mystery Creature* form. *NOTE that this random element of die rolling is merely a way to create intriguing combinations of survival needs. You may prefer to have students select a combination instead.*

Re-read the descriptions of the ecosystems aloud for students if necessary. Then have students compare the survival needs of the example creature to the ecosystem. Ask them, *Based on its needs, which ecosystem seems to offer the best habitat for our mystery creature?* Have them discuss their answers with a neighbor, and then the whole group. Be sure that students justify their choices.

##### 2. Have students go to it!

Hand out the *My Mystery Creature* forms and dice (1 die for every 2-3 students). Students will have fun rolling the dice to discover their creature's habitat needs. Be sure to encourage them to move on to selecting an ecosystem that they think offers their creature the best habitat. Have them name their creature and draw a picture of it on the back of the form.

# LESSON #3

## Why Does it Live Here?

### Discuss mystery creatures

Once finished, prompt students to explain why they selected certain ecosystems as suitable habitat for their creature. In some cases it may be that multiple habitats would have been suitable.

Some habitats will likely have more than one animal placed in it. Ask students, How do you think these creatures would interact? Would one eat the other(s)? Also have students share their drawings and explain their design decisions.

### Change the ecosystem and habitats (optional)

Push their thinking by selecting an ecosystem and asking students, What would happen to the creatures in an ecosystem if the temperature were to get hotter (or colder)? Students may note that the creatures will die. They may also mention that the creatures will move, or change locations (i.e., go somewhere colder/hotter). However, it is more likely that they will die.

Sometimes, however, creatures do move to new locations. Often humans introduce them, either on purpose or by accident. Ask students, What do you think happens when a plant or animal moves into a new location? If it doesn't come up, explain that sometimes animals and plants that move to new locations become pests because they pose a threat to the ecosystem's existing animals and plants. In the worst cases, they take over and the existing plants and animals become rare or die out

### Watch out for the transformationist belief!

Students may suggest that a creature can “adapt” or transform itself to survive (e.g., lose its fur, grow wings, get smaller, etc.). This is called a transformationist belief. It is understandable, but incorrect. Such physiological changes are impossible!

Changes in physiology require random mutations in genes that confer a survival advantage. This is a core aspect of natural selection. The scientific language of natural selection may be too advanced for elementary students, but the underlying ideas are not. If students express the transformationist belief, ask them questions to challenge it. For example, ask them, “If you wanted to warm up, could you grow fur like a bear or racoon?”

# LESSON #3

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## Why Does it Live Here?

### The Classroom Habitat (10: 40/50/50 minutes)

#### Look Around the Room

Have students discuss their answers to the following questions with a neighbor:

- Where is there water in the classroom?
- Where is there food in the classroom?
- Where could pests hide or find shelter in the classroom?

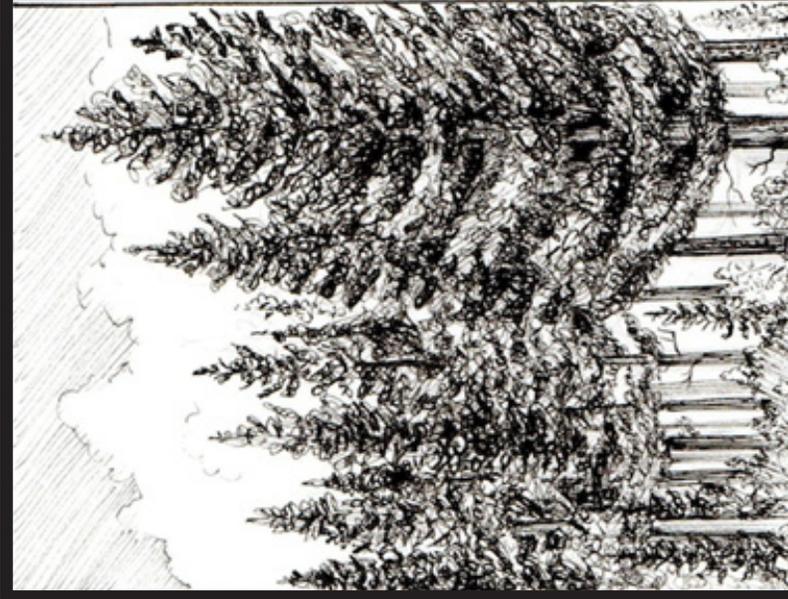
Have students share their responses to the questions. Mention that in the next two lessons they will look more carefully at the classroom and school ecosystem and the various habitats it provides for pests to survive.

# The Ecosystems of the West



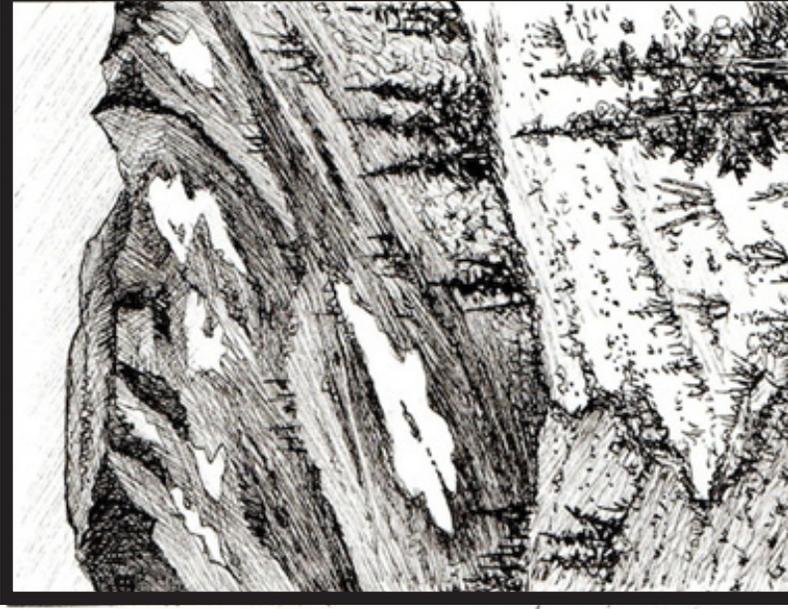
## The Plains

The plains are a harsh landscape with hot summers and cold winters. They are often dry and offer little water for living things. The grasses and shrubs provide some shelter from predators, though many creatures spend time underground. Small birds, reptiles, and mammals feed on insects, seeds, grasses and each other, while predatory birds hunt unsuspecting prey.



## Conifer Forests

The pine, fir, and spruce forests of the west shade a rocky ground covered in grasses, flowering plants, and leafy shrubs. In the mountains these forests offer cooler temperatures. Often there are streams and ponds in which aquatic insects and amphibians thrive. There are many places for large and small creatures to hide in the forests.



