

Bugs on the Bog

Students learn to identify and manage insect pests on a cranberry bog.

How do growers identify, monitor populations of, and control insect pests?

Lesson Overview

In this lesson students continue to manage their adopted bogs by responding to insect pest threats with an approach called Integrated Pest Management (as described in Background). To be successful students must carefully observe samples of insects found in their bogs and identify which stages of the life cycle are represented in these samples. They also use information about pest treatment to decide on a response strategy. Because the success of many pest treatments depends upon carefully matching the treatment to the pest's stage of development, this lesson provides an opportunity for students to reinforce their knowledge of insect life cycles.

Background

Insect pests and IPM

There are *many* different kinds of insects that can be found on a cranberry bog. Over twenty insects can cause considerable damage to a cranberry crop. These include the cranberry girdler, the cranberry fruitworm, weevils, and cutworms. For the purpose of this lesson, the insect pest focus is on the gypsy moth caterpillar, the black-headed fireworm, the brown spanworm and the false armyworm.

It is essential to understand that not all insects found on a cranberry bog are destructive to the cranberry plant. Harmless visitors to the bog include butterflies, some moths, and wasps. Of course, bees are major contributors to the survival of the cranberry crop, serving as critical pollinators. There are also beneficial insects that parasitize the eggs of potential pests. For example, the trichogramma wasp lays its eggs inside the eggs of the cranberry fruitworm. When the wasp eggs hatch, the larvae consume the fruitworm eggs.

It is very important, therefore, that insects are not destroyed indiscriminately.

Integrated Pest Management (IPM) is a broad based approach to insect control which takes into consideration ecological, societal, and economic concerns. IPM

seeks to carefully weigh and intelligently combine multiple strategies to effectively manage harmful pest populations. A critical component of IPM is the cranberry grower's awareness of the different types (and numbers) of insects - both harmful and beneficial - that are part of the cranberry ecosystem. Sweep netting is one tool that allows farmers to monitor their bogs as they collect, identify, and count their insect population. Typically, cranberry growers sweep net their bogs weekly from the time buds first appear in the early spring until late August when berries are abundant. Once growers understand the nature and makeup of the insect population, they can take carefully considered actions to prevent and limit crop damage.

Cranberry farmers utilize a protocol to identify when it is time to take steps to limit harmful insect population. This is called an action threshold. An action threshold is the numerical ceiling advised for a particular pest population. Once that ceiling is reached, growers know to take action.

Some pest management strategies include:

- trapping insects, which utilizes hormones that attract adults to sticky traps; this enables growers to monitor population growth and time treatment strategies.
- use of biological agents (such as bacteria) which target specific pests and yet are benign to other insects.
- chemical controls.
- specific farming practices which include short term flooding and/or extra sanding of the bog to inhibit the growth of an insect population.

Note: Additional information on these methods is provided in the student resource, Growers' Association Brief, What is IPM? This information is intended for you as well the students to better understand IPM.

Materials

Exploring Cranberries Web Resources:

Challenges Await You Introductory Presentation (optional)

Demonstration Sweep Net Sample

Student Web Resources:

- Blue Sky Bog Sweep Net Sample
- Sunrise Bog Sweep Net Sample

Student Worksheets:

- Bugs on My Bog: Sweep Net Results (2 per student pair)
- Bugs on My Bog: Taking Action (1 per student pair)

Student Handouts:

- Growers' Association Brief: *Insects on Your Bog?* (1 per student pair)
- Growers' Association Brief: *What is IPM?* (1 per student pair)

Preparation

1. Print all student worksheets and handouts listed in Materials.
2. Optional: Make additional copies of Bugs on My Bog: Sweep Net Sample Results (1 copy per student pair) to support Optional Step 15.
3. Set up the computer stations so that students can access the web resources for this lesson. Plan to have students who adopted the same bog work together in pairs at the computer stations.
4. Arrange to project Demonstration Sweep Net Sample to the whole class.

Lesson

1. Set the stage for this lesson by inviting students to reflect on problems the bog may encounter during the springtime. (To launch this conversation, you might find it helpful to review all or part of the Challenges Await You Introductory Presentation.) Record all responses. If students have not already done so, help guide them to the understanding that spring is when insects (typically in the larval stage) are very busy, growing and feeding.

2. Advise students that during today's lesson they will manage their adopted bogs to protect them from insect pest damage.
3. If this is your students' first encounter with a lesson from *Challenges Await You*, introduce the Growers' Association meeting as a way to learn more about managing a cranberry bog to discuss decisions, get advice, etc.
4. Convene a Growers' Association meeting about insect pests and the challenge of managing them. Distribute *Insects on Your Bog?* Read and discuss as a group.
5. Tell students that during this Growers' Association meeting, the class will examine one sweep net sample together and make a decision as to an appropriate pest management plan. This demonstration sample will help prepare students to face their own challenges with their adopted bogs.
6. Project Demonstration Sweep Net Sample for the class to view. Explore the page together, using the following questions to guide student thinking:
 - What do you see?
 - Describe the insects. At what stage of the life cycle are these insects?
 - Why is there more than one type of insect?
 - Other than insects, what else do you see on this page?
 - How do people organize information in order to understand it better?
 - What are some ways we could organize the insect information on this page?

If students have not already suggested a bar graph, ask:

 - What is a bar graph? How does a bar graph display information?
7. Explain to students that the class will collectively create a bar graph of the insects in this sample.
8. As you, the teacher, click on a particular insect, invite students to determine its appropriate location on the horizontal axis. Drag that insect to its location. Continue to complete the graph together.
9. Distribute to each student pair the student worksheet, *Bugs on My Bog! Sweep Net Sample Results*. Tell students to use information from the graph and the Growers' Brief to complete the student worksheet.

10. Have students determine if any the insects in this sample pose a threat to their cranberry crop. *Note: All students should conclude that at this time no insect poses a threat to the bogs.*
11. Explain to students that they will now examine a sweep net sample from their adopted bogs. Direct students to the appropriate student web page (either Blue Sky Bog Sweep Net Sample or Sunrise Bog Sweep Net Sample).
12. Distribute a second copy of the student worksheet, Bugs on My Bog! to each student pair.
13. Allow 10-12 minutes for students to complete their sweep net bar graph and record the relevant information on their student worksheet, Bugs on My Bog!
14. Reconvene the Growers' Association and invite students to report their findings.

Note: The numbers of gypsy moth larvae on Sunrise Bog exceed the action threshold while the numbers of false army worm exceeds the action threshold on Blue Sky Bog. Therefore, the results of the sweep will require students to take action, no matter which bog they have adopted.

15. The rest of this lesson challenges students to solve their insect pest problems. Raise the question, "What actions are possible?" Discuss.
16. Distribute What is IPM? Read and discuss, addressing the following questions:
 - What are some typical treatments cranberry growers use to manage insect pests?
 - What is the benefit to the bog when using these options?
 - What is the risk to the bog using these options?
 - Are there any treatments that pose no risk?
17. Introduce student worksheet, Taking Action. Instruct students to use this table to organize their information and decide on a course of treatment for their problem insect pests.
18. After student pairs have completed Taking Action, organize same bog student pairs into discussion groups (2 to 3 student pairs per group). *NOTE: As in the real world, there is no one right answer to this challenge. This*

lesson provides a rich opportunity for students to defend their positions with data. Explain to students that each student pair should review their data gathering and decision making with the rest of the small group. Direct the small groups to address the following discussion questions:

- What insects posed a threat to your cranberry crop?
- What were some treatment options that you considered?
- What treatment options did you reject? Why?
- Which treatment did you select? Why?
- Would you now change your decision based on the comments of the other members of your group?

19. OPTIONAL: If you wish, you might have pairs of students who have adopted Sunrise Bog exchange data with student pairs who have adopted Blue Sky Bog, so that these teams might serve as “consultants” to each other. This provides an additional opportunity for students to practice the IPM analysis and communication about decisions in depth.

20. Assign each student a writing piece for Bog Blog, where they provide a rationale for their pest management strategy or critically respond to other student growers' decisions.