



Lesson Plan

Wrangling With Worms

Created: 04/2024 by the National FFA Organization

Description of Lesson: Follow Payden Criswell as he walks through a typical day in his Catawba worm farming SAE. Then explore the world of integrated pest management through a few quick scenarios.

Student Learning Objectives:

After completing these activities, students will ...

1. Examine the components of a Catawba worm farming SAE.
2. Identify the components of an integrated pest management plan.
3. Research a pest problem and create a brief management plan.

Suggested Grade Level:

Grades 9 and 10 (This lesson is written so instructors can scale up or down based on class needs.)

Suggested Time: 50 minutes (*Time requirements may vary based upon student understanding and class schedule.)

Resources/References:

1. Video: "Catawba Worms SAE | Payden Criswell," <https://vimeo.com/857912603>
2. Website: Environmental Protection Agency – Integrated Pest Management, <https://www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles>
3. Website: Penn State Extension – Steps of Integrated Pest Management (IPM), <https://extension.psu.edu/steps-of-integrated-pest-management-ipm>
4. Website: United States Department of Agriculture – Integrated Pest Management, <https://www.usda.gov/oce/pest/integrated-pest-management>
5. Website: University of California, Agriculture and Natural Resources – Statewide Integrated Pest Management Program, <https://ipm.ucanr.edu/what-is-ipm/>

Equipment and Supplies Needed:

1. A copy of the "Wrangling With Worms" worksheet for each student
2. A copy of the article "Integrated Pest Management (IPM)" for each student
3. A copy of the "Bugging Out" worksheet for each student
4. Internet access to play the video in real time or embed it in a PowerPoint ahead of time

Vocabulary:

1. Action Threshold
2. Biological Controls
3. Chemical Controls
4. Cultural Controls
5. Integrated Pest Management
6. Mechanical/Physical Controls
7. Pest

Cross-Curricular Connections:

Science	English/Language Arts
Use the logic/science-based process of integrated pest management to construct a pest management plan.	- Read a text and use it to identify components within a given scenario. - Synthesize new information.

Virtual Instruction Ideas:

Instructor may post the student activity sheets to an LMS. Students may access the SAE video on their own devices to complete.

Student Activity Sheets:

Direct access to student activity sheets without lesson plan or answer key for easy upload to a learning management system or printing for classwork.

<https://ffa.box.com/s/odohqtsb6sos644kka94xm04tqxykwgd> (Word)

<https://ffa.box.com/s/b3ux0jl96mx75i1892jtk7klpuo4su6> (Non-Designed Word)

<https://ffa.box.com/s/wf45mgghab408ac34v49xl50pd2hqjhmu> (PDF)

<https://docs.google.com/document/d/17Elu8sCm66CQgnGKDYcChKFMRLtCQH2ifSMcTgAqWuo/copy> (Google)

These Activities Are Aligned to the Following Standards:

AFNR Performance Element

- CS.05: Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- PS.01: Develop and implement crop management plan for a given production goal that accounts for environmental factors.

FFA Precept

- FFA.PL-A.Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.
- FFA.PL-C.Vision: Visualize the future and how to get there.
- FFA.PL-E.Awareness: Understand personal vision, mission and goals.
- FFA.PL-F.Continuous Improvement: Accept responsibility for learning and personal growth.
- FFA.PG-I.Professional Growth: Assume responsibility for attaining and improving upon the skills needed for career success.
- FFA.PG-J.Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking and coping.
- FFA.CS-M.Communication: Effectively interact with others in personal and professional settings.
- FFA.CS-N.Decision Making: Analyze a situation and execute an appropriate course of action.

