Understanding Insects as Friends or Foes

AUTHOR:
The original lesson, developed by members of Michigan Farm Bureau, was modified by the Michigan Water Stewardship Program.

LESSON OVERVIEW:
This lesson exposes students to good/beneficial and bad bugs and methods used to control or eliminate them. Students will use pheromones to traps insects, identify them, and make a bar graph to show the results of their test.

Michigan Grade Level Content Expectations (GLCEs):
- Make purposeful observation of the natural world using the appropriate senses (S.IP.02.11).
- Generate questions based on observations (S.IP.02.12).
- Plan and conduct simple investigations (S.IP.02.13).
- Construct simple charts from data and observations (S.IP.02.16).
- Communicate and present findings of observations (S.IA.02.13).
- Develop strategies and skills for information gathering and problem solving (books, internet, ask an expert, observation, investigation, technology tools (S.IA.02.14).

OBJECTIVES:
Students will be able to:

- Describe good/beneficial and bad bugs.
- Identify methods used to control or eliminate bad bugs, including integrated pest management.
- Use an insect key to identify insects.
- Construct a bar graph.

GRADE: 2

SUBJECT(S): Science

DURATION: 3 sessions

GLCEs: S.IP.02.11, S.IP.02.12, S.IP.02.13, S.IP.02.16, S.IA.02.13, S.IA.02.14.

MATERIALS:
- Copies of 8" x 10" pictures of "good" and "bad" bugs (ladybug, praying mantis, honeybee, grasshopper, tomato horn worm, gypsy moth caterpillar.
- Insect Trap Making handout.
- Insect Lab Sheet handout.
- Bug Card Sheet, photocopied and cut out for each of the 6 bugs
- Insect Key handout.
- Insect Record handout.
- Samples of apples with no bugs and apples with bug damage.
- Examples of bug control methods – flea collars, ant traps, fly swatters, sprays, fly paper, citronella candles, etc.
- An insect trap (available at most farm and garden supply stores).
- Cotton balls – three for each group.
- Three scents (pheromones) – vanilla, vinegar and perfume.
- Crayons or markers – three colors for

BACKGROUND INFORMATION:
Introduction:
Insects can be found nearly everywhere. Some insects are helpful to people. Other insects are harmful and cause damage to trees and crops. Farmers and gardeners need to know which insects are friends and which are not. Insects can carry diseases, damage crops, make fruits and vegetables look bad and can even destroy entire crops, which limits the amount of food available for people and animals to eat. Integrated pest management (IPM) is a pest management system

that focuses on managing pests with the least possible impact on people, property, and the environment. Farmers use tools like crop rotation, sprays or good bugs to help their crops. Using traps, scouting and identifying insects, and controlling bugs are all important tools for farmers to use.

Farmers/Growers use:

1. **Chemical crop sprays or powders**- Farmers use as little as needed, to protect the environment and to protect the water and food supplies. Pesticide applications are a useful tool, when applied according to label instructions by registered and certified pesticide applicators.
2. **Crop Rotation**- Farmers do not grow the same crop every year, but instead rotate which crops they plant in each field. For instance, one year a farmer may grow a field of corn. The next year, the farmer may grow alfalfa hay in that field. Farmers do this because certain bugs like certain crops. By growing different crops year after year, bugs will leave. Crop rotation is a common practice on sloping soils because of its potential for saving soil. Rotation also reduces fertilizer needs, because alfalfa and other legumes replace some of the nitrogen corn and other grain crops remove. With crop rotation, pesticide costs may be reduced by naturally breaking the cycles of weeds, insects and diseases. As added benefits, grass and legumes in a rotation protect water quality by preventing excess nutrients or chemicals from entering water supplies; meadow or small grains cut soil erosion dramatically; and crop rotations add diversity to a farming operation.
3. **Good Insects**- Farmers also use "good" or beneficial insects to protect their crops and get rid of harmful insects. Some insects can do a lot of damage to crops and orchards. An insect's worst enemies are other insects. Of the millions of insects that eat animals instead of plants, most feed on other insects. Using insects to control insects is called a "bio-control" method. Biological control is the use of naturally occurring organisms that act as natural enemies to the pests in question. These approaches to pest management may be used to reduce pesticide use. The introduction and encouragement of natural predators is a highly effective method of controlling many bugs. Some quick bio-control definitions: Pest – an unwanted insect or weed; Pathogen – bacterium or fungus that causes disease in a pest; Parasite – an insect that feeds in a living pest; and Predator – an insect that eats pests. When used effectively, bio-control methods can be a safe and effective approach to pest management.
4. **Scouting/Trapping**- Farmers must watch their fields or orchards closely. Farmers look on the leaves of the trees or plants for bugs. This is called scouting. To help find the insects, farmers use traps. When pests are found that could damage the crop, the farmer must choose the best way to get rid of the pest. Traps are hung in fruit trees, in greenhouses and on posts in fields for other crops. A scent, called a pheromone, is used inside the trap. This attracts the bugs to the trap. The trap is sticky inside, so when the bugs fly into the trap to smell the pheromone they get stuck. Killing adult bugs stop the cycle of egg laying or larval development and reduce pest populations. Sometimes farmers need help identifying the insects they find. They use a key, or guide. A key uses color, the number of legs or other things to determine what bug they have found.

In addition to the pest management tools listed above, keeping things clean goes a long way toward reducing pest problems, especially indoor pests like cockroaches, ants and houseflies. Cleanliness is also important on farms for pest control, especially around feed piles and manure-prone areas. The most important thing you can do to control bugs is to learn as much as you can about the life cycles and preventative treatments for bugs that are bugging you.

VOCABULARY:
Insects, good/beneficial insects, bad/harmful insects, integrated pest management (IPM), chemical control, mechanical control, biological control, crop rotation, pest, pathogen, parasite, predator, scouting/trapping, pheromone, ladybug, praying mantis, honey bee, grasshopper, tomato horn worm, gypsy moth, disease, insect identification key.

PROCEDURE:
Warm-Up (Anticipatory Set):
Have a discussion about insects with students. Which bugs do they like or dislike? Which bugs "bug" us and which bugs do we depend on? Why or why not? Encourage them to draw pictures or write stories of good and bad bugs that they are familiar with.