## Alpine Meadow

Up high the mountain air can be very cold. The wind can be strong, and the winter can bring deep snow that remains through the summer. Water rushes down creeks in the spring, often filling small lakes and ponds. There are many rocks and boulders. Many insects, birds, and mammals must survive on the small shrubs and flowering plants.

# My Mystery Creature:

My Creature's Survival Needs:

How much water?	
What kind of food?	
What type of shelter?	
What temperature?	

I think my creature lives in the \_\_\_\_\_  
because \_\_\_\_\_  
\_\_\_\_\_

## Survival Needs Table

Roll the dice for each survival need.



Survival Need	Die Roll					
	1	2	3	4	5	6
Water Amount	A little	A little	Some	Some	A lot	A lot
Food Type	Seeds	Plants	Insects	Meat	Seeds & insects	All types
Shelter Type	Trees	Shrubs	Grasses	Rocks	Under-ground	All types
Temperature	Cooler temp.	Cooler temp.	Warmer temp.	Warmer temp.	Hot temp.	Hot temp.

Draw a picture of your creature on the back of this sheet.

# My Mystery Creature:

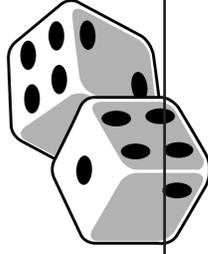
My Creature's Survival Needs:

How much water?	
What kind of food?	
What type of shelter?	
What temperature?	

I think my creature lives in the \_\_\_\_\_  
because \_\_\_\_\_  
\_\_\_\_\_

## Survival Needs Table

Roll the dice for each survival need.



Survival Need	Die Roll					
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Shelter Type	Trees	Shrubs	Grasses	Rocks	Under-ground	All types
Temperature	Cooler temp.	Cooler temp.	Warmer temp.	Warmer temp.	Hot temp.	Hot temp.

Draw a picture of your creature on the back of this sheet.

# LESSON #4

## Managing Pesky Pests

### Overview:

In this lesson students will use knowledge from the first three lessons to address case studies from the InPESTigator Files. They will learn the basic steps for successful IPM by engaging three of the Files and discussing their strategies. First, the whole class will consider the same File and establish the InPESTigation steps. Then students will work together to address two more Files by using the steps and justifying their choices. By successfully completing the third file, students will earn an official InPESTigator badge.

### Learning Objectives:

1. Students show that they understand the IPM steps of identify, decide, act, and evaluate by successfully using them in simulated inPESTigations. As evidence of understanding, students will demonstrate that they...
  - ...can use evidence to designate a living organism as a pest and accurately identify it;
  - ...can use evidence to decide whether or not the pest poses a health risk and needs to be managed
  - ...know that there are various ways of managing pests;
  - ...know how to monitor a proposed method for managing a pest and decide whether or not that method is working.
2. Students demonstrate that they can share the findings of their inPESTigations with others.

### Guiding Questions :

1. What can we do if we spot a creature or plant that we think is a pest?
2. What are the different ways to manage a pest?
3. What is the best way to manage a pest?

### Materials :

- Copies of the InPESTigator Files – choose the more or less challenging files based on your students reading abilities
- InPESTigator Badges
- Handout – InPESTigation Log
- Handout –Ways to Manage Pests
- Examples of pest control methods to show the class, such as roach trap, mousetrap, fly swatter, fly paper, and weeding trowel.

### Language & Literacy

#### Essential Vocab:

evidence, InPESTigation Steps (Identify, Decide, Act, Evaluate), pest controls (behaviors, traps & hands, natural enemies, chemicals, pesticides)

#### Useful Vocab:

residue, bacteria

### Language Demands:

Students will need to be able to use the syntactic structure of sequential reasoning (i.e., “First, I will identify. Second, I will decide. Third, I will act. Finally, I will evaluate.”).

As with previous lessons, students will need to be able to use the syntactic structure of using evidence to support a claim (i.e., “I think the we should do \_\_\_\_\_ to because of X, Y, and Z.”).

# LESSON #4

## Managing Pesky Pests

### Preparation :

- Have the InPESTigation Steps somewhere visible for students to see, such as on a board or overhead.
- Have examples of pest control methods ready to show the class, such as fly swatters and sticky traps. For health and safety reasons, it is recommended that teachers not have canisters or bottles of chemical treatments such as pesticides and herbicides in the classroom (including organic products), although inviting custodial staff to show these items could be possible (check with your principal). These examples can also be pictures.
- Two copies of the InPESTigation Log per student and one copy as an example.
- Prepare one InPESTigation Badge per student.
- Copies of the InPESTigator Files. There are two sets of files based on reading difficulty. The stories in the Less Challenging set have been simplified, though the pest clues are the same. Choose stories based on the reading level and interests of your students. Each student should have one file to read.

### Opening (5: 0/5/50 minutes)

#### Engage

Begin by reminding students of the pest story they heard in the first lesson about the gross goo. Explain that today they are going to revisit these stories and develop strategies for dealing with the problems in them.

Ask students, What do we do about pests? Perhaps they've seen a parent spray insects or weeds. Document student responses where they can be seen. Show students a variety of the examples of pest control methods for flying insects (e.g., pesticide, fly paper, fly swatter, etc.). Ask them, If there were wasps in the classroom, which one would you choose? Have students explain their choices, but refrain from evaluating these choices. If it doesn't come up, pose further questions about how they would know if their selected method was working and whether it was safe for people or not.

#### Lesson and Unit Goals

Read the guiding questions for today's lesson. Explain that they will be learning the steps for dealing with pests, and they will know different ways to manage pests and see if what they are doing is working. If they are successful, they will earn an InPESTigator badge!

# LESSON #4

## Managing Pesky Pests

Activity (35: 5/40/50 minutes)

### InPESTigating!

#### Developing a Scientific Strategy (10 minutes)

Show InPESTigator File #1 and read it to the class. Ask students, What is the problem in this situation? After framing the problem, ask them, What should be done to deal with the problem? Collect and document students' ideas for all to see. Then ask, Which of these things would you do first? From there, have students order the ideas and add new ones to create a series of steps from first to last. You may wish to rewrite their steps next to the list of initial ideas.

Depending on the steps they develop, pose questions to prompt them to consider the steps that they are missing. For example, students will have likely jumped to ideas for controlling or killing the pest. But how do they know what the pest is? Are they sure that action is required? And even after the pest has been removed, how can they be sure that more pests won't show up?

Draw their attention to the InPESTigation Steps. Walk through each step and the questions on the log associated with each one.

Start with **Identify** step and remind them of what they learned in the second lesson about being sure that they know what kind of organism they are dealing with. Some organisms may not be pests!