Common Career Technical Core

- AG5: Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources Career Pathways

AFNR Cluster Skills

- CS.05: Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

Common Core – Reading: Informational Text

- CCSS.ELA-Literacy.RI.9-10.4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper)

Common Core – Writing

- CCSS.ELA-Literacy.W.9-10.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- CCSS.ELA-Literacy.W.9-10.2: Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

Common Core – Science & Technical Subjects

- CCSS.ELA-Literacy.RST.9.10.8: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

Common Core – Literacy in Science & Technical Subjects: Writing

- CCSS.ELA-Literacy.WHST.9.10.1: Write arguments focused on discipline-specific content.
- CCSS.ELA-Literacy.WHST.9.10.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Common Core – Math Practices

- CCSS.Math.Practice.MP1: Make sense of problems and persevere in solving them.
- CCSS.Math.Practice.MP2: Reason abstractly and quantitatively.
- CCSS.Math.Practice.MP3: Construct viable arguments and critique the reasoning of others.

AFNR Career Ready Practices

- CRP.02: Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.
- CRP.04: Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.
- CRP.06: Demonstrate creativity and innovation. Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization.
- CRP.07: Employ valid and reliable research strategies. Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies.
- CRP.08: Utilize critical thinking to make sense of problems and persevere in solving them. Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.

Partnership for 21st Century Skills

- Communication
- Critical Thinking and Problem Solving
- Environmental Literacy
- Global Awareness
- Information, Communications, and Technology Literacy
- Think Creatively

Lesson Plan:

1. **Bell Ringer:** What do you usually do when you see a bug?
2. **Introduction:** *Bugs (insects) are often considered undesirable in our lives, and we are often quick to get rid of them, not considering that there would be any benefit that could come from them. In the video we're about to watch, however, an FFA member has found a beneficial use for a common pest in his area. Let's take a look.*
3. **Activity 1:** Each student needs a copy of the worksheet "Wrangling With Worms."
 - a. Play the video "Catawba Worms SAE | Payden Criswell," available at <https://vimeo.com/857912603>. Students will watch the video and answer the questions on the student worksheet as they follow along.
4. **Activity 2:** Each student needs a copy of the article "Integrated Pest Management (IPM)" and the worksheet "Bugging Out."
 - a. Students will read the one-page article on integrated pest management and use the information they learn from it to answer the two pest management scenarios. In the first scenario, they will identify the pieces of IPM from the plan given in the scenario. In the second scenario, they will complete some short research on a given pest and devise a plan according to the principles of IPM.
5. **Follow-up:** Have students share ideas from their plans with the class and discuss the variety of approaches that may all be successful for managing pest populations.
6. **Exit Ticket:** What are the benefits of using an IPM plan to manage pest populations rather than using only chemical controls?

Name: _____

Aligned to the following standards:

CS.05; PS.01; FFA.PL-A; FFA.PL-C; FFA.PL-E; FFA.PL-F; FFA.PG-I; FFA.PG-J; FFA.CS-M; FFA.CS-N; CCSS.ELA-RI.9-10.4; -CCSS.ELA.W.9-10.1; CCSS.ELA.W.9-10.2; CCSS.ELA.RST.9.10.8; CCSS.ELA.WHST.9.10.1; CCSS.ELA.WHST.9.10.4; CCSS. MP1; CCSS. MP2; CCSS. MP3; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

Wrangling With Worms

Directions:

Answer the questions below as you watch the video "Catawba Worms SAE | Payden Criswell," available at <https://vimeo.com/857912603>.

1. What does Payden say the Catawba worms are used for after he collects them from the trees?



2. How many trees does Payden's farm have on it?

3. What are the daily tasks associated with Payden's SAE?

4. Describe how the Catawba worms are harvested from the trees.

5. What safety precautions does Payden take for his SAE?

a.

b.

6. What advice does Payden have for students wanting to start a new SAE?

- a. How can you implement his advice into your own SAE?



Name: _____

Integrated Pest Management (IPM)

Directions:

Read the following information about integrated pest management (IPM) and then use the principles you've learned to answer the two scenarios on the "Bugging Out" worksheet. As you read, underline important definitions of terms. When finished reading, draw an icon in the space in the margin to go along with each component of IPM. Also, choose a color to highlight each component of IPM (i.e., Identification = Blue, Setting Action Thresholds = Green, etc.)