Lesson One: Identifying "Good" Bugs and "Bad" Bugs

- Divide students in groups of four.
- Distribute one set of the 8"x10" pictures of bugs.
- Have the groups divide the pictures into two piles, "good" or beneficial bugs, and "bad" or bugs that cause damage to trees, crops and gardens.
- As a whole class, go through the pictures one by one, and have the groups identify the bug, then indicate with a thumbs up if they think the bug is beneficial, and thumbs down if they think it is harmful.

Good Bugs:
Ladybug – ladybugs are beneficial bugs. They eat aphids, mealy bugs and scale mites. Ladybugs can eat up to 24 insects every day. Some gardeners purchase ladybugs and release them in their gardens to help control insects.
Praying Mantis – Although they look rather scary, praying mantis are good bugs. They eat cutworms, beetles, flies, aphids and insect eggs. They eat much more than they weigh each day.
Honey Bee - Honey Bees are also thumbs up, they help pollinate crops and produce honey.

Bad Bugs:
Grasshopper – Although grasshoppers are cool to look at and quite friendly, farmers and gardeners give grasshoppers a big thumbs down. That's because grasshoppers eat crops and can do a lot of damage.
Tomato Horn Worm – This strange-looking worm is called a Tomato Horn Worm. It gets a thumbs down. You may see him on a tomato plant munching away at the leaves. Plants need leaves to absorb sun for photosynthesis, which in turn helps the plant take in nutrients it needs to grow and produce fruit.
Gypsy Moth Caterpillar – Gypsy moth caterpillars do not eat much, but can completely defoliate trees (eat all the leaves on a tree). This weakens the tree and makes it vulnerable to

diseases and harmful weather conditions. If gypsy moths infest a tree for more than one year in a row, the tree can die.

There are many more examples of "good" and "bad" bugs. In the next section, students can identify the bugs that "bug" them, and then learn about how farmers control the bugs that damage or destroy crops.

Lesson Two: Ways Farmers Control or Eliminate Bad Bugs

- Show examples of apples that have not been infested by pests and apples that have damage due to pest infestation.
- Discuss which apple people would be more likely to want to eat.
- Discuss why we are concerned about insects in our food (diseases, the way foods look and taste, and reduction in food production, which can affect supply and cost).
- Have the children list some of the bugs they deal with, and discuss the list as a class. (Some responses might be: black flies, house flies, spiders, mosquitoes, wasps, bees, aphids, yellow jackets, hornets, fleas, lice and ants)
- Discuss some ways that can be used to control or get rid of these bugs. (Some responses might be to use a fly swatter, to step on them, to use fly strips or traps, catch them in a net, use flea collars, candles or sprays, natural predators, etc.)
- Discuss methods farmers use to control bugs. (Scouting for pests, crop rotation, chemical pesticides, pheromones and traps, and introducing beneficial bugs to serve as natural predators.)

Lesson Three: Bug Traps and Pheromones

- Show the insect trap to the students, and discuss how the trap works.
- Have students make their own traps: (Make sure students write their names on their traps.) Fold on the dotted lines 1 and 2, then unfold them and carefully cut on the solid "cut" lines, just to the dotted lines, not past the dotted lines. Now fold lines 3, 4, and 5 and tape the top end of the trap closed.
- Discuss pheromones with students and how different insects are attracted to different scents.
- Have the students smell the three scents (pheromones), and let them choose which "pheromone" to put in their trap. Record on the board with a check mark which scent each child selects (these numbers will be used to create a bar graph).
- Based on the particular scent selected, ask students to hypothesize which insect or insects that will be able to trap.
- Add a few drops of the scent they select to their cotton balls, and have them place the cotton balls in their traps. Collect the traps from the students.
- Give each student the Insect Lab Sheet handout for making their scent bar graphs (Scent #1 - vanilla; Scent #2 - vinegar; Scent #3 - perfume), and have the students use the crayons or markers to chart the results of how many students selected each scent.
- While the students are plotting their graphs, use the insect cards provided and place one or two bugs in each trap, without the children seeing.

- Pass the traps back to the students and have them see what bugs their traps have "caught".
- Using the Insect Key, have the students identify the bugs they caught and record them as a group on the Insect Lab Sheet.

Wrap-Up (Closure):
Review the various methods used in IPM. Discuss the effects on people, other living things, and the environment if the only method of pest and disease control was the use of chemicals.

ASSESSMENT OPTION:
Ask students to respond to the following questions: What are other examples of good/beneficial insects? What are other examples of bad/harmful insects? What methods could you use to control insects? What would happen if you chose to do nothing to control a harmful insect? What would the effect be on our food supply? What happens of a control plan does not work?