For the **Decide** step, explain that they need to offer a reason to take action. Those reasons will most likely be due to the harm or health risk posed by the organism. They should explain that risk (i.e., "Students could get stung" or "The weeds could take over the grass."). Also mention that if we decide that a creature is not a pest, we can choose to ignore it or put it outside if it's in our space.

For the **Act** step, hand out the Ways to Manage Pests sheet and discuss each of the ways for managing pests. Mention that some pest problems are so bad that they require the use of pesticides.

**A pesticide is a chemical used to kill a pest. They are often sold as sprays.**

Chemicals like pesticides can harm non-pests. They can also leave residues or thin, invisible layers of chemical that can get into human bodies and cause health problems. As such, it is worth considering other ways to manage pests. Discuss the alternatives and add any that may be missing from the list. The goal is not for students to know all of the ways to manage pests but to know that there are many ways, including chemicals when appropriate.

Finally, for the **Evaluate** step, have students consider simple ways to check if a pest problem is dealt with, such as keeping a count of the number of pests spotted each day or week.

# LESSON #4

## Managing Pesky Pests

### Do an example InPESTigation Log (5 minutes)

Have an InPESTigation Log visible for students. Explain that they are going to fill out their own log soon, but first you want to show them how to do it. Explain that their task will be to identify the problem and propose a solution using the inPESTigation steps.

Read InPESTigator File #2 aloud for students. When finished, go through the log with the class, soliciting student input for each component. Start with clues from the story to fill in the “Pest Evidence” box. Next, show them how to do a quick, labeled sketch that includes key details about the pest problem in the story.

Then proceed through the inPESTigation steps answering each of the questions in turn with student input.

As you discuss what to write, you may notice that students have different answers. This is okay! There are no ‘right’ answers but there are better explanations, so be sure to have them justify their decisions. Ask them questions such as, How do you know? What is your evidence? What would you need to know to be sure?

### The InPESTigator Challenge (20 minutes)

Now that students have considered the inPESTigation steps and seen how to use them, it’s time for them to show that they can be successful inPESTigators! Explain that each student is going to receive his or her own InPESTigation File. They should start by reading the story carefully. You may decide to pair students up to address one story, and have the student who is the better reader read the story aloud to their partner.

Explain that their task is to consider the situation carefully and address it by completing an InPESTigation Log, just like in the example. If they do this successfully, they will earn their official inPESTigator badge!

### Go to it!

Hand out InPESTigation Logs and files and have students get started!

## The InPESTigation Steps

### 1. Identify

- Is there a pest?
- What kind of pest is it?
- Why is the pest there?
- How many of the pest is there?

### 2. Decide

- Do you think something should be done about the pest? Why?

### 3. Act

- What do you think should be done about the pest?

### 4. Evaluate

- How will you know if what you did worked?

# LESSON #4

## Managing Pesky Pests

### Conclusion (10: 40/50/50 minutes)

#### Share logs and earn badges.

Have students share their Files and log responses with the whole class. After, you can award them their inPESTigator badges.

If you run out of time, you may opt to collect the logs, evaluate them, and award the badges at the start of the next lesson.

Regardless, be sure to revisit the guiding questions, especially the third one: What is the best way to manage a pest? Students should acknowledge that it depends on the pest and the situation

### Tech Alternative: Pest Private Eye

The University of Nebraska-Lincoln has created an award-winning IPM game available online for free at the following address:

<http://pested.unl.edu/pestpi>

Instead of using the InPESTigation Files for the challenge, you may opt to have students do the game. In it, players take on the role of a private investigator brought in by a principal to address her school's various pest problems. Most of the problems are similar to those in the files.

# InPESTigation Log:

InPESTigator Name: \_\_\_\_\_

Date: \_\_\_\_\_

Write down THREE key details of the pest problem:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Draw and label a sketch of the pest problem in the box:

# Follow the InPESTigation Steps:

## 1. Identify:

What creature is it? How can you tell?

I think my creature is a \_\_\_\_\_ because \_\_\_\_\_

Is the creature a pest?

It (circle one) IS ? IS NOT a pest because \_\_\_\_\_

## 2. Decide

Should something be done about the pest? (circle one) YES NO

I chose YES/NO because \_\_\_\_\_

## 3. Act:

What do you think should be done about the pest?

Look at the Ways to Manage Pests handout and pick an option

I chose to \_\_\_\_\_ because \_\_\_\_\_

## 4. Evaluate

How will you know if what you did worked?

I will \_\_\_\_\_

\_\_\_\_\_ to see if my pest control worked.

# Ways to Manage Pests

## Behaviors

We can do simple things to prevent pests, such as cleaning messes, using lids on trash-cans, and keeping doors and windows closed.

I can...

- close the doors
- shut the windows
- take out the trash
- cover the trash
- clean up spills
- clean up food waste
- block holes in the walls

## Tools & Traps

Sometimes we can catch or remove pests using simple tools such as fly swatters for flying bugs or weeding trowels to dig up weeds. We can also set out sticky and "snappy" traps to catch pests. These include roach traps, mousetraps, and fly paper.

I can...

- use a fly swatter
- set out a sticky trap
- set out a mouse trap
- dig up the weed

## Natural Enemies

Pests have many enemies in nature that we can use to get rid of them. For example, insects such as lady beetles and assassin bugs can be introduced to hunt down pests. Also, birdhouses and bat boxes can attract bug-loving birds and bats.

I can...

- set up bird houses
- set up bat boxes
- introduce bugs that will eat my pest

## Chemicals

Many chemicals will repel or kill pests. Those that kill include pesticides for insects and herbicides for plants. Chemicals that repel pests include citronella candles and insect repellent.

I can...

- use a bug spray to kill a pest
- light a citronella candle to
- keep pests away
- use a spray that kills plants

**What other ways can you think of to manage pests?**

Write them here:

# INPESTIGATOR BADGES



# LESSON #5

## A Classroom InPESTigation

### Overview:

In this lesson students will conduct an InPESTigation of their classroom. They will review the InPESTigation steps and consider the places within the classroom that may be most suitable for pests. Then they will work in pairs to explore the classroom and consider what to make of the various pests and pest clues that have been placed throughout the classroom by the teacher. Students will formulate plans to address the discovered pests and report them to the class. Students will conclude the lesson and unit by creating a Pest-free Classroom poster with strategies for handling pests and keeping pest out.

### Learning Objectives:

1. Students will show that they can use the inPESTigation steps to identify and assess the scope of any pest problems in their classroom and. Students will be able to
  - ...discover potential pests;
  - ...determine if organisms are pests or not.
  - ...use evidence to estimate the number of pests and how much of a problem they pose;
  - ...propose and justify ways to manage pests;
  - ...suggest ways to monitor and assess whether or not proposed ways for managing pests are working.
2. Students demonstrate that they can share the findings of their inPESTigations with others.
3. Students can show that they know ways to address and reduce classroom pests.