"Catawba Worm Farming"

You've just watched the video about Payden's SAE, which involves removing Catawba (Catalpa) worms from Catalpa trees and selling them as fishing bait. The "worms" are the larval form of the Catalpa Sphinx Moth and exclusively eat the leaves of Catalpa trees thus technically making them a pest. Payden, through his SAE, has found a way to help control the population of these pests without using chemicals and in a beneficial way. This is one of the primary principles of a process called *integrated pest management*.



Integrated Pest Management

Integrated pest management (IPM) is "a science-based decision-making process that combines tools and strategies to identify and manage pests" (USDA). It is a wider look at the whole system in which the pests exist and how they come to be where they are rather than just focusing on the elimination of the pests that are already there. There are several considerations taken into account within the practices of IPM including the identification of pests, setting action thresholds, choosing and implementing an appropriate combination of management techniques (biological, cultural, mechanical/physical and chemical), and evaluating the results of the plan's actions.

Identification and Monitoring of Pests: To best understand what is happening in any scenario, the first step is identifying the pest and what damage (if any) it is causing. This helps to determine if action needs to be taken.

Setting Action Thresholds: In most cases, there is a certain level of pests that can be tolerated within a system. It is up to each individual or organization to set the threshold or "tipping point" for when action to manage the pests will need to be taken. This could be economically driven, health-related or aesthetically motivated.

Methods of Control: There are different ways to control or manage pest populations. IPM considers each of the following strategies for managing pests.

- *Biological Controls:* Using "natural enemies" (predators, parasites, competitors, pathogens) to manage pests. This involves introducing another living organism into the system that will reduce the impact of the pests and will not cause further damage.
- *Cultural Controls:* Making changes to the environment or "culture" of the system that will reduce pests establishing themselves. For example, if the identified pest thrives in standing water, this could mean reducing irrigation for plants (if possible) to limit the amount of excess water around.
- *Mechanical/Physical Controls:* These methods are tangible things that kill, remove or prevent pests (traps, sealing holes, picking pests off of plants, etc.). Payden's shaking the Catawba worms free from the trees and removing them is an example of mechanical control.
- *Chemical Controls:* The use of pesticides does have its place in some instances; however, in IPM, spraying pesticides is an "only when absolutely necessary" measure and should be done in a way that minimizes harm to the environment, people, animals and other organisms in the system.

Evaluating Results: To ensure the best and most effective practices are always being used, it is essential that pest populations, thresholds and controls are regularly evaluated and updated as needed.

References:

Environmental Protection Agency – Integrated Pest Management, <https://www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles>
Penn State Extension – Steps of Integrated Pest Management (IPM), <https://extension.psu.edu/steps-of-integrated-pest-management-ipm>
United States Department of Agriculture – Integrated Pest Management, <https://www.usda.gov/oce/pest/integrated-pest-management>
University of California, Agriculture and Natural Resources – Statewide Integrated Pest Management Program, <https://ipm.ucanr.edu/what-is-ipm/>
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Name: _____

Bugging Out

Aligned to the following standards:

CS.05; PS.01; FFA.PL-A; FFA.PL-C; FFA.PL-E; FFA.PL-F; FFA.PG-I; FFA.PG-J; FFA.CS-M; FFA.CS-N; CCSS.ELA-RI.9-10.4; CCSS.ELA.W.9-10.1; CCSS.ELA.W.9-10.2; CCSS.ELA.RST.9.10.8; CCSS.ELA.WHST.9.10.1; CCSS.ELA.WHST.9.10.4; CCSS. MP1; CCSS. MP2; CCSS. MP3; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

Part 1

Directions:

Using the information you've read, explain how the following scenario aligns with the principles of IPM in the spaces provided below. As you read, use the colors you highlighted in the article to highlight portions of the scenario to help you identify the components of IPM.