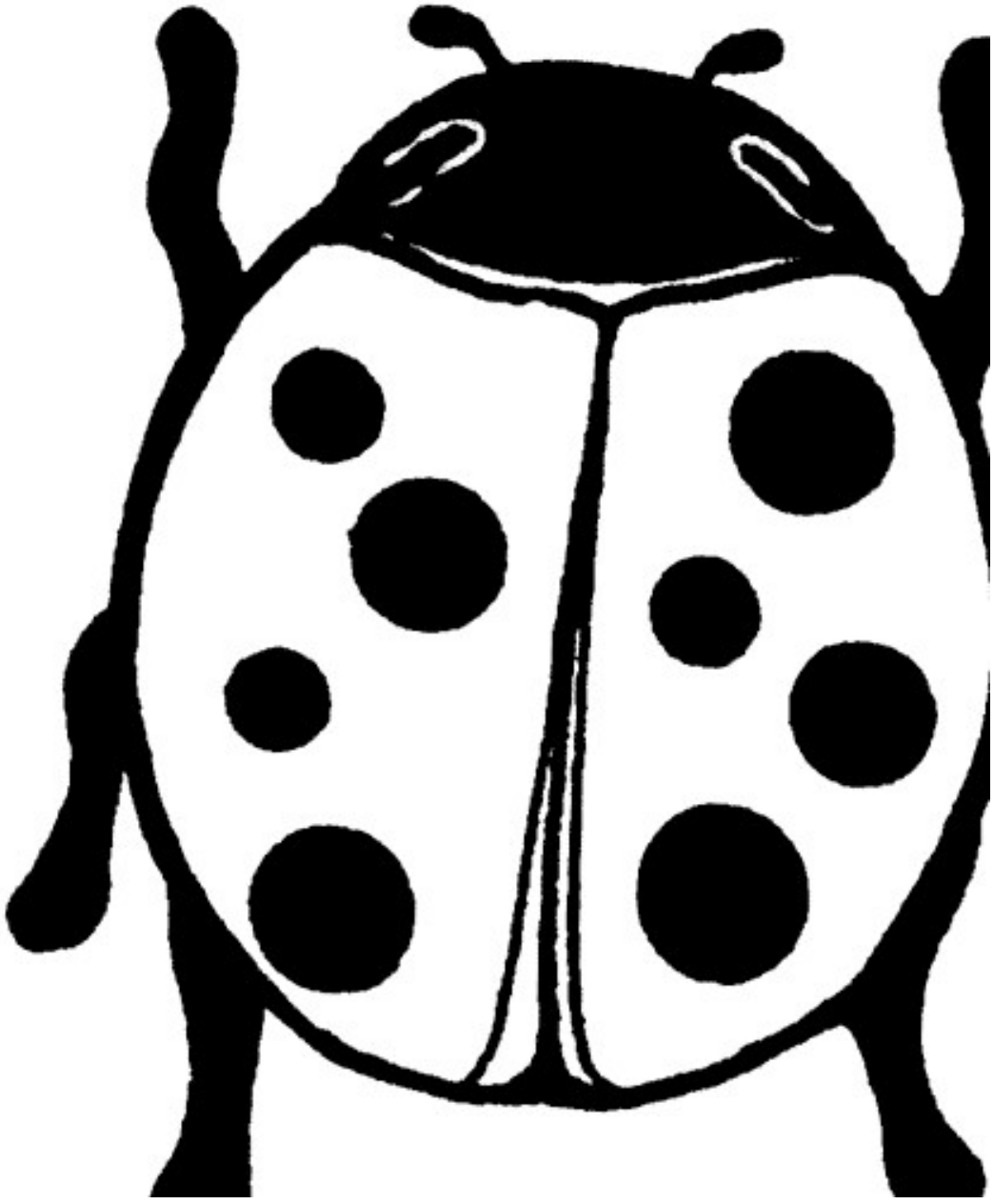
EXTENSIONS:
The lady bug is often very misunderstood. Do research to find pictures of the ladybug at each stage of its lifecycle. Without telling them that they are pictures of ladybugs, share each picture with the students and get their reaction. Because the ladybug has life stages that are most likely unfamiliar to most people, discuss the importance of being able to properly identify insects before deciding on the best control option(s).

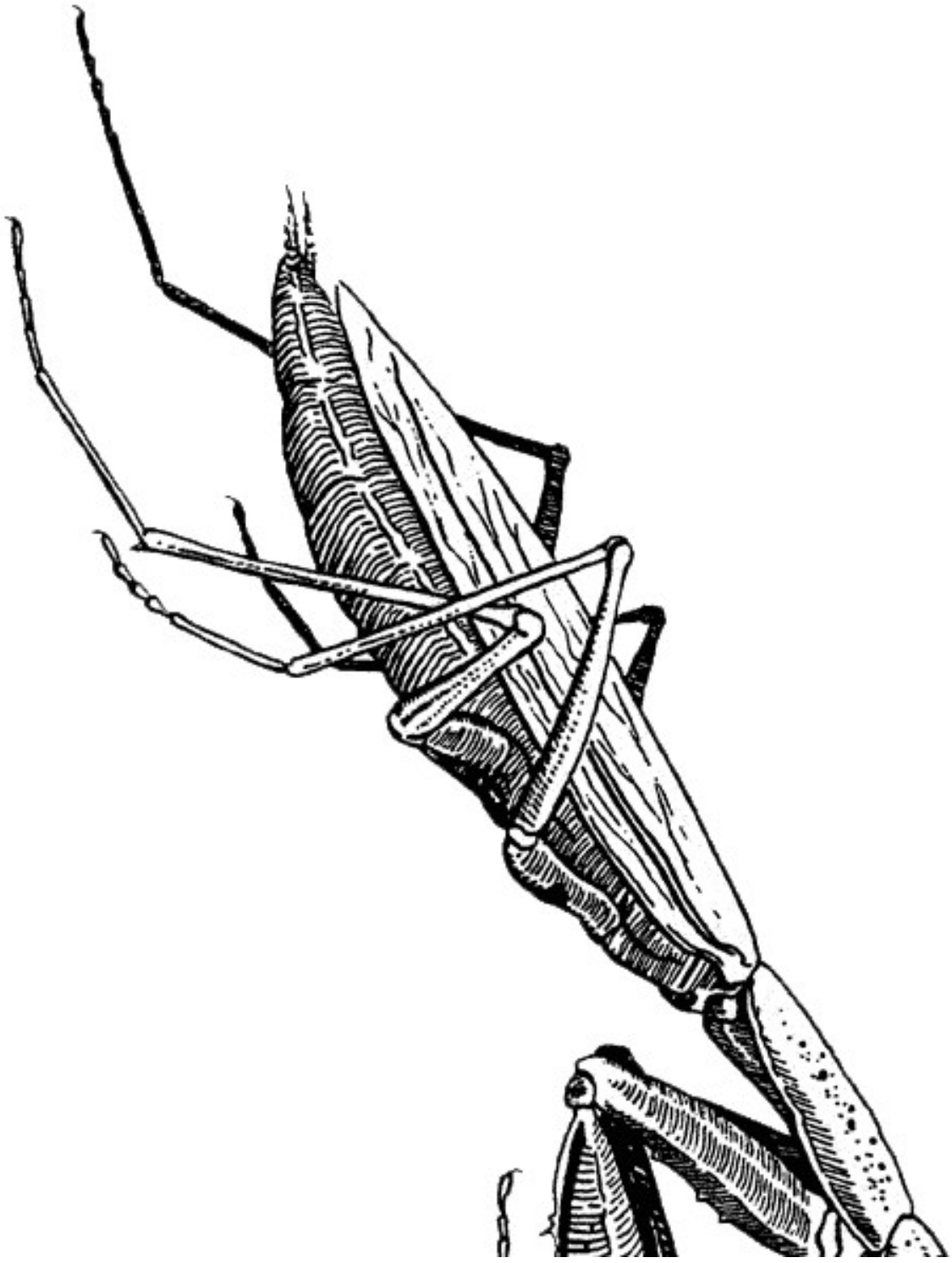
Bedbugs are becoming a growing problem in the United States. What control methods are used?

