SOLE Sciences of Life Explorations: Through Agriculture Grades 4 and 5



Teacher Guide Unit: Learning about IPM

UNIT TITLE Learning about IPM

GOAL

In this unit, students will learn about **Integrated Pest Management (IPM**): the decision-making process involved in reducing **pests**. They will recognize that **pests** can be animals or insects in homes and other structures, as well as weeds, insects and diseases in yards, gardens and croplands. Students should learn that gaining knowledge before they act is important in all they do. Specific to this lesson, students will be reminded that pesticides are chemicals and must be used carefully. Pesticides are used to eliminate **pests**, but should not be the first choice for treatment. We hope students and teachers discuss **IPM** in the classroom and at home with their families.

OBJECTIVES

Students will:

- 1. Listen and read to acquire information and understanding from collecting data, facts, and ideas; and discovering relationships. (NYS Learning Standard 1: Language for Information and Understanding, Elementary 1)
- 2. Use scientific inquiry to develop explanations of natural phenomena, such as when bugs can be **pests**. (NYS Learning Standard1: Analysis, Inquiry, and Design,Elementary1)
- 3. Explore and solve the problem of **pest**-related damage to trees in their school neighborhood. (NYS Learning Standard 1: Analysis, Inquiry, and Design, Elementary 3, Mathematical Analysis)
- Take notes and make charts of their observations in order to gain insight into the problem and solution of **pests**. (NYS Learning Standard 1: Analysis, Inquiry, and Design, Intermediate 3, Scientific Inquiry)
- 5. Acknowledge that living things are both similar to and different from each other by describing characteristics of various insects. (NYS Learning Standard: Science, Elementary 1, Living Environment)
- 6. Understand continuity of life by describing major stages in the life cycle of selected insects. (NYS Learning Standard 4: Science, Elementary 7, Living Environment)
- 7. Identify ways in which humans have changed their environment and the effects of those changes. (NYS Learning Standard 4: Science, Elementary 7, Living Environment)
- 8. Modify their personal understanding based on evaluation of hypotheses. (NYS Learning Standard 1: Analysis, Inquiry, and Design: Intermediate 3, Scientific Inquiry)
- 9. Analyze science problems that affect their home, school and community and carry out a remedy. (NYS Learning Standard 7: Interdisciplinary Problem Solving: Elementary 1, Connections)
- 10. Identify classes of organisms involved in **IPM** and explain the roles of those organisms. (Food and Fiber Systems Litercy III: Science, Technology, and Environment: B, 6-8)
- 11. Identify **pest** management practices in agriculture and compare traditional and alternative **pest** management practices. (Food and Fiber Systems Literacy III: Science, Technology, and Environment: C, 4-5)
- 12. Analyze science problems that affect a nearby tree and carry out a remedy. (NYS Learning Standard 7: Interdisciplinary Problem Solving: Elementary 1, Connections)

TERMS

Beneficial - helpful

Bud - an oval-shaped structure found above leaf scars, that holds next year's flowers or leaves

Coniferous - a tree which has seeds in cones and very narrow or overlapping leaves; most are evergreens and have leaves throughout the year

Consensus - an opinion or agreement reached by a group as a whole

Cooperative extension - a resource for more information on **pest** control, an office in each county where people work to help farmers and homeowners be educated about farming and take care of their homes and their health

Deciduous - a tree which does not have seeds in cones, and has broad leaves that fall in autumn

Host - something that pests live off, such as an animal, crop, or other plant

Integrated - using multiple ways to do something

IPM - abbreviation for **Integrated Pest Management**, a way to reduce **pests** by using the safest and best methods

Leaf scar - area where a leaf was attached to the twig

Nutrients - necessary vitamins and minerals; fue' for our bodies

Pest - something that is damaging or causes a problem, such as a bug, weed, or disease

Pesticide - something that eliminates or reduces pests

Pith - the center of a twig

Predator - an organism that hunts and eats other organisms

Species - a group of related organisms that resemble one another and breed among themselves

Tactics - actions taken to get something done

Terminal bud ring - a scar that forms a ring around the twig where last year's **terminal bud** was **Toxic** - poisonous

Integrated Pest Management is a specialized form of environmental management wherein scientific research and real world application work together to reduce pests such as insects, diseases or weeds.

- 1. Properly identify pests
- 2. Learn the pest/ host biology
- 3. Sample the environment for pests
- 4. Determine an action threshold
- 5. Choose the best tactic
- 6. Evaluate results

SAFETY

General school safety practices, as well as safety with tools and chemicals.