Scenario 1:

Students at a local elementary school notice the plants in their school garden are showing extensive leaf damage. One of the students identified the pest and uncovered that their garden is being overrun by an infestation of cabbage worms. The students realize that, if they do not act, they will not have any vegetables to harvest and share in their school celebration at the end of the school year. After conducting research on different techniques, they come up with a plan. They decide to implement companion planting by adding aromatic herbs such as basil, mint and rosemary around the perimeter of the garden beds. These herbs naturally repel cabbage worms and other pests. Additionally, the students introduce beneficial insects such as parasitic wasps and ladybugs, which prey on cabbage worm larvae and adults, respectively. Throughout the rest of the growing season, the students inspect the leaves of plants weekly and record an approximate percentage of leaves damaged as well as remove the worms from the surfaces of the leaves as they see them. They also count the number of cabbage worms they see and record those numbers in their classroom to determine if they are seeing any reduction in populations to determine if further action is needed.



Explain the actions students took that align with each principle of IPM.

1. Identification and Monitoring of Pests: _____

2. Setting Action Thresholds: _____

3. Which types of controls did the students use? (Circle each that applies and explain your observations below.)
Biological Cultural Mechanical/Physical Chemical

4. Evaluating Results:

Name: _____

Part 2

Directions:

Using the information you've read, explain how the orchard owner in the scenario has already completed the first two steps of IPM. As you read, use the colors you highlighted in the article to highlight portions of the scenario to help you identify the components of IPM.

Then conduct your own research and come up with the rest of the plan to help manage the identified pest.

Scenario 2:

A local orchard is facing a significant threat from an outbreak of codling moths, which are damaging the apple crop. The orchard estimates they have lost 10% of their apple crop for this year so far and are concerned for how much more they could lose before the season is over. The orchard owner wants to avoid using chemical pesticides due to environmental concerns and is seeking alternative solutions. She has enlisted your class to help her come up with solutions according to the principles of IPM.

1. Without knowing much about it, the orchard owner has already completed the first two steps of IPM. Identify how she has done this.

a. Pest Identification/Monitoring: _____

b. Setting Action Thresholds: _____

2. Based on your research, explain in detail what controls you are recommending. Be sure to identify what kind of control each recommendation is (biological, cultural, mechanical/physical), and remember, the owner would like to avoid the use of chemical pesticides as much as possible.

3. Explain how you would suggest evaluating the IPM plan after implementation.

Name: _____

Aligned to the following standards:

CS.05; PS.01; FFA.PL-A; FFA.PL-C; FFA.PL-E; FFA.PL-F; FFA.PG-I; FFA.PG-J;
FFA.CS-M; FFA.CS-N; CCSS.ELA-RI.9-10.4; CCSS.ELA.W.9-10.1; CCSS.ELA.W.9-10.2; CCSS.ELA.RST.9.10.8; CCSS.ELA.WHST.9.10.1; CCSS.ELA.WHST.9.10.4;
CCSS. MP1; CCSS. MP2; CCSS. MP3; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

KEY: Wrangling With Worms

Directions:

Answer the questions below as you watch the video "Catawba Worms SAE | Payden Criswell," available at <https://vimeo.com/857912603>.

1. What does Payden say the Catawba worms are used for after he collects them from the trees?

He says that the Catawba worms are used for fishing bait.



2. How many trees does Payden's farm have on it?

He has 20 to 30 trees on his farm.

3. What are the daily tasks associated with Payden's SAE?

Going through the trees, picking up rotten limbs, checking to see if the worms are big enough to remove

4. Describe how the Catawba worms are harvested from the trees.

Payden hits the tree with the back of an axe and the big worms fall off the tree and are collected.

5. What safety precautions does Payden take for his SAE?

- a. He wears sunscreen to protect him when he's working outside.
- b. He wears gloves and safety glasses.



6. What advice does Payden have for students wanting to start a new SAE?

Payden says students should pick something that they love and that they know they are really going to enjoy.

- a. How can you implement his advice into your own SAE?

Answers will vary.