### Guiding Questions :

1. What do we do if we find pests in our classroom?
2. What can we do to manage pests and keep them out of our classroom?

### Materials :

- Handout – InPESTigation Logs (same logs from Lesson #4)
- Pests and clues (see Pest Evidence form)
- Copy of Pest Pictures and Descriptions
- A sheet of poster paper (optional)

### Preparation :

- Place 8-10 fake pests and pest clues throughout the classroom for students to discover (see the Pest Evidence form).
- Have a copy of the Pest Pictures and Descriptions visible for students to reference.
- Copies of the InPESTigator Log for (1 per student).

### Language & Literacy

#### Essential Vocab:

InPESTigation Steps (Identify, Decide, Act, Evaluate)

#### Useful Vocab:

residue, bacteria

### Language Demands:

Students will need to understand the syntactic structure of using evidence to support a claim (i.e., "I think X because Y.").

# LESSON #5

## A Classroom InPESTigation

### Opening (5: 0/5/50 minutes)

#### Activate Prior Knowledge

Begin by informing students that the classroom has been overrun with creatures! (Not really, of course, but ask them to imagine that this is the case.) Remind them of the first lesson and ask, So what would make these classroom invaders pests? Review the InPESTigation steps for addressing organisms that are suspected pests (perhaps have the steps visible for quick review).

#### Lesson goals

Read the guiding questions for today's lesson. Mention that this is the last lesson for the pest unit their design decisions.

### Activity (35: 5/40/50 minutes)

## A Classroom InPESTigation!

#### Set up the activity (5 minutes)

Show the Pest Pictures and Descriptions. Mention that some of these creatures are in the classroom. Their job is to locate, identify, and address these invaders. Highlight the pests that are in the classroom on the Pest Pictures and Descriptions form to narrow their search.

Explain that there will be two parts to this activity. First, they will walk around the classroom hunting for the pests and pest clues. Second, they will select a pest and complete an InPESTigation Log to address the problem. Just like the previous lesson, they will need to document the presence of the pest through written evidence and a drawing. Then they will need to address the inPESTigation steps and select a management method and way to check if it's working.

#### Part 1: Pest hunt! (10 minutes)

Explain that they will have about 8-10 minutes to walk around the classroom looking for pests. They should avoid calling out their discoveries so other students can have fun finding pests. You may find it helpful to have a list of the pests that are around the classroom up on a board or overhead for students to check with as they explore the classroom.

After the 8-10 minutes are up, have students take a seat. Discuss what organisms they discovered and where they spotted them.

#### Part 2: Complete a log (10 minutes)

Hand out copies of the InPESTigation Log, one for each student. Have students select one of the discovered pests to address on their log. You may decide to solicit volunteers to take each pest to ensure that all pests are addressed. Have students work on their logs.

# LESSON #5

## A Classroom InPESTigation

### Share logs (10 minutes)

When finished, have students discuss what they wrote in their logs. Perhaps have them share their logs with a neighbor or small group. For whole class discussions, be sure that students share each component of their logs. Invite students who are listening to participate by asking them questions such as:

- Do you agree that it's a pest?
- Do you agree with the suggested way to manage the pest?
- How else could you manage this pest?

Repeat this process of sharing for each discovered pest, making sure that all pairs have an opportunity to contribute to the discussion.

### Wrap Up the Unit (10: 40/50/50 minutes)

#### Review pest management strategies

Wrap up the lesson and unit by having the class establish a list of ways that they can help ensure that their class remains pest-free. Ask students, How do pests end up in a human space like our classroom? Also, why do they want to be in our classroom? Have them consider the various pests that they encountered during the InPESTigation. Document students' responses up on a board or overhead. Students may say things like "they come in through open windows" or "they want to eat our food."

After collecting several student responses, pivot the discussion to strategies for preventing classroom pests. Ask students the following questions and solicit their responses:

1. What can we do to keep pests out of our classroom?
2. What should we do if we see a pest in the classroom?

You may decide to document student responses on a board or overhead, then transfer the finished list to a sheet of poster paper and place it somewhere in the classroom for students to reference. A student or group of students may wish to create the poster for the class.

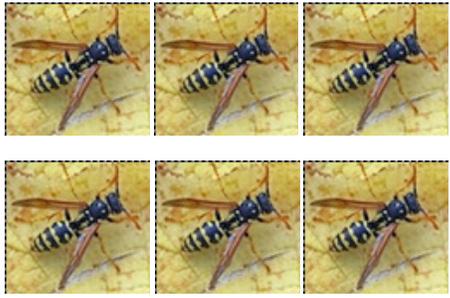
#### Conclude the Unit

by reminding students that not all creepy-crawly creatures are pests. The ones that are pests are merely trying to survive. Also, some plants can be pests. We can help ensure that the places where we live and work are not good for pests' survival. We can also try different ways of managing pests and check to see if those ways are working.

# PEST EVIDENCE

Lesson #5 asks that students conduct an inPESTigation of their classroom. Many classrooms will lack pests (thankfully!) or enough pest clues for this activity to be successful. Also, there is a health and safety risk with having students intentionally interacting with pests and pest messes, like mouse droppings. Simulating pests and clues of their presence will limit this risk and provide more for students to discover, examine, and analyze. Below is a list of pests and ideas for how to place cutouts and clues around the classroom. You may choose to create some “pest-friendly” conditions for students to consider, such as food and food wrappers with pests on or near them.

## Common School Pests of the Western U.S.

<p><b>Paper Wasps</b></p>	<p>Cut out the paper wasps and place them on windows or by a trash can. They can also be placed by or on pieces of food or food waste. Also, if you have access to a found paper wasp nest, consider taping it up in a corner of the classroom. The custodial staff may be willing to keep an eye out for a nest that you could use. Be sure to freeze or microwave found nests before use.</p>	
<p><b>House Mouse</b></p>	<p>Cut out the house mouse and place it along the edge of the classroom. Also, use chocolate sprinkles for droppings, and place a few of the “droppings” by a food source or in a cupboard. A shredded paper nest can also be created and placed in a cupboard or under a sink. Finally, consider substituting a realistic mouse cat toy for the cutout.</p>	
<p><b>Ants</b></p>	<p>Place cutout ants by or on food and food waste. Also create lines of ants going to food and coming into the classroom from doors using chocolate sprinkles for the odorous and pavement ants and orange sprinkles for the pharaoh ants. Place the magnifying glass cutouts on the lines so students can identify the type of ant.</p>	