Standards Matrix for this Lesson:

		Standards:								
Month	Unit	Math/Science/and Technology	English Language Arts	Social Studies	НЕАLTH	ARTS	Food & Fiber Literacy	CDOS	Other Languages	Interconnectedness
9	Learning About IPM	7:13 e1	1:3 e1	4:10 e7			III B 6-8			7:13 e1
		1:7 e1		7:13 e1			II C 4-5			
		1:7 e3								
		1:7 i3								
		4:10 e1								
		4:10 e7								
		1:7 i3								

Matrix Key:

NYS Learning Standards arranged by Standard: Category, Level Categories:

- 1 Career Development
- 2 Universal Foundation Skills
- 3 Language for Information and Understanding
- 4 Language for Literary Response and Expression
- 5 Language for Social Interaction
- 6 Communication Skills
- 7 Analysis, Inquiry, and Design
- 8 Information Systems
- 9 Mathematics

- 10 Science
- 11 Technology
- 12 Interconnectedness: Common Themes
- 13 Interdisciplinary Problem Solving
- 14 History of the United States and New York

e = elementary i = intermediate

- 15 World History
- 16 Geography
- 17 Economics

ADDITIONAL RESOURCES

http://www.nysIPM.cornell.edu/

SUPPLIES AND EQUIPMENT Crayons or markers Glue Pruners

BACKGROUND FOR TEACHERS

Why teach about IPM?

Children are especially vulnerable to pesticides. They play close to the ground, put things in their mouths, grow rapidly, eat a lot relative to their body size, and are less able to detoxify chemicals in their bodies. Children in cities are at special risk because chemicals that may alter neurological and reproductive development are most heavily applied there.. Schools are a focal point of urban communities. New York State has 703 public school districts, and 3.5 million K-12 students.

IPM is real-world science. It teaches about birds and bees, health and disease, and about the evershifting interface between science, nature, and culture.

Pesticide Use in American Households Is Prolific

Household toxins include insecticides, disinfectants, repellents, herbicides, fungicides, rat and mouse poison, and unregulated fumigants. In 2002, the Environmental Protection Agency estimated that domestic users applied 1.1 billion pounds of active pesticide ingredients, and that 90 percent of households used pesticides. The New York State Attorney General's office found that 69 percent of urban dwellers used pesticides in their living space, and that 33 percent did so weekly.

Besides the risks posed to human and the environment, pesticide use can promote resistance in weeds, insects, and diseases. In fact, over 530 insect **species** now show resistance to pesticides. New legislation in some areas is phasing out entire classes of pesticides, which means that communities need alternative ways to manage **pests** where people live, work, play, and learn.

Pesticide Use and Human Health

A wealth of publications examine the risks of environmental toxins to human and animal health. As many as 107 active ingredients in pesticides may cause cancer in animals or humans. Pesticide-related illnesses in children rose significantly between 1988 and 2002. In cases where the source of exposure could be traced, 69% were tied to chemicals used to control insect **pests** in schools - more than double the number linked to pesticide drift from neighboring farmlands. Pesticide use by farmers is heavily regulated, but pesticide use by homeowners is not.

NYS **IPM**'s School Program works with facilities managers to implement the least **toxic pest** management strategies for schools and grounds. There is an urgent need for public education, since the majority of our population is urban, **pest** populations are elevated and concentrated in urban areas, and children in cities are at higher risks for pesticide-related illnesses. Since children are primary stakeholders, they deserve to be informed.

Pesticide use and environmental challenges

Pesticide contamination of water resources is well-documented. The United States Geological Survey reports that decades of pesticide use have resulted in widespread contamination. Seventy percent of New Yorkers - roughly 17 million - are served by public water. In urban areas, concentrations of more than one pesticide often exceed established water-quality guidelines. Non-point source pollution (pollution whose source is hard to identify) is the dominant threat to water quality, and accounts for up to 65 percent of water pollution in the northeastern U.S. Residential neighborhoods are a major non-point source of pollution.

The need for **IPM** education

Teaching people about the link between pesticide use, **IPM**, and water quality is crucially important. Public concern about health and environmental risks, especially for children, is increasing. **IPM** is endorsed by the EPA and national parent-teacher groups. The National Institute of Occupational Safety and Health recommends **IPM** for schools. We can teach our citizens to prevent or reduce **pest** infestations using a combination of good science and good sense; to choose the least **toxic** agents when pesticides are necessary as a last resort; to base their decisions on identifying **pests** correctly and understanding their biology; and to think **IPM**.

Why educate children about IPM?

Schoolchildren are an enormous audience, one that's both vulnerable to pesticide overuse and open to new ideas, and children carry the message far into the future. What they learn trickles out into the broader community because they take the message home.

We inspire students to discover science and **IPM** through interactive learning programs that are fun, engaging, and encourage conversation between adults and children. **IPM** is real-world science in action and provides a fantastic opportunity to provide educational materials that are applicable to daily life. Preventing pesticide misuse starts with engaging children and through them, their families and communities, and so providing the input, education, and resources that help each person contribute to the solution.