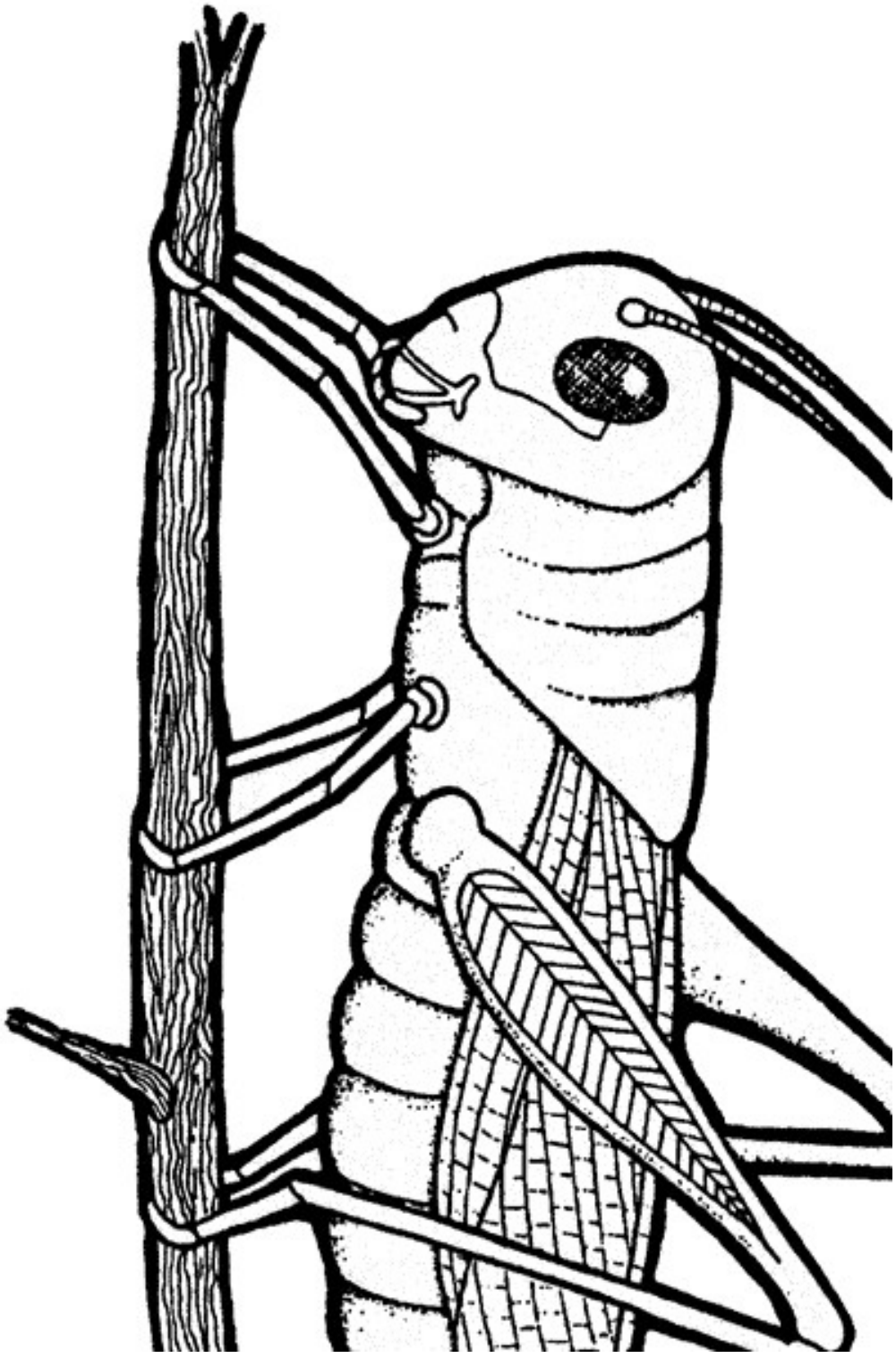
RESOURCES:

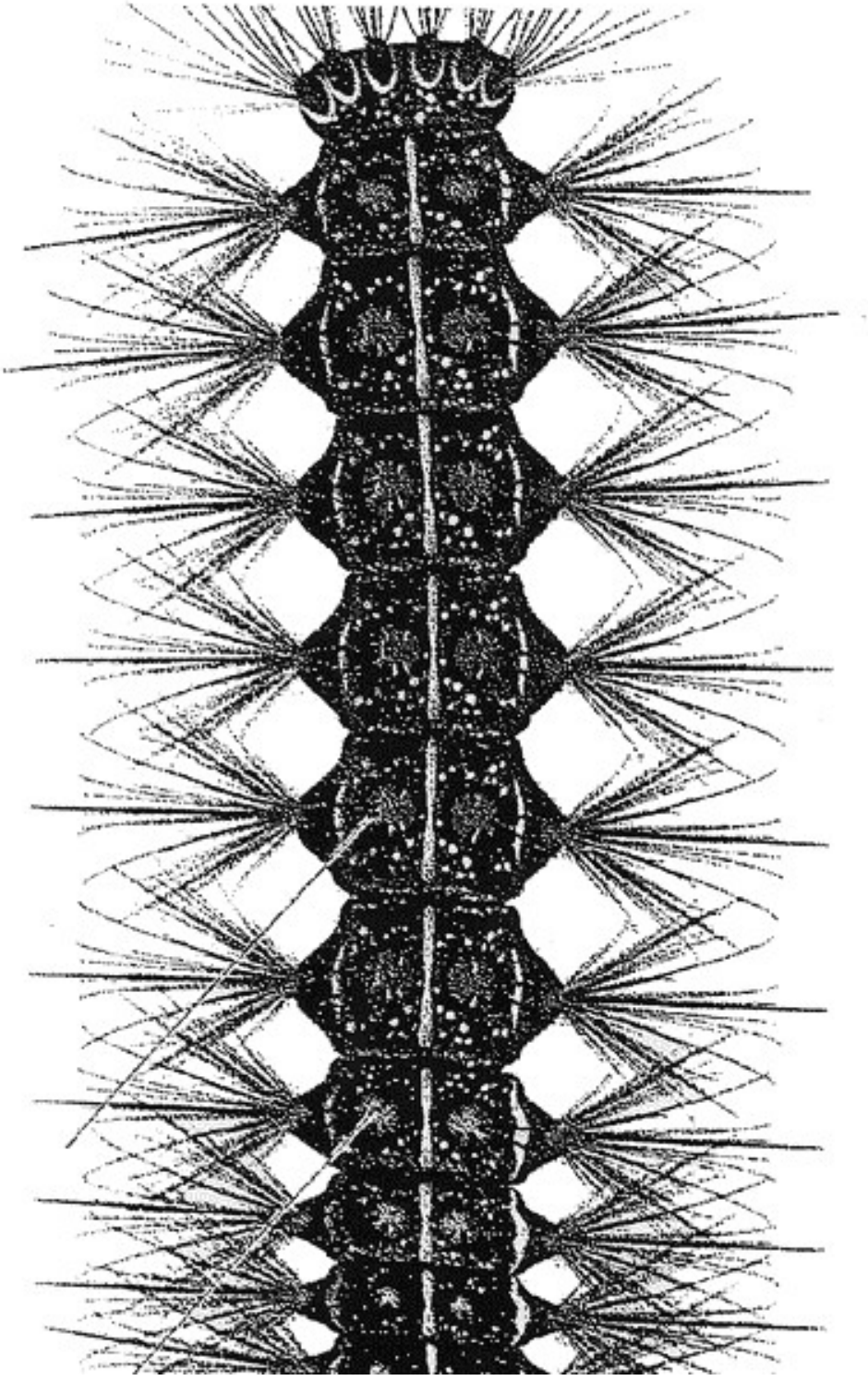
University of Nebraska-Lincoln, Teaching Integrated Pest Management in Schools: http://schoolipm.unl.edu/teaching.shtml

To learn more about insect control, identification, and management, contact you local Michigan State University Extension office, Conservation District, local library, on-line insect databases, and entomology clubs.









Cut
Fold 5
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Fold 3
Fold 2
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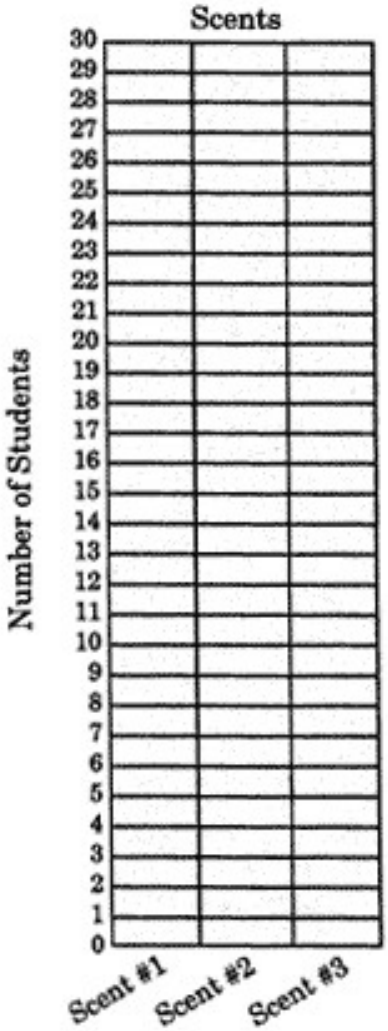
Fold 4

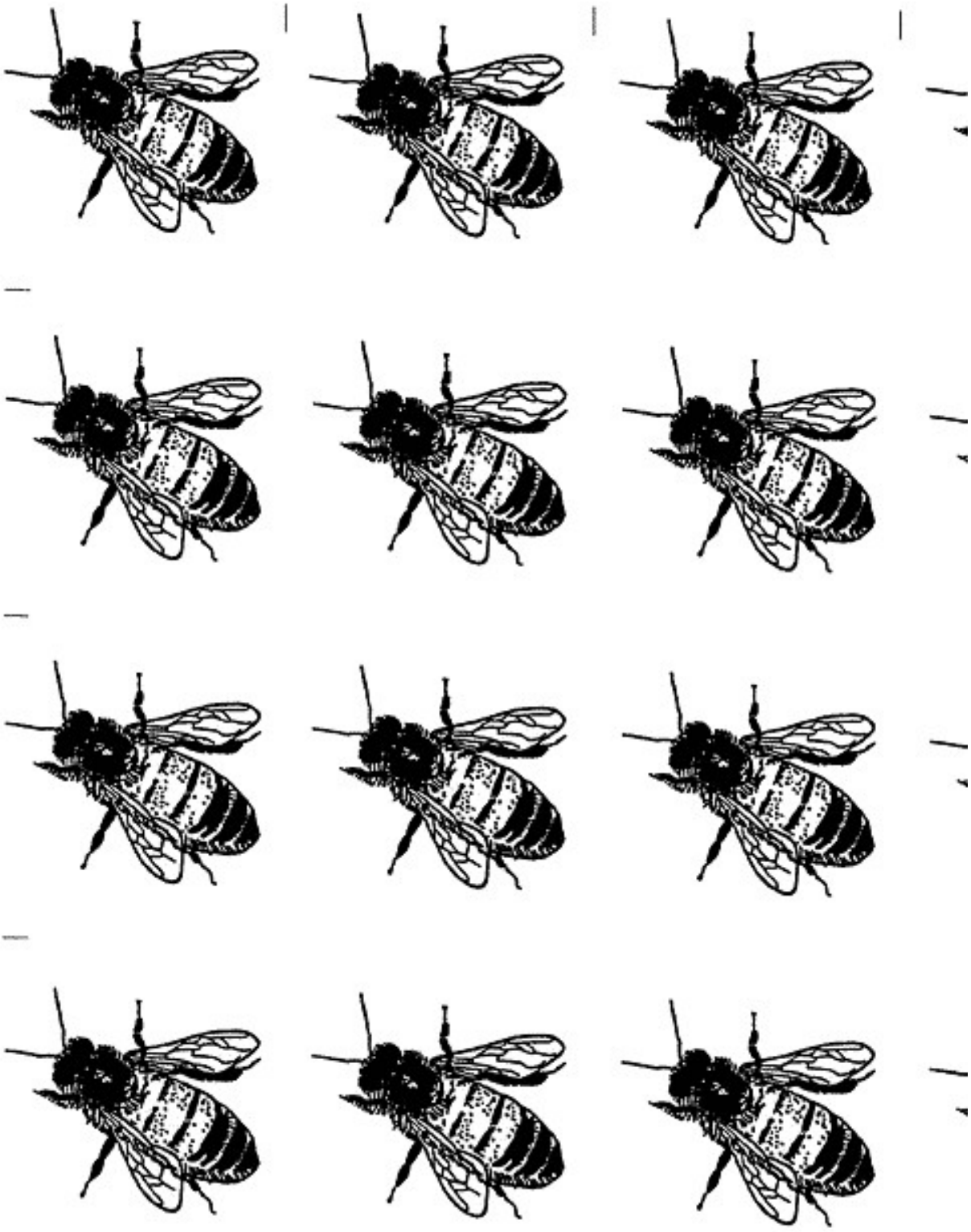
"Understanding Insects As Friends and Foes"