### Ants:

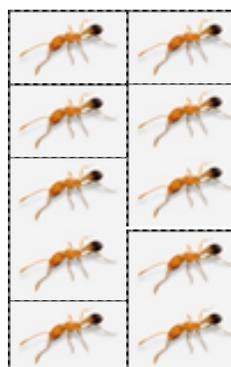
#### Odorous

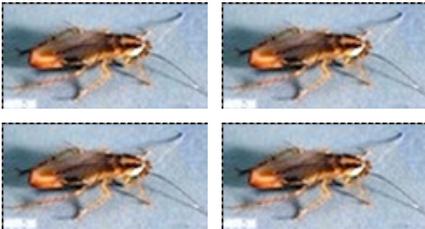
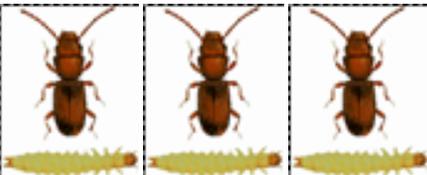
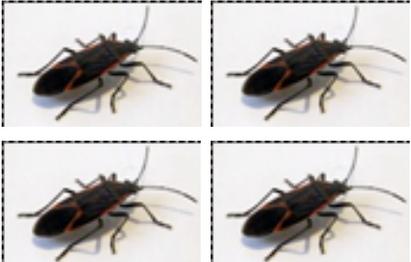


#### Pavement



#### Pharaoh



<p><b>Fruit Fly</b></p>	<p>Fruit flies are tiny! Simulate them by placing out a piece of fruit such as an apple or banana and sprinkling it with the small, round chocolate sprinkles. Place a magnifying glass on the fruit for accurate identification. This can be done without sprinkles. A second magnifying glass can also be placed on the rim of the trashcan or recycling bin.</p>	
<p><b>Cockroach</b></p>	<p>Cockroaches prefer places that are dark and damp, and they will seek out scraps of food. Cut out the cockroach pictures and place them under a sink or water fountain. Also place them near places where food is stored or eaten by students.</p>	
<p><b>Yellow Jacket</b></p>	<p>Cut out the yellow jackets and place them on windows or by a trash can. They can also be placed by or on pieces of food or food waste. Also consider hanging them from ceilings and doorways with twine or fishing line.</p>	
<p><b>Bed Bug</b></p>	<p>Bed bugs can be hard to spot. Place a magnifying glass on a couch, chair, or pillow commonly used by students in the classroom. Also, a few flax seeds can be placed by the magnifying glass</p>	
<p><b>Head Lice</b></p>	<p>Head lice are very small. Set out a comb or brush and attach the magnifying glass to it for students to discover.</p>	
<p><b>Grain Beetle</b></p>	<p>Cut out the larva and beetles and place them in or near uncooked pasta, rice, or beans.</p>	
<p><b>Boxelder Bug</b></p>	<p>Cut out the larva and beetles and place them in or near uncooked pasta, rice, or beans.</p>	

# Additional IPM Curriculum Resources

- **CSU eXtension** – <http://www.extension.org/pages/64931/teaching-ipm-to-kids>
- **Pest Private Eye** – free online IPM game – <http://pested.unl.edu/pestpi>
- **Maine IPM Curricular Resources** – elementary materials suited for K-2 <http://www.maine.gov/agriculture/pesticides/school-ipm-curriculum/index.htm>
- **Exploring Urban IPM** – elementary curriculum developed at Michigan State [http://www.ipm.msu.edu/community\\_and\\_home/schools/elementary\\_urban\\_ipm\\_curriculum](http://www.ipm.msu.edu/community_and_home/schools/elementary_urban_ipm_curriculum)
- **IPM Jumpstart** – elementary IPM instructional materials developed at Penn State <http://extension.psu.edu/ipm/schools/educators/brochures/jumpstart/view>
- **Backyard Explorers IPM Activity Book** – <http://www.epa.gov/pesticides/kids/pestpatrol/>

A Classroom InPESTigation has been designed with other popular life sciences curricula in mind, especially the Full Option Science System (FOSS) kits. Many of the knowledge and skills emphasized within typical life sciences curricula are necessary for effectively understanding and managing pests. An investigation of pests could be undertaken to reinforce or assess life sciences learning goals. Likewise, certain activities in a life sciences curriculum could be slightly modified to address pests. Below are some connections between IPM and elementary life science learning goals along with three possible modifications to common life science activities. This list is intended to initiate some creative thinking; there are certainly many more connections and relevant activities than listed.

Topic	Life science goals relevant to IPM	Common activity & IPM modification
<p><b>Living systems, including the human body</b></p>	<ul style="list-style-type: none"> <li>Familiarity with the characteristics of living things and the requirements for life can provide students with a richer basis for understanding and classifying pests.</li> <li>Knowledge of human body systems can be useful for understanding the health threats presented by both pests and chemical treatments.</li> </ul>	<p><i>Leaf Classification Activity</i> In this activity students learn about the structure and function of leaves. They gather, sort, and classify leaves collected from the schoolyard based on their vein patterns.</p> <p><b>IPM modification:</b> It is possible that some of the leaves collected will be from common plant pests, or weeds. Special emphasis could be given to the collection, identification, and classification of certain weed species. Also, students could be asked to consider features of weed leaves that may permit them to live where other plants cannot, such as in cracks in the pavement.</p>
<p><b>Structures of life and habitats</b></p>	<ul style="list-style-type: none"> <li>By considering the relationship between organisms and their habitats, students will be primed to consider the conditions that certain pests prefer.</li> <li>Likewise, they will understand why pests often prefer 'human' habitats.</li> </ul>	<p><i>Terrarium Habitat Activity</i> In this activity students set up habitats to care for creatures such as snails or beetles. They must consider the environmental factors necessary to sustain life. They also learn the characteristics of their creature and how they help it to survive.</p> <p><b>IPM modification:</b> Students could contrast the terrarium habitat to the classroom or school and consider whether or not the creature could survive in human habitats. They could also consider useful physical and behavioral characteristics (e.g., small size, fast, good sense of smell, social, nocturnal, etc.) that a creature might want to survive in a human habitat.</p>
<p><b>Environments and ecosystems</b></p>	<ul style="list-style-type: none"> <li>Understanding the environmental factors that permit life is important for understanding how pests thrive and often outcompete local organisms for resources.</li> <li>Student understanding of 'disturbed' environments, where established relationships between organisms and their surrounding have been somehow disrupted, can reveal why many pests persist despite efforts to control them.</li> </ul>	<p><i>Isopod and Beetle Behavior Activity</i> Similar to the terrarium activity, students set up controlled environment to determine the preferred conditions for an isopod or beetle. They intentionally manipulate certain environmental factors, often providing different conditions within the same space, and monitor where the creature spends the most time.</p> <p><b>IPM modification:</b> This study could be modified to simulate a classroom space that is more or less favorable for pests (e.g., pieces of wet vs. dry rug; absence vs. presence of snack foods; covered vs. open spaces etc.).</p>

# INPESTIGATOR FILES

- The InPESTigator Files are fictional stories about elementary students encountering various pests in the classroom and on the school grounds. There are two sets of files: a less challenging (pages 39-41) and a more challenging (pages 42-46) set based on reading difficulty.
- The less and more challenging sets include the same ten stories with the same pest situation and clues. You do not need to use all ten stories for the fourth lesson. You may prefer to select a few stories for students to read.