QUESTIONS FOR STUDENTS

What is **IPM**? What is a **pest**? Why should **IPM** be important to me? What is a pesticide? What are **toxic** substances? If I have a **pest** in my house or garden, what should I do?

TEACHER INFORMATION

Materials required: Magnifying Glass Tree

Purpose

This activity's purpose is to allow students to critically examine a tree for signs of **pest** damage, to make hypotheses as to what might have caused such damage, and what can be done to prevent or control the problem.

What is a tree?

For our purposes, a tree is defined as a woody plant usually having a single, upright stem growing to a height of at least 15 feet with a defined crown developing at least two or more feet above the ground. Shrubs, in contrast, usually have several upright or spreading stems branching from the base and grow less than 15 feet tall. (http://www.extension.umn.edu/distribution/naturalresources/DD0486.html)



Selecting a Tree

Before taking your class outdoors, do some investigative work. Locate an easily identifiable tree near your classroom. If a tree cannot be found on school grounds, take a walk to a park or somewhere a tree is available for observation. It may or may not have immediate signs of **pests**, but most trees have some type of **pest** problem. Walk around the tree and look closely at the trunk, leaves, and ground for signs of **pests**. (see Reference Sheets for a guide). Make a list of the signs you found.

NB: Keep in mind that sometimes, humans are the **pests**! We can cause damage to trees by salting the ground nearby, or by making damage to the trunks. Ask students why they should never try to carve into a tree. (making holes in the trunk allows the tree to become more susceptible to disease and **pests**, just like a cut on human skin can let germs in).

Time of Year

This activity can be completed in the spring or fall. Be careful not to attribute dead leaves to **pests** if it is too late in the fall, or little leaf growth if it is too early in the spring.

Identifying Trees

When we try to identify things, whether rocks, animals or trees, we begin by connecting them with groups of things with similar characteristics. Trees can be classified into two broad groups: **coniferous** and **deciduous**.

- **Coniferous** trees bear their seeds in cones and have very narrow or overlapping leaves. All of the **coniferous** trees except the larches are evergreens, meaning that they maintain their leaves throughout the year.
- **Deciduous** trees do not bear their seeds in cones, and have broad leaves that drop in autumn.

(Information from: http://www.extension.umn.edu/distribution/naturalresources/DD0486.html) For further information regarding tree identification, refer to *The Audubon Society: Field Guide to North American Trees: Eastern Region* (ISBN 0-394-50760-6)

See included reference sheets for information on common signs of **pests**, types of damage, and methods of treatment and control.

Procedure:

- Take the class outside on a nice day and have them walk around the tree. Guide them in looking at the leaves for holes or discoloration, or for caterpillars, beetles, or damage on the trunk.
- 2. Symptoms & Treatment
 - A. Describe the site

Before deciding on any plan of action, thoroughly observe the designated tree and its surroundings. Write observations as journal entries.

B. Consensus

As each student makes his observations, build **consensus** with peers

C. Document

Always document observations

D. Identify

Identify current and potential **pest species** and conditions in the tree that could support **pests**, such as air, water, food, shelter, temperature, and light

E. Monitor

Monitor **pests** and environmental conditions, including **pest** population levels. (Graphs could be made comparing daily or weekly observations.)

- F. Discuss what the students found.
 - i. What signs of **pests** did you see?
 - ii. What might have caused those signs?
 - iii. What should you do about the damage?
- G. Damage Evaluation

Is damage extensive enough to require action? You want to avoid using chemicals or other harsh methods if the tree is not being overly harmed. **Pests** are natural and widespread, so unless the tree is dying or appears unsightly, leave the bugs alone. If the damage is extensive, then the use of **IPM** methods should be considered.

H. Planning

Establish, through **consensus**, possible action plans, listing pros and cons. Review best management practices for dealing with identified problems. The class may:

- i. Take no action
- ii. Choose manual action
- iii. Choose biological action

Examples of action to be implemented:

- i. Removal of salt remains
- ii. Watering
- iii. Mulching
- iv. Adding peat
- v. Removing bugs by hand
- vi. Putting tree guard around trunk
- vii. Introducing beneficial organisms
- I. Approval

Your action plan needs teacher and/or proper authority approval. Once given, your strategy needs to be implemented.

J. Materials and Tools

Decide on what tools and materials will be needed. Class and teacher will decide who will be responsible for bringing in each item. If items from home are requested, the teacher should inform parents of the project and the need for designated materials and/or tools.













K. Participating

Define responsibilities of each member of the class. If possible, the entire class should be involved in the process.

- L. Take action Carry out your plan by implementing your decisions.
- M. Evaluation

Examine your results periodically. Students should make notes of their observations in journal entries.

- N. Determination
 - As a class, decide if the original goal has been met.
 - i. If yes, celebrate!
 - ii. If no, learn more about the tree through its twigs.