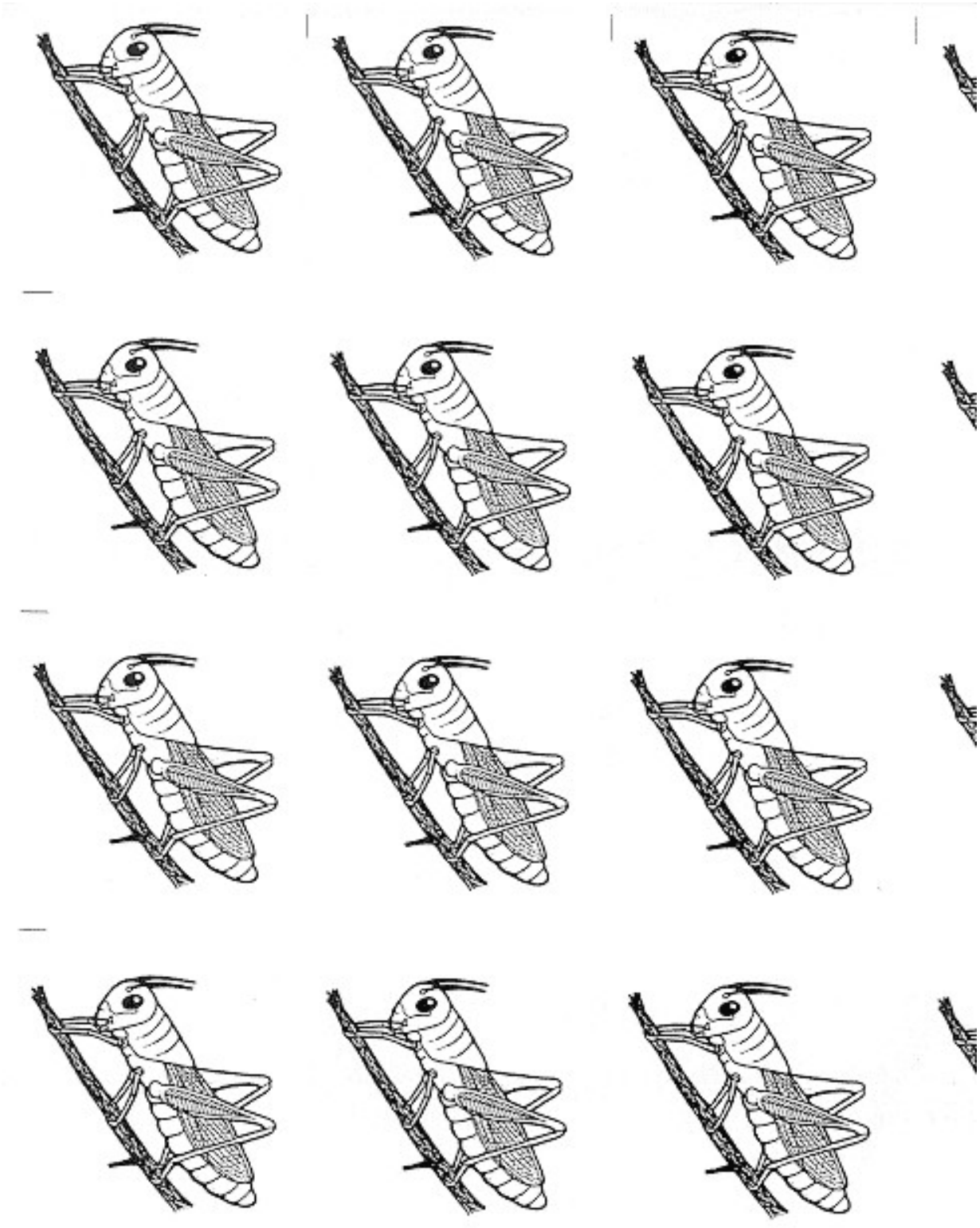
2nd Grade Lesson Plan
Insect Lab Sheet
presented by
Members of Michigan Farm Bureau