## File #1

### Jaycee and The Gross Goo Mystery

It is recess. You and Jaycee are playing tag by the school. He falls down to the ground. "Yuck", he says. He stands up and shows you his left hand. On his hand you see white and black goo. You look on the ground by the school and see a lot of white and black goo. You also see a small bowl made of mud and sticks. Suddenly you hear a flapping noise! Jaycee jumps. You also hear a coo-coo-coooooo sound over your head. You are scared, but now you know where the goo is coming from.

## File #2

### Twizzled

It is a rainy Monday. You are inside the classroom working on an art project. The teacher asks you to get out paper from the cabinet. You get up and walk to the cabinet. Crunch! You step on a cracker. You open up the cabinet. The paper is on the bottom shelf behind the crackers and Twizzlers. You pull out the food and set it aside. The paper is in a plastic tub. Next to the paper tub is a little piece of brown crud. It looks like rice, but it is brown. You pull out the paper tub. Behind it are three more pieces of brown crud. They are pointed at both ends. One of them has a tiny hair sticking out it. You also notice pieces of Twizzler with small teeth marks on them. "Uh oh", you say to your teacher.

## File #3

### Zombie Beans

"Time for math!" your teacher says to the class. Today you are going to use beans for math. The teacher gives you a glass jar of dried beans. You notice many different kinds of beans. There are brown, black, white, and red ones. It has been a long time since you used the beans in math class. You see that some of the red beans are moving! You take a closer look. They aren't beans. They have antenna and six legs. You also notice small worm-like insects that are white and yellow. You tell the teacher come quickly.

## File #4

### The Trail of Trouble

Lunch! You, Desean, and Courtney are eating at a table. Your bag of chips falls onto the floor. You reach down to pick it up and see a line of black insects under the table. You get up from the table and follow the line to the door. It goes out the door to a crack in the pavement. There is a small hill of dirt in the crack. You follow the line of insects back under the table. You notice that the insects have six legs. The line of insects leads to a mess of shiny foil and pieces of food. "This could be trouble", you say to Desean and Courtney.

## File #5

### The Mystery of the Vanishing Grass

It is recess. Your friend Jackson is running across a field to the swings. He trips! "Ouch!" he yells. You ask if he is okay. He has fallen on hard dirt. He sits up and shows you his knee, which is scraped. There is no blood. "Where is the grass?" he asks you. You see green plants growing. The leaves on the plants are small and spread out along green stems. You notice that there is not much grass on the field. Also, the places where students like to play are mostly dirt. Instead of grass there are many of these strange plants.

## File #6

### Taylor and the Trash Terror

"Have you seen Taylor", asks your friend Carrie. You tell her that you saw Taylor by the trashcans on the playground. You walk together to the trashcans to find Taylor. The lids of the cans are off. It smells like rotting food. Carrie looks into one of the cans. A big black and yellow insect flies out at her! She flaps her hands and dances away. "Stay away!" she yells at the insect. You and Carrie run into your classroom. You find Taylor sitting down. She is crying, and a wet towel is on her arm. "That insect really hurt!" she tells you. "What was it?" Carrie asks. You tell her what you think buzzed at her and hurt Carrie.

## File #7

### Squish & Stink

You and Jeff are eating breakfast burritos. Your teacher reminds you that all food must be eaten at tables. He also asks you to recycle the foil wrapper when you are finished. You and Jeff take your burritos to a table. When you finish, you take the foil to the recycling bin. By the bin you see a line of black dots on the floor. You see that the dots are moving toward the recycling bin. They look like insects, and they are crawling on a juice box. You squish the insects with a paper towel. As you do, you smell a coconut odor.

## File #8

### Fresh Air Frenzy

It is the first day of school. You are sitting at your table in the classroom. You notice that a window is open. It has no screen. A breeze blows into the classroom. Suddenly you hear an odd buzzing sound. You look around but see nothing. A minute passes. You hear the buzzing again. It is coming from a book on your table. On the book you see a fuzzy yellow and black insect crawling around. It has wings. The insect begins to fly into the air. It flies up to another fuzzy yellow and black insect by a light in the ceiling. What a first day!

## File #9

### Invasion of the Brownie Snatchers

School is over. You and Francis are in after-school care. Francis asks, "I wonder what the snack is today?" The teacher tells him that the snack will be brownies. You and Francis walk up to a table to get your brownies. Suddenly you notice a flat, brown insect running across the table. It goes under the table and into a cardboard box. The box is from the kitchen. The teacher used it to carry the brownies. You peak in the box and see more of the brown insects crawling around. They have antennae. "I don't think we should eat these brownies", you say to the teacher.

## File #10

### Trashcan UFO's

Today you are going to have a party in class. You are celebrating the success of the school garden. The teacher brings out plates with strawberries, watermelon, and carrots from the garden. Everyone eats the fresh fruit and vegetables. When they finish, they put their watermelon rinds in the trashcan. Two days later you notice little things flying around the trashcan. They land on the watermelon rinds. You take a closer look at the little creatures. They have clear wings and big reddish eyes. "We need to do something about the trash", you tell your teacher.

### Jaycee and The Gross Goo Mystery

You are eating lunch in the school cafeteria. It is a hot day and your cold juice tastes good. Suddenly you hear someone call your name. Jaycee runs up to you and asks you to come quick because there is a problem on the playground.

"We were running around, hiding from each other", he tells you. "I hid by the door and touched something slimy!"

Jaycee shows you his left hand, which looks kind of muddy, with some white streaks.

You ask him, "Is it food? Like a melted chocolate bar?"

He smells the brown stuff on his hand.

"It's definitely not food", he says with a disgusted look.

"Can you show me the spot where you touched it?" you ask.

He nods and takes you to a backdoor that leads into the kindergarten classroom. On the ground by the door you see the brown stuff he was talking about. You crouch down. It is lumpy and has small twigs in it. You see a little bowl made of sticks nearby. You also see many little spots of white and black goo.