*Please note: The above plan is for **deciduous** and **coniferous** trees. However, this basic procedure can be used for investigating any plant problems caused by **pests**, as well as other kinds of damage.



Reference Sheets:

Common Tree Problems

Tip Die-Back

Ends of branches are dead with no leaves. The center branches of the tree may still have leaves, but the outer branches have few leaves. This is a sign of general ill-health.

Discoloration

Leaf discoloration such as yellow leaves or leaves that look like they are dying too early in the fall. Leaf problems can be due to a variety of factors, including low pH (acidic) soil, too much water, or general ill-health.

"Witch's Brooms"

Tips of tree branches look more spindly than normal, similar to a witch's broom. The most probable cause of this is salt damage. Is there a sidewalk or driveway nearby that is salted during the winter?

Leaves wrinkled and discolored: Aphids

Aphids suck juices from maple leaves, causing them to turn yellow or brown. Ants are attracted to the honeydew secreted by aphids.

Tree defoliated; Twigs girdled: Bagworms

Bagworms feed on the leaves of maples and girdle the twigs. The adult males are black, clear-winged moths. Female moths have no wings. The bagworm caterpillar builds a silken cocoon and attaches bits and pieces of leaves for camouflage. Look for the bags, which are covered with leaves and twigs.

Holes in leaves: Boxelder bugs

Boxelder bugs chew holes in the flowers, fruit, and foliage of maple trees. Adult bugs are brownish-black with red markings. They measure about 1/2 inch in length and resemble squash bugs. The nymphs are bright red. The adults frequently swarm in the fall around the bases of trees, fence posts, or walls.

Leaves wilt and turn brown: Midges

Trees infested by midges show wilted, deformed, and browned **buds** and foliage. Adults are two-winged flies, 1/14 to 1/8 inch long, with long legs and antennae.

Numerous galls on leaves: Mites

Maple bladder gall mites cover the upper surfaces of maple leaves with small, green, wartlike galls, which later turn blood red. If the galls are very numerous, the leaves become deformed.

Small bumps on leaves and branches: Scale

Scale insects attach themselves to leaves and branches of trees and actually look like bumps. They protect themselves under a waxy, concave, shell-like covering. These insects are brown, about 1/8 to 1/4 inch in diameter, and create a cottony mass around themselves. This mass can contain up to 500 eggs, and is about 1/2 inch in diameter. In June, the young move out and infest the leaves. Scale insects suck the sap from the leaves and branches, causing leaves to yellow and curl. If you see small bumps on the branches of your pines, you may be looking at scale insects. Scale insects suck the sap from the needles and bark.

Leaves turn brown and collapse: Wilt

A fungus causes wilt in oaks. Affected trees have curled, drooping brown leaves, and sometimes the sapwood turns black or brown.

Pine leaves yellowish, tunnels in bark: Beetles

Pines are susceptible to attack from a wide variety of beetles. The damage beetled do can be especially dangerous after a period of prolonged drought.

Information on Pest & Disease Treatment & Control:

To control aphids, spray trees vigorously with water. Do this in the morning, three times, once every other day. If aphids keep returning, spray with insecticidal soap every two to three days until the **pests** are gone.

Bagworms' bags can be picked off of the tree. In August, set out pheromone traps to catch male bagworms, in the hope of reducing the population of these **pests** next year.

Control boxelder bugs by spraying infected trees with insecticidal soap. Spray them two or three times at threeto five-day intervals.

To control midges, pick and destroy infested leaves and gather and dispose of any fallen leaves; then spray the tree with insecticidal soap, using three applications at three- to five-day intervals.

As soon as you spot mite damage, spray trees in the early morning with a forceful stream of water to knock mites from leaf undersides. Repeat this procedure on three consecutive mornings. If you still find mites on your trees, spray with insecticidal soap.

All scale insects are controlled in the same way. If caught early on, you can scrape them off the tree with your fingernail or a cotton swab dipped in rubbing alcohol; otherwise, spray with a mixture of alcohol and insecticidal soap every three days for two weeks. To make this mixture, combine 1/2 cup of alcohol with every quart of insecticidal soap you use.

No effective control for wilt is known. Infected trees must be cut down and destroyed. Prune and destroy dead branches. If your tree is badly infected, remove it, together with as many roots as possible, and destroy it, since the soil may continue to harbor the fungi.

Most beeltes can be controlled by hand-picking. No effective control for bark beetles is known. Keep your trees in good condition with proper feeding and watering. Cut down severely infested trees and destroy them.

Source for **Pest** Signs #4-11 and Treatments:

Rodale's Landscape Problem Solver: A Plant-by-Plant Guide by Jeff and Liz Ball ISBN 0-87596-692-6



Reference Sheets:

Other Types of Tree Damage

Understanding the problem

Tree roots develop and survive where there is adequate oxygen and moisture. Most active tree roots are in the top three feet of soil, and the majority of those are in the top twelve inches. The more compacted or poorly drained the soil, the closer the roots are to the surface. When the roots on one side of the tree are injured, the branches on that side of the tree may die.