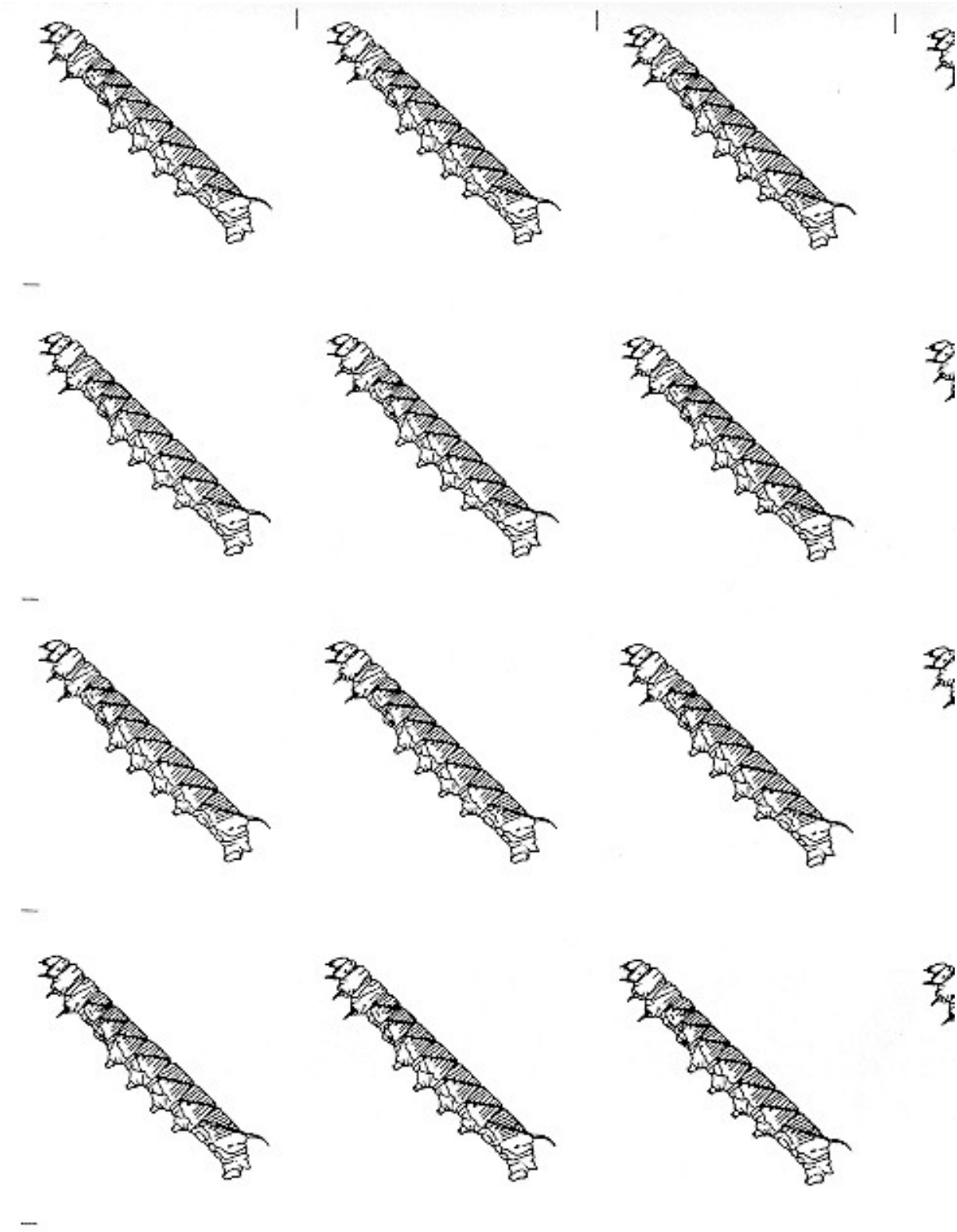
1. Make a bar graph of the student results from the pheromone (scent) test.