Jaycee starts to talk excitedly. "What is it? Is it from the kindergarten kids? It looks disgusting. Do you think..." Suddenly you hear a ghostly noise overhead. Goo-coo-cooooo! You look up, but don't see anything. An explosive BA-DAP-FLAP-FLAP-FLAP causes Jaycee to jump.

"What was that?" he says with his hands on his mouth.

"Don't let your hands touch your mouth", you tell him.

You notice that the roof hangs out over the door. There are many wood beams visible under the roof. You stand up. Then you notice that there are many, many little spots of white and black goo all along the school beneath the roof.

### Twizzled

It is a cold, rainy Monday. It rained all weekend and you miss the sunshine. In class today you are going to make dioramas to illustrate scenes from a book you just read, *The Tale of Despereaux*. You tell your friend Kyle, "My scene is going to have a big, hot sun in it!"

"Mine is going to have burritos in it", he replies.

"What?" you exclaim. "The mice didn't eat burritos!"

"But I'm so hungry", he complains. "Is it time for lunch, yet?"

The teacher asks you to get out the construction paper from the cabinet. You get up and walk to the cabinet. Crunch! You step on a cracker. The paper is on the bottom shelf, so you crouch down. The paper is in the very back of the cabinet behind the crackers and Twizzlers that the teacher sometimes hands out.

You pull out the food and set it aside. The paper is in a plastic tub. As you reach into it you notice a little black piece of "crud" about the size of a grain of rice. Maybe it's a piece of dirt, you think to yourself. You pull out the tub of paper and set it on the ground. Then you grab the food and start to put it back in the cabinet. Suddenly you notice more of the small black pieces. The paper tub was blocking them.

"Is the paper ready?" the teacher asks you.

"Almost", you respond, "but I've discovered something odd."

The teacher walks over and kneels down next to you. You point to the little black pieces in the back of the cabinet. They are pointed at both ends. One of them has a tiny hair sticking out it.

"Black rice?" she asks, puzzled.

"No", you tell her, "they are not pieces of rice. They are something far worse."

### Zombie Beans

"Time for math!" your teacher says to the class.

Good, you think. I like math. Jonah and Alma sit at your table. The three of you have become good friends this year. You help each other during math, and Alma always makes funny jokes.

"I wonder if we get to use a cow-culator today", she says.

"A what?" Jonah asks.

Alma smiles. "You know, what a farmer uses to count cows."

You laugh and ask, "So what does a farmer use to count her chickens? A chick-ulator?"

"No", she says. "She uses a hen-cil and paper." Jonah giggles.

The teacher comes around to each table and puts down a glass jar full of dried beans. There are many different kinds of beans. It has been a while since you used them in math class. Jonah opens his math notebook and writes his name on a page. You grab a pencil and start to do the same thing.

You notice that Alma has been quiet. Too quiet. She is holding the glass jar in her hands, turning it slowly. She is squinting as she looks at it.

"What's wrong, Alma?" you ask.

"I don't know", she replies, "but I think these beans are alive."

Jonah speaks up. "They can't be alive!"

"Maybe they're zombie beans", Alma says, looking up at both of you. "Night of the living beans. Doooooh! Do math if you dare!"

"Can I look?" you ask her. She hands you the jar and you look carefully. She wasn't lying. Some of the reddish "beans" are moving around. Creepy, you think. You get out your hand lens and take a closer look. You notice that they have six legs. You also notice another creature moving around: little white and yellow worm-like things with tiny legs.

"These aren't beans", you say, "but they are alive!"

## The Trail of Trouble

Another day at school, another lunchtime. You walk down the hall into the cafeteria with your friends. "Hey Rob, is that the granola bar you dropped on the ground yesterday?" you hear someone say. The cafeteria is loud and smells funny. You and your friends sit down at the table closest to the playground.

"Desean, what do you have for lunch?" Courtney asks.

"Soup, crackers, grapes, and two chocolate chip cookies", he replies. "What do you have?"

"I have ants-on-a-log. Yum!" Courtney pulls out a small plastic tub and pops off the lid. Then she frowns and takes out a stick of celery with only peanut butter on it. "All I got is the log."

Desean asks her if she wants to put any grapes on it. She shakes her head. You reach into your bag and pull out your sandwich. Your bag of chips falls onto the floor. You reach down to pick it up and notice a little line of black insects under the table. It runs out the door to the playground. Uh oh, you think to yourself. You get up from the table and follow the line to the door.

A teacher at the door stops you. "It's not time to go outside."

"I know", you say, "but look at that line."

Together you look down at the line. It passes right between the teacher's feet and out to a crack in the pavement.

There is a small pile of sand and dirt in the crack. You notice that the line of insects is moving. You follow it back under the table. Desean lifts up he feet and Courtney pokes her head under the table to look at you. She spots the moving trail. You both follow it with your eyes. The trail ends in the middle of the floor. The insects crawl around a mess of shiny foil and pieces of food.

Pointing at the insects, you say to Courtney, "How about those for your celery log?"

"Ewww! Gross." She says. Desean laughs.

### The Mystery of the Vanishing Grass

Recess! Glorious recess. You have worked hard this morning on a science project. It was fun, but you are ready to run around outside. The teacher asks that you put your pencils away before you go out. Other students are getting up and heading to the door. You follow them. Walking out the door, the bright sun causes you to blink and block your eyes.

"The swings are open", Jackson says to you. "Let's go before they are taken."

Together you set off across a field to the swings. Kids are running around playing soccer. The field is mostly covered in grass, but there are places where there is no grass. In these places it is still a little green. One of these places is the spot where the kids play soccer. The other is the path that leads to the swings.

Jackson is running on the path to the swings. He trips! "Ouch!" he cries out. You run up to him and ask if he is okay. He has fallen on the hard, packed dirt of the path. He sits up and shows you his knee, which is scraped. There is no blood.

"I'm fine", Jackson says to you. "I wish there was grass here. This dirt hurts."

"It's not all dirt", you point out. You both look at a plant by Jackson's hand. There are green plants growing with many stems snaking out along the ground. The leaves are small and spread out along the green stems. You notice that the plants are also growing in cracks in playground next to the field.

"Those plants don't help you when you fall", Jackson says.

You look out and the field and begin to notice something odd. The paths where students cross the field are brown with dirt and covered in the odd plants. In fact, you notice that there are several more of these curious plants growing in the grass near the path. The green grass hides them, but the plants are there

## **Taylor and the Trash Terror**

It is early in the morning, and school hasn't started yet. You hear some thunder in the distance. The sky is full of dark clouds. The teachers have asked students come inside to wait for school to start. You walk across the playground. You see Carrie, who says to you. "Have you seen Taylor?"

"No", you reply. "Is she here yet?"