Root damage by trenching

Digging trenches for installation of water and sewer pipes, telephone cables, gas lines, or for building foundations can damage the root system of nearby trees.

Roots covered by pavement

Roots which are covered by pavement may be deprived of air and moisture, which are essential for growth. If a large area around the tree is paved, the surface should be porous to allow water and air to penetrate.

Changes in soil grade

Even a few inches of fill or soil removal can cause extensive root damage. Clay soils cause the most damage because the fineness of the soil shuts out air and water more than a gravelly or coarse soil.

Storm Damage

Treatment of storm-damaged trees requires wise decisions and prompt action to achieve maximum benefit from repair work. Repairs come in two stages: first aid for immediate attention; and follow-up work to be distributed over a period of months to several years. Care for damaged large trees is best left to professionals.

Snow/ice damage

Little can be done about removing ice from plants. Snow can be removed with a broom. Always sweep upward, lifting snow off. When the branches are frozen they are quite brittle and may break. Do not be in a hurry to prune to correct plants bent out of shape by snow or ice. Often, the plants will straighten up by themselves in a few days. Broken branches, however, should be pruned as soon as possible.

Hollow trees

Hollow trees result from a tree injury severe enough that the tree fails to stop the spread of decay. Fungi cause wood decay and insects assist with wood removal. Growth continues to occur on the outer part of the trunk, which remains intact. Traditionally, homeowners have attempted to clean decay from the cavity and fill the empty space with concrete or similar material. Benefits from filling the cavity are questionable at best. Sometimes the cavity will contain water. The old recommendation was to drill holes below the cavity so that the water could drain. However, drilling holes will break the barrier that keeps the decay from invading healthy wood.

Water Stress

Most plants wilt when they experience inadequate moisture. Leaves on river birch and poplar trees turn yellow and drop. Sycamore leaves turn brown and fall, while other trees develop premature fall color or shed small branches.

Lawnmowers and Weed Trimmers

Injury and infection started by a lawnmower or weed trimmer can seriously threaten a tree's health. The most severe injury occurs in early spring during leaf emergence, and in early fall during leaf drop. Injury can be prevented by the removal (by hand trimming) or prevention (use of mulch) of grass and weeds from growing at the base of the tree. Wounds are serious enough by themselves, but the wounded tree must also protect itself from pathogens that invade the wound, attacking the bark and healthy tissue.

Sources

North Carolina State University: http://www.ces.nscu.edu/depts/hort/consumer/factsheets/trees-new/text/tree_damage.html

TWIG DETECTIVE

TEACHER INFORMATION

Investigating twigs can help us infer a lot about a tree, such as the weather, the tree' age and environment, and whether the tree is infested with insects. Guide students to consider some of the above during this activity and encourage students' input.

Gathering Twigs

Using pruning shears, cut enough twigs (approx. 12"-15" long whenever possible) for pairs of students to examine in the classroom. As an alternative, you may choose to have students go outside to investigate twigs as they grow on the tree.

Information

- 1. Parts of a Twig
 - A. pith center of a twig
 - B. leaf scar area where leaf was attached to the branch
 - C. bud oval-shaped structures usually found above leaf scars
 - D. **terminal bud ring** a scar that may form a ring around the twig, located where the prior year's **terminal bud** was
- 1. Determining Twig Growth
 - A. Measure the distance from one **terminal bud ring** to the next, or from last year's **terminal bud ring** to this year's **terminal bud**.

Procedure:

- 1. Students will use a magnifying glass to find:
 - A. pith
 - B. leaf scar
 - C. **bud**
 - D. terminal bud ring
- 2. Trace back the years by measuring the distance from one **terminal bud ring** to the next. Record the data in journal entries.
- 3. Compare data with other students' and look for patterns. Make a chart of the data collected. Use this data to make a bar graph (see sample below).
- 4. What conclusions can be made about growth? About the health of the tree?
- 5. Discuss possible reasons for these growth patterns.
- 6. With this new information, have we learned enough to meet the original goal? If not, it may be time to contact your county's **Cooperative Extension** Office for assistance.