Name: _____

KEY: Bugging Out

Aligned to the following standards:

CS.05; PS.01; FFA.PL-A; FFA.PL-C; FFA.PL-E; FFA.PL-F; FFA.PL-I; FFA.PG-J; FFA.CS-M; FFA.CS-N; CCSS.ELA-RI.9-10.4; CCSS.ELA.W.9-10.1; CCSS.ELA.W.9-10.2; CCSS.ELA.RST.9.10.8; CCSS.ELA.WHST.9.10.1; CCSS.ELA.WHST.9.10.4; CCSS. MP1; CCSS. MP2; CCSS. MP3; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

Part 1

Directions:

Using the information you've read, explain how the following scenario aligns with the principles of IPM in the spaces provided below. As you read, use the colors you highlighted in the article to highlight portions of the scenario help you identify the components of IPM.

Scenario 1:

Students at a local elementary school notice that the plants in their school garden are showing extensive leaf damage. One of the students identified the pest and uncovered that their garden is being overrun by an infestation of cabbage worms. The students realize that, if they do not act, they will not have any vegetables to harvest and share in their school celebration at the end of the school year. After conducting research on different techniques, they come up with a plan. They decide to implement companion planting by adding aromatic herbs such as basil, mint and rosemary around the perimeter of the garden beds. These herbs naturally repel cabbage worms and other pests. Additionally, the students introduce beneficial insects such as parasitic wasps and ladybugs, which prey on cabbage worm larvae and adults, respectively. Throughout the rest of the growing season, the students inspect the leaves of plants weekly and record an approximate percentage of leaves damaged as well as remove the worms from the surfaces of the leaves as they see them. They also count the number of cabbage worms they see and record those numbers in their classroom to determine if they are seeing any reduction in populations to determine if further action is needed.



Explain the actions students took that align with each principle of IPM.

1. Identification and Monitoring of Pests: _____

The students recognized they had insect damage on their plants, and one student found the pest and identified it as a cabbage worm.

2. Setting Action Thresholds: _____

The students realized they would not have any vegetables to share at their school celebration after the harvest. This was enough of a threshold or "tipping point" for them to act.

3. Which types of controls did the students use? (Circle each that applies and explain your observations below.)

Biological

Cultural

Mechanical/Physical

Chemical

Biological: beneficial insects (parasitic wasps, ladybugs)

Cultural: companion planting the herbs that will repel the cabbage worms and other pests

Mechanical/Physical: students picking the worms off of the leaves as they see and count them

4. Evaluating Results:

The students are recording the percentage of leaves damaged as well as the number of worms they see and remove to see if their controls are having a significant impact.

Name: _____

Part 2

Directions:

Using the information you've read, explain how the orchard owner in the scenario has already completed the first two steps of IPM. As you read, use the colors you highlighted in the article to highlight portions of the scenario to help you identify the components of IPM.

Then conduct your own research and come up with the rest of the plan to help manage the identified pest.

Scenario 2:

A local orchard is facing a significant threat from an outbreak of codling moths, which are damaging the apple crop. The orchard estimates they have lost 10% of their apple crop for this year so far and are concerned for how much more they could lose before the season is over. The orchard owner wants to avoid using chemical pesticides due to environmental concerns and is seeking alternative solutions. She has enlisted your class to help her come up with solutions according to the principles of IPM.

1. Without knowing much about it, the orchard owner has already completed the first two steps of IPM. Identify how she has done this.
 - a. Pest Identification/Monitoring: _____
The orchard owner identified the pest as codling moths and noticed they were damaging her apple crop.
 - b. Setting Action Thresholds: _____
The orchard calculated that 10% of their apple crop had been lost and decided this was a significant enough loss to act.
2. Based on your research, explain in detail what controls you are recommending. Be sure to identify what kind of control each recommendation is (biological, cultural, mechanical/physical), and remember, the owner would like to avoid the use of chemical pesticides as much as possible.
Answers will vary but could include pheromone traps to disrupt mating behaviors (mechanical), predatory insects such as lacewings and parasitic wasps (biological), and pruning the trees to increase air circulation and reduce hiding spots for larvae (cultural).
3. Explain how you would suggest evaluating the IPM plan after implementation.

Answers will vary based on student research and plans.