"Yes. She and I were playing. A teacher told her to throw away her yogurt container." Carrie looks around the playground nervously. "I thought she would be right back."

Lightning flashes. The storm is getting closer. Carrie walks toward the trashcan on the playground. You follow her to the trashcan. The lid is off. Carrie looks in the can. Suddenly a buzzing black and yellow insect flies out at her! She flaps her hands and dances away from the trashcan.

"Stay away!" she yells at the buzzing insect. Then she turns to you and says that the yogurt container was not in the trash.

"Maybe she took it to the dumpster", you suggest. Another flash of lightning and BDDM! Time is running out. You both run to the dumpster. The buzzing bug has returned. It darts for your head. You shoo it away. It flies up to a little tan paper ball hanging above a door. Several more of the insects fly up to the tan ball. You notice that they are large, shiny, and mostly black, with some yellow stripes. Suddenly they drop down and start buzzing around your head and legs.

"We need to get out of here!" Carrie shouts, starting to run.

When you get into the classroom you see Taylor standing by the window. She is crying and holding a wet towel on her arm.

"I never should have gone near the dumpster", she says.

Worried, Carrie says, "What happened, Taylor?" But you know what happened before Taylor even answers.

### Squish and Stink

Some mornings before school starts you and Jeff eat breakfast in the classroom. You like to flip through a big book of inventions while you eat. This morning you are eating an egg-and-cheese burrito. You sit together on the floor by the books.

"The catapult is so cool", Jeff says, pointing at a page. "I bet we could build one."

Your teacher walks over and reminds you that all food must be eaten at tables.

"Also, be sure to throw away your trash when you're done", he says, adding, "and throw the aluminum foil in the recycling bin."

You and Jeff take your burritos and the book to a table.

"We could totally make a catapult", you tell Jeff. "It could fling balls of foil!"

"Yah!" he says excitedly. "We could fling them at targets or at teachers!" Your teacher looks at Jeff and frowns.

The bell is going to ring in a few minutes. You take your last bite of burrito. Then you ball up the foil wrapper from the burrito and turn to face the trashcan and recycling bin. The bin is only a few feet away from the table. You take aim and throw the foil ball at the bin. It hits the side and bounces on to the floor.

"Nice one", Jeff says with a smile.

You get up and walk over to pick it up. As you approach the recycling bin you notice a thin line of black insects on the floor. You see that the insects are moving toward the recycling bin. Looking in the bin, you see your empty juice box from two weeks ago. You grab a paper towel and try squishing the insects. As you do so, you notice a funny coconut smell.

Wrinkling your nose, you say to Jeff, "Do you smell something strange?"

## Fresh Air Frenzy

Alas! Summer is over and today is the first day of school. The school building has been closed all summer. The maintenance and custodial staff worked hard to clean and fix up the school. The classrooms and hallways are all shiny.

You walk into your new classroom and look around. One wall is full of big windows. On a table by the windows you spot a piece of paper with your name on it.

"That's your seat", the teacher says.

You sit down. A slight breeze passes through the classroom. It smells like freshly mowed grass. You notice that the window by your table is open. Perhaps your teacher thought her classroom could use some fresh air.

The bell rings and school starts. Later that day you are quietly reading a book on forests when Sam nudges you in the arm. You turn your head, kind of annoyed.

"What is it, Sam?" you ask.

She points to the center of the table. There is nothing there, but you hear an odd buzzing sound. It gets louder and you duck.

"What was that?" Sam asks. "I saw it on the table walking toward you." You shrug. The buzzing has stopped for now, so you go back to reading. A few minutes pass. Then you hear the buzzing again and look up. Sam also looks up. She is holding her book up as she reads it. On the cover of the book you see an insect with wings crawling toward Sam's fingers. It has a hairy yellow thorax and a black and yellow abdomen.

"Look out!" you say surprised.

She drops the book on the table. The other students look at you. One of them points to the insect as it flies through the air. Another points to the teacher's desk, where a second fuzzy yellow and black insect is flying around. What a first day!

### : Invasion of the Brownie Snatchers

The bell rings. School is over and students shuffle out the classroom. Everyone heads to the front of the school to meet parents or get on buses. You aren't getting picked up today until five o'clock, so you walk to the library with your friends Rachel and Francis. The after-school program is fun. The three of you read books, play games, and make things with Legos or art materials.

When you get there you take a seat at a round table. Francis asks, "I wonder what the snack is today?"

"I hope its chips and an apple", Rachel responds.

"I hope its pizza covered in doughnuts", you say. Francis lets out a snort and Rachel laughs out loud. The teacher overhears your comment.

"No pizza today, but we have brownies!"

"Yes! Brownies are sweet!" Francis says with a grin.

"So sweet", Rachel adds.

The teacher invites you to come up to a table and take a brownie and a napkin. You take a brownie and start walking back to your table when suddenly you hear a shriek.

"The brownie moved!" Francis says. "I saw it run across the table."

He points to a spot on the table where, sure enough, you see something brown and flat. It runs to the edge of the table and vanishes. You and Rachel look under the table. There is a cardboard box from the kitchen that the teacher used to carry the napkins and brownies. You peak in the box and on the bottom you see more brown, flat things crawling around. They have six legs and long antennae.

"What are they", Rachel asks.

You sigh and say, "They are definitely not brownies."

## Trashcan UFO's

"Carlos, can you pass the green pencil?" you ask.

He passes it to you and asks, "What are you making?"

"I'm drawing a picture of Mars", you say as you hold up a picture, "and the Martians that live in the caves."

"Martians aren't real", Carlos says with a sniff.

"Yah, but what if they were?" you respond.

Before Carlos can answer your question, the teacher interrupts to announce that it's time for the fruit and veggie party. Yesterday your class harvested fresh strawberries, watermelon, and cherries and carrots, tomatoes, and peppers from the school garden. Your class worked hard in the garden for the first two months of school. Today you are going to celebrate your effort with a small, delicious feast.

The party is a success and the class eats most of the vegetables and fruit. Carlos says that the strawberries were his favorite. You liked the carrots. After the party, the teacher throws away the seeds, stems, and rinds in the trashcan.

Two days pass.

You are still working to finish your Martian drawing. The green pencil needs to be sharpened, so you walk to the pencil sharper. On the way you pass by the trashcan, which has large specks of "dust" hovering around it. You peak into the can. It's empty. Looking on the floor around the can, you see a couple pieces of watermelon that have been on the floor since the party. The "dust" specks fly up around your nose. You swat them away.

Carlos walks up and asks, "What's going on?"

"I'm not sure", you respond.

"What are these things flying around?" Carlos asks.

One of them lands on your knee. You take a closer look. The "dust" is alive! Two big reddish eyes stare back at you.