I. Introduction

- A. Introduces the concept of **Integrated Pest Management** and defines what a **pest** is
- II. I Protect Myself
 - A. Relates "Integrated Pest Management" to "I Protect Myself"
- III. Why should IPM be important to me?
 - A. Discusses **pests** and the concept of pesticide
- IV. What are Toxic Substances?
 - A. Discusses the importance of using pesticides and **toxic** substances safely and includes an at-home activity
- V. Red, Yellow, Green
 - A. Discusses the **IPM** pyramid and ways to decide when and how to use pesticides safely

VI.IPM Steps (2 pages)

- A. The steps of **IPM**:
 - i. Learn to properly identify the **pest** (and **beneficial** insects)
 - ii. Learn the life cycle and biology (consider contacting **Cooperative extension**)
 - iii. Sample and monitor the environment
 - iv. Determine an action threshold (Is it necessary to use pesticides?)
 - v. Choose tactics
 - vi. Evaluate results

TEACHING-LEARNING ACTIVITIES

I. Introduction

A. Read this page individually or as a class.

- II. I Protect Myself
 - A. Students work to individually fill in the blanks and complete the sentences.
- III. Why should IPM be important to me?
 - A. Discuss as a class to get students thinking about pesticides.
- IV. What are Toxic Substances?
 - A. Introduce this activity by reading aloud in class.
 - B. Students complete the activity at home.
- V. Red, Yellow, Green
 - A. Read this page together as a class.
 - B. Create the pyramid found at the end of the lesson pages.
- VI.IPM Steps (2 pages)
 - A. Use these pages for individual reading or discuss them together as a class.
 - B. Refer to the **IPM** pyramid for steps 4 & 5.

- VII.Review What You've Learned
 - A. Have students complete this page individually.

- VII.Review What You've Learned
 - A. Covers **pest** vs. **beneficial** insect, the **IPM** pyramid, and safety with chemicals

VIII.Vocabulary

name _

Student Lesson: Learning about **IPM** Introduction

What is **IPM**?

What is a **pest**?

Why should IPM be important to me?

What is a pesticide?

What are **toxic** substances?

If I have a **pest** in my house or garden, what should I do?



What is **IPM**?

IPM is the short way to say **Integrated Pest Management**, which means being careful about how we try to reduce **pests**. The word "**integrated**" means using a combination of ways to do something

What is a **pest**?

A **pest** is what we call things, usually living hings, that are causing problems.

Sometimes this means bugs are eating our plants. Sometimes it means a disease is affecting our fruit tree. Weeds can be **pests** in a garden because they compete for **nutrients** and water in the soil.

Something that is a **pest** in our house, like ants, may not be **pests** outside. Sometimes, a **pest** is also something that is simply in the wrong place.

A wasp can be a **pest** when it is next to your front door. But in the garden, it is a **beneficial** insect, because it eats caterpillars that eat your vegetables.

Student Lesson: Learning about **IPM** I Protect Myself



Protect Myself from pests and pesticides.	
--	--

- I Protect My environment from **pests** and pesticides.
- I Protect My own food and flowers.
- I Protect My food and flowers from **pests** and pesticides.

I Protect My	
I Protect My	

Student Lesson: Learning about **IPM** Why should **IPM** be important to me?

IPM is important for everyone, ecause everyone should use the safest and bestworking way to eliminate **pests**. It is the healthy thing to do!



What is a pesticide?

When we end a word with "-icide," it means we want to eliminate somthing.

What we put at the beginning of that word refers to what we want to eliminate.

For example, an insecticide ("insect" + "icide") eliminates insects.

What does a pesticide eliminate?

Answer:

Other **Toxic** Substances

Student Lesson: Learning about **IPM** What are **Toxic** Substances?

Pesticides

Pesticides and other **toxic** substances may be in and around your home. Do you know how to use them safely?

Take this list home and discuss it with your parents. We use many types of products to change the environment we live in. Most products contain chemicals. They can be used safely, but can also cause harm if used incorrectly. Always read the labels carefully, use as directed, and dispose of properly. Consider ways to use less chemicals.

With the help of an adult, circle the items used in your home!

Cockroach sprays and baitsDrain cleanersMosquito spraysOven cleanersRat poisonsLaundry detergentsFlea and tick sprays, powders, and collarsFurniture polishHousehold plant spraysPaintSwimming pool chemicalsBleachLawn and garden products designed to killAmmonia

Now, add other items that were not on this list:

Do you have any items labeled "Non-**Toxic**" or "Organic?"

Student Worksheet 4

name_

Student Lesson: Learning about **IPM** Red, Yellow, Green



Just like traffic signals use red, yellow and green for our safety, the **IPM** Pyramid reminds us when and how to use pesticides safely.



Use the terms above to fill in the blanks:

When we look at the pyramid, the largest area is the bottom – this is the green area. When we are trying to rid our home of a **pest**, we can use the actions in the green zone safely. They are the methods we should try first and use often.

Green means " ____ __ __ __ __ __ ."

For example, to reduce ants in the house, clean up crumbs from food. This is a very safe method of **pest** management and can be used by both children and adults. So, it is in the green area.

The next area is yellow. These methods can be used, but only by an adult and only with care.

Yellow means "______."

Red is the smallest area of the pyramid and should be used the least often. These methods usually use a chemical to reduce the **pest** and may be harmful to others, especially if not used properly. These methods can only be used by an adult, and only when absolutely necessary.

Red means "____; ___; ___."

In the following lessons, we will learn how to use the steps of **IPM**. Properly identify if there is a problem or a **pest**. Learn about the biology of what you are studying. Sample the environment. Determine the action to take. Evaluate your results.

Student Lesson: Learning about IPM IPM Steps

If you think you have found a **pest**, what should you do? Be careful! Ask an adult to help you. Remind them to follow the **IPM** steps.



Before you decide you need to get rid of that bug you saw on your plant, make sure you know if it's a **pest** or not.

Some of the most ferocious "good" bugs are the larvae of ladybugs and lacewings. They eat many insect **pests**, so we call them **beneficial** insects. If you don't know what they look like, you might think they were "bad" bugs. When you spray, you eliminate **beneficial** insects, too. Think before you act!



Because of the life cycle of **pests**, there is usually a time when your treatment will work best. If you treat at the wrong time, it may not work - it may be a waste of time and money.

Integrated Pest Management means finding out the best way to treat a **pest** *before* you take action. Look for information about your **pest** online, or contact the **Cooperative extension** in your area.



Let's review what we've learned. If you see a **pest** in your house or garden, what should you do? First, ask an adult to help you identify it and learn about it. Step #3 tells us to sample the environment. This means, don't treat the **pest** until you are sure there are enough to be a problem. (It's important to know its life cycle and biology.)

Student Worksheet 6-A

name _

Student Lesson: Learning about **IPM IPM** Steps



There are always going to be **pests** (like insects, diseases and weeds) in and around your home and yard. If you have learned about the **pest**, you will know when you can ignore it or when you should act to treat it.

Remember, you should not use pesticides yourself. Only adults should use pesticides, and they should only use them when they have read the label carefully and have decided it is necessary.



The first **tactics** (actions) you consider should be the safest ones. Always think of the **IPM** pyramid. Use **tactics** from the green zone first (Go Safely).

For example: Use a fly swatter instead of spraying, or pull young weeds by hand before they mature and drop seeds.



Keep track of what worked and what didn't work. If you always have problems with **pests** in the same place, at the same time every year, it's time to make a change.

For example: your Mom's favorite shrub used to get a leaf spot disease every summer. Last year, you cleaned up the dry leaves in the late fall (where the fungus spores were hiding) and this year, the plant did not get spots. What does that mean? Will you clean up the dry leaves every year to prevent the infection?

Student Worksheet 6-B

Student Lesson: Learning about **IPM** Test Your Knowledge!

Some insects can be a **pest** or **beneficial**.

____ yes _____ no _____ No _____ What color is the largest part of the **IPM** Pyramid? ______

What color is the smallest part of the **IPM** Pyramid? _____

Why?

Many chemicals can be found in your home. They can be under your kitchen sink or in the garage. Does that mean you can use them?

____yes

____no

Finish these phrases:

ALWAYS___THE LABEL

I____ MYSELF



Student Worksheet 7

Student Lesson: Learning about **IPM** Vocabulary

- Beneficial helpful
- Bud an oval-shaped structure found above leaf scars, that holds next year's flowers or leaves
- **Coniferous** a tree which has seeds in cones and very narrow or overlapping leaves; most are evergreens and have leaves throughout the year
- Consensus an opinion or agreement reached by a group as a whole
- **Cooperative extension** a resource for more information on **pest** control, an office in each county where people work to help farmers and homeowners be educated about farming and take care of their homes and their health
- Deciduous a tree which does not have seeds in cones, and has broad leaves that fall in autumn
- Host something that pests live off, such as an animal, crop, or other plant
- Integrated using multiple ways to do something
- **IPM** abbreviation for **Integrated Pest Management**, a way to reduce **pests** by using the safest and best methods
- Leaf scar area where a leaf was attached to the twig
- Nutrients necessary vitamins and minerals; fue' for our bodies
- Pest something that is damaging or causes a problem, such as a bug, weed, or disease
- Pesticide something that eliminates or reduces pests
- Pith the center of a twig
- Predator an organism that hunts and eats other organisms
- Species a group of related organisms that resemble one another and breed among themselves
- Tactics actions taken to get something done

Terminal bud ring - a scar that forms a ring around the twig where last year's **terminal bud** was **Toxic** - poisonous



Integrated Pest Management is a specialized form of environmental management wherein scientific research and real world application work together to reduce **pests** such as insects, diseases or weeds.

- 1. Properly identify pests
- 2. Learn the pest/ host biology
- 3. Sample the environment for pests
- 4. Determine an action threshold
- 5. Choose the best tactic
- 6. Evaluate results

Teacher information for Student Worksheets

Student Worksheet 1

Introduction

IPM and **Integrated Pest Management** are not common household names, but **IPM** has been going on around us as long as people have been raising crops and building homes. **IPM** means being knowledgeable about the **pest** you are dealing with and thinking carefully about the best way to treat it. Before science came up with pesticides and traps, farmers let **beneficial** insects do their jobs.

First, students must begin to understand what a **pest** is. A **pest** is not always a **pest**. It is only when something is damaging, or potentially damaging should it be considered a **pest**.

Student Worksheet 2

I Protect Myself

Students should be reminded that common household chemicals as well as those that are stored carefully in the garage, basement, or barn can all be unsafe or **toxic** when they are not used properly. No one likes mosquitoes or cockroaches, but the unsafe use of a chemical can be even more of a problem. Once students become aware that they must consider what is safe, they will begin to think about the actions they take and are exposed to. Have students complete the sentences.

Ex: I protect my family, friends, pets, etc (by being aware of what can cause harm)

Student Worksheet 3

Why should **IPM** be important to me?

Pesticides are a serious matter. They are used to kill **pests**. Any type of herbicide (kills plants, specifically targeting weeds), insecticide, or fungicide are all pesticides.

Pesticides are necessary to manage **pests** in agriculture and to protect people from disease-carrying insects and rodents. However, they may be used too frequently when they are not necessary. Homeowners use pesticides with much less control than agriculturalists. When something is sold in a store, we often consider it safe. The search for a **pest**-free home and garden (which is nearly impossible) drives people to use pesticides without the knowledge they need to make sound decisions.

Student Worksheet 4

What are **Toxic** Substances

Pesticides and **toxic** substances are found in almost every home. This activity is not meant to frighten anyone, but should be used to remind students and their families that chemicals may be harmful despite their common use. Often, homeowners are concerned with pesticides used in agriculture, but do not think that spraying their lawns against the chance of a weed or insect is the same thing. The main point of this lesson is to be careful!

Student Worksheet 5

Red, Yellow, Green

Green: Go safely Yellow: Be cautious Red: Stop; don't go

Using the patterns for the **IPM** Pyramid, have students create their own pyramid. This is an excellent tool to take home and share with family members.

The greatest portion of the pyramid should be colored in with green for "go safely."

The lower four levels are green. The middle level, Physical Techniques, will be yellow for "be cautious." The top level of the pyramid is the last resort and will be colored in with red for "Stop, don't go." Reinforce the idea that the safest methods (green) can be practiced by anyone (example: don't let crumbs lie around to encourage ants) but actions in the red portion should only be used by adults who have carefully read the label.

Student Worksheet 6-A

IPM Steps

Proper Identification is a key to proper treatment. You might be using a pesticide on something that is causing no harm at all.

Learn the life cycle and biology. Many homeowners treat for grubs in their lawns. Have they actually determined they are in the lawn and causing damage? Do they treat at the most effective time, when grubs are most susceptible?

We all should consider treatments based on what is the most effective and least **toxic**. We cannot do this unless we have taken the time to learn all the facts.

Sample and monitor the environment. Be sure there are enough **pests** to cause a problem before you treat. Seeing bugs on your plants does not mean it is time to spray. You may have a healthy population of **beneficial** insects that are keeping the **pest** population in check. Spraying them will kill both the **beneficial** insects and the **pests**, but consider this: the **pest** population can come back more quickly than the **beneficial** insects and your problem may become worse than before you sprayed.

Student Worksheet 6-B

IPM Steps

Determine an action threshold. Knowledge of the **pest** and the damage it can do is the best way to know when to take action!

Choose **tactics**. **Tactics** are actions. Remind students that we should all think before we act. This is a good idea for many things, not just when treating **pests**. When we use **IPM**, we are considering all the information we have, and thinking carefully about the best action to take. It is much easier to use a non-**toxic** method of **pest** control, when we have been paying attention to the environment of our home and garden or field.

Evaluate results. Did our treatment work? Do we know why? Can we use it again next time or should we try something else? Treating a plant with a fungicide every year because it gets leaf spots doesn't make sense. Perhaps the plant is in the wrong place.

Placing it in a sunnier and more open area might reduce fungal infections. Evaluate your actions.

Student Worksheet 7

Test Your Knowledge

This lesson aims to teach students a few basics about how people treat **pests**.

The important idea is to remind them that chemicals, like pesticides and many household products, must be used carefully, and by adults only.

Pesticides can be used and can be helpful, but there may be other tactics to try first.

Students should learn to be responsible for themselves when it comes to safety. They must learn to be aware of things that may potentially cause them harm. This idea goes beyond the use of pesticides

Answers:

- 1. Yes 5. NO
- 2. Green 6. ALWAYS **READ** THE LABEL I.**PROTECT** MYSELF.
- 3. Red
- 4. 4. Because we should stop, think, and use the safest methods more often. Use green most of the time and use red methods vary rarely it is the smallest part of the pyramid

Student Worksheet 8

Provided for student reference

Lesson Supplements



this page left blank intentionally.

