



Module 3 ~ Why Manage Invasive Plants? (MS/HS) Teacher Guide – What’s eating the air potato?

INTRODUCTION: An invasive species is defined as non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Non-native plants often reach much higher densities when they are moved to new geographic areas and can become invasive. This is because the plants escape control by natural enemies that occur in their native range. Natural enemies typically include insects and disease causing pathogens. Some natural enemies are highly host specific, meaning that they will only feed or infect one or a very few plant species. Biological control involves the identification of these specialized natural enemies and their introduction into the invaded range. If successful, the natural enemies provide a self-sustaining and permanent suppression of the target weed. This is one way scientists manage invasive species.

Air potato (*Dioscorea bulbifera*) is an herbaceous twining vine that was introduced in Florida in 1905. It has large heart shaped leaves and produces aerial tubers. It can displace native species and disrupt natural processes such as fire and water flow. Due to this, it was placed on the Florida Noxious Weed List in 1999. Air potato is considered one of Florida’s most invasive plant species. In late 2011, a leaf feeding beetle from Asia (*Lilioceris cheni*) was introduced as a biological control for air potato. Scientists at the Invasive Plant Research Laboratory found that the beetles only feed and complete development on *Dioscorea bulbifera*. The introduction of the beetles has resulted in a reduced height of vines, decreased bulbil production, and an increase in native vegetation. This lesson introduces students to the relationship between the air potato plant and its predator, the air potato leaf feeding beetle, in order to explain the concept of biological control.

ESSENTIAL QUESTION:

- Do you think using non-native insects is a good way to control invasive plants? Why? Why not?

SUBJECTS: Biology, life science, ecology, environmental science

GRADE LEVEL: 6th-12th grade

TIME ESTIMATES: 45 minutes

VOCABULARY: biological control, herbaceous, host plant, invasive, larvae, oviposition, pupae

LESSON SUMMARY: The class starts with a short reading introducing the invasive plant air potato and its biological control agent, the air potato leaf beetle. Students then split into groups and take turns rotating through three activity stations to further explore the topic. After the groups have completed all three stations the class re-groups and discusses the EQ: Do you think using non-native insects is a good way to control invasive plants? Why? Why not?

LEARNING OBJECTIVES:

Students will be able to:

- Describe the problems and impacts associated with air potato.
- Identify air potato by its leaf shape.
- Describe the life cycle of the air potato leaf beetle.
- Explain how the air potato leaf beetle affects air potato plant populations.





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MATERIALS:

Note: All materials are available to download from plants.ifas.ufl.edu/education. Contact us at caip-education@ufl.edu with any questions.

1. Introductory reading, *Air Potato Leaf Beetle, Lilioceris cheni* (1 page): Print one per student.
2. Station numbers (3 pages): Print and fold along solid line to create marker for each station
3. Station Discussion Questions (3 pages): Print and place at each station. The questions do not leave the stations. Students are to write their answers on their own notebook paper.
4. Station Fact Sheets (4 pages): Print and place at each station.
5. Air potato line drawing (1 page): Print out and place at Station #3
6. Several samples of air potato leaves for Station #3 (optional, can instead provide a color photo)

The fact sheets provided in this lesson are excerpted from:

- UF/IFAS Extension Publication: *Air Potato Leaf Beetle, Lilioceris cheni*
<http://edis.ifas.ufl.edu/in972>

ADVANCE PREPARATION:

Set up the three work stations for students. Each of the three stations should have a station number, and the corresponding station fact sheet and questions as follows:

- **Station 1:** Does the air potato leaf beetle undergo complete or incomplete metamorphosis?
- **Station 2:** What is the relationship between the air potato leaf beetle and the air potato plant?
- **Station 3:** Draw an air potato plant and label the various parts of the plant.

PROCEDURE:

1. Pass out and read the introduction on air potato and the air potato leaf beetle (as a class or individually). (5 minutes)
2. Divide the students into three groups and assign each a station to begin.
3. At each station, students read the fact sheet and discuss the question as a group. Have them each write the answer to the question on their own sheet of paper. After 10 minutes have the students rotate stations. (30 minutes)
4. After the groups have completed all 3 stations, re-group and as a class discuss the essential question: Do you think using non-native insects is a good way to control invasive plants? Why? Why not? (10 minutes)

ASSESSMENT: Student performance in group discussion and written responses to station activities.

EXTENSIONS:

- Have students research and find another example of a biological control agent for an invasive plant and write an essay comparing it to the air potato leaf beetle.

BACKGROUND INFORMATION:

- More information on the air potato leaf beetle can be found on this comprehensive website:
<http://bcrc1.ifas.ufl.edu/airpotatobiologicalcontrol.shtml>



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LIST OF STANDARDS

The following is a list of suggested standards that pertain to this activity. This list is provided as a reference to incorporate and expand upon as needed.

Next Generation Sunshine State Standards

7th Grade

SC.7.L.17.3: Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

9th – 12th Grades

SC.912.L.17.8: Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

Common Core State Standards

6th Grade

Common Core Code	FL Standard Code	Common Core Standard
CCSS.ELA-Literacy.RI.6.1	LAFS.6.RI.1.1	Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-Literacy.RI.6.4	LAFS.6.RI.2.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
CCSS.ELA-Literacy.L.6.4	LAFS.6.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibility from a range of strategies.
CCSS.ELA-Literacy.RST.6-8.4	LAFS.68.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and the topics.

7th Grade

CCSS.ELA-Literacy.RI.7.1	LAFS.7.RI.1.1	Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text
CCSS.ELA-Literacy.RI.7.4	LAFS.7.RI.2.4	Determine the meaning of words and phrases as they were used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.
CCSS.ELA-Literacy.L.7.4	LAFS.7.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-Literacy.RST.6-8.4	LAFS.68.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

8th Grade

CCSS.ELA-Literacy.RI.8.1	LAFS.8.RI.1.1	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
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CCSS.ELA-Literacy.RI.8.4	LAFS.8.RI.2.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
CCSS.