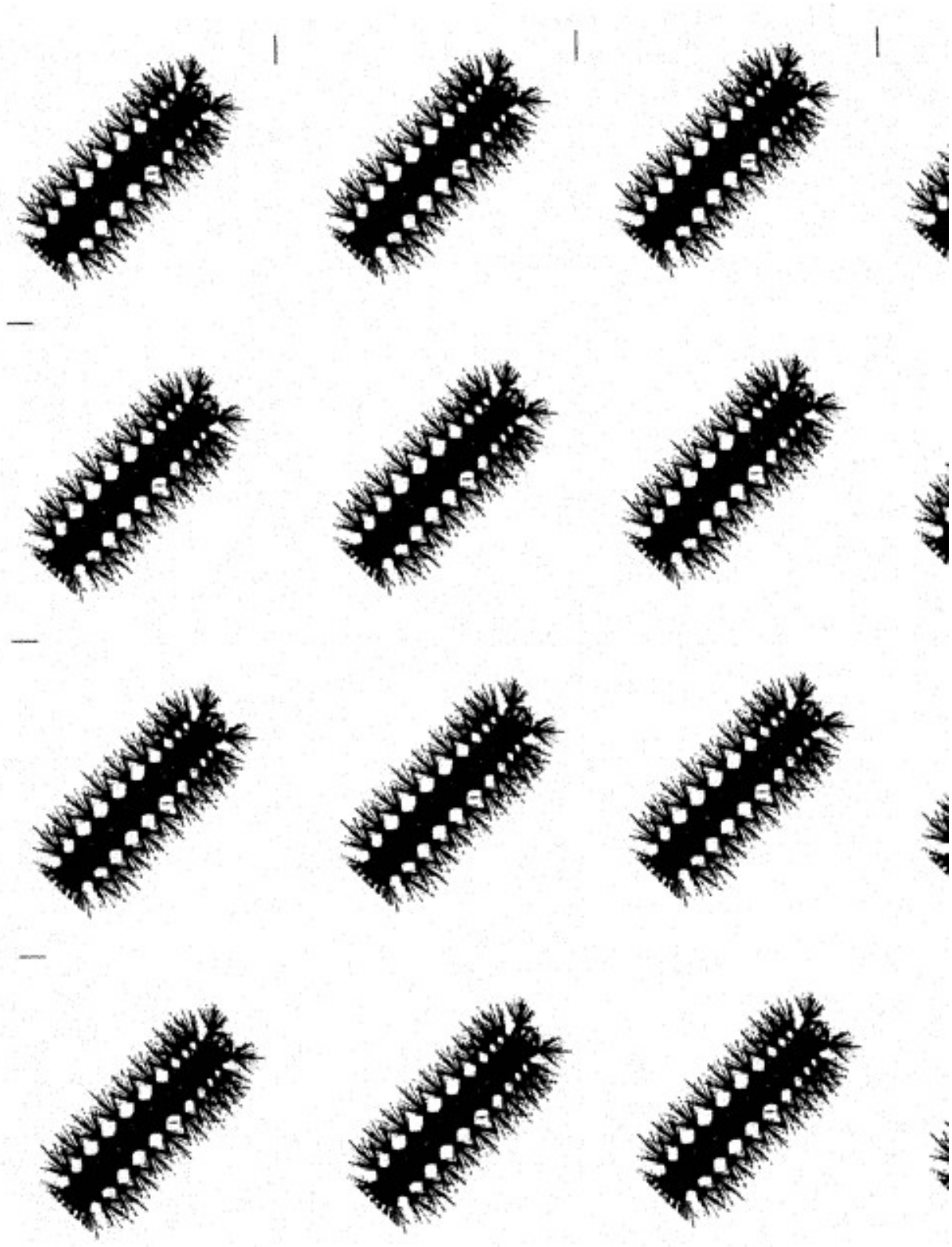


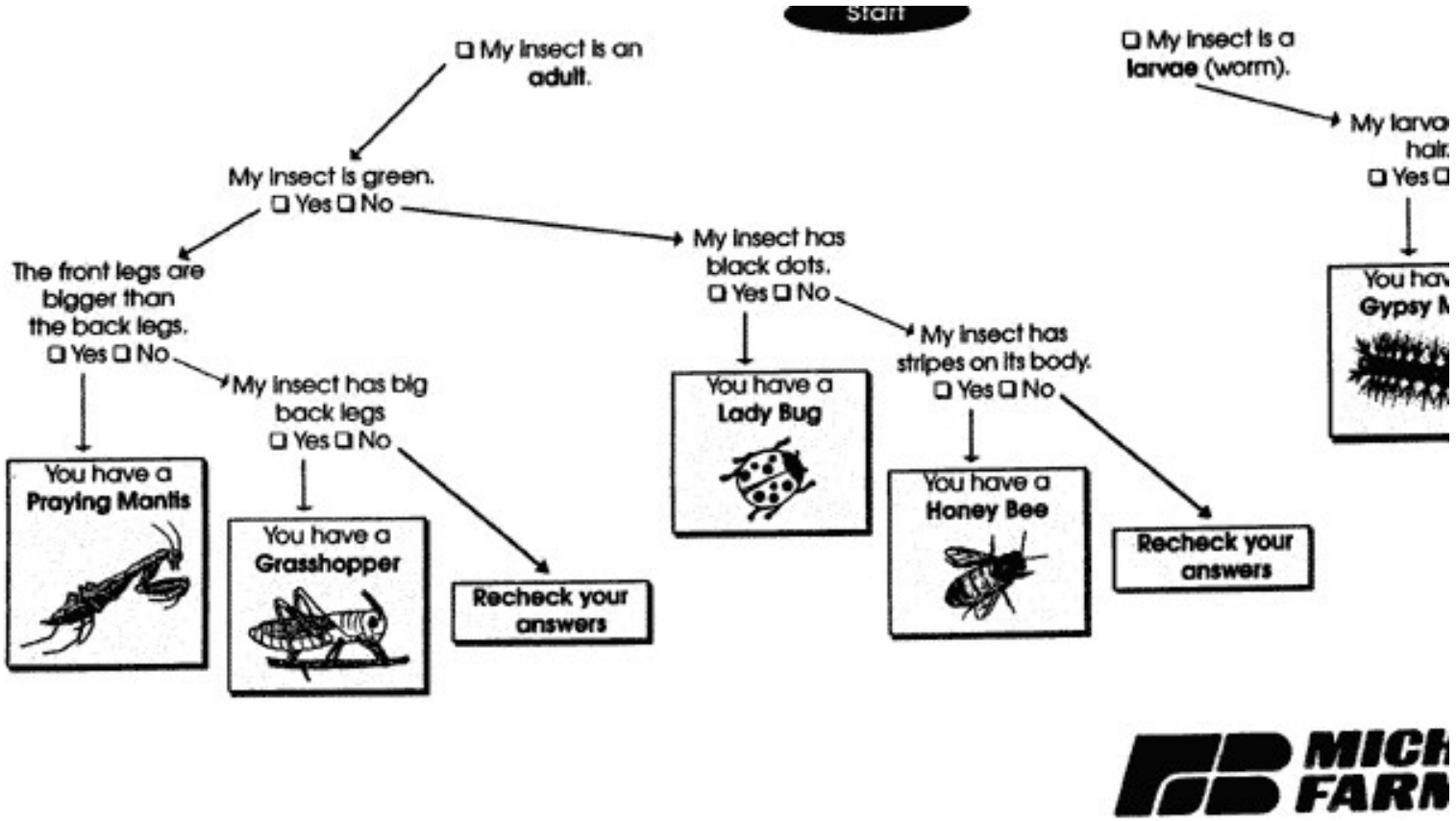
2. Working as a group, put the number of insects you found in your traps on t










Start
❑ My insect is an **adult**.
❑ My insect is a **larvae** (worm).
My insect is green.
❑ Yes ❑ No
The front legs are bigger than the back legs.
❑ Yes ❑ No
My insect has big back legs
❑ Yes ❑ No
My insect has black dots.
❑ Yes ❑ No
My insect has stripes on its body.
❑ Yes ❑ No
You have a **Praying Mantis**
You have a **Grasshopper**
Recheck your answers
You have a **Lady Bug**
You have a **Honey Bee**
Recheck your answers
My larva
hair.
❑ Yes ❑
You hav
Gypsy M

Name: _____

INSECT RECORD

Harmful Insects	Date Found	Number of Insects

Beneficial Insects	Date Found	Number of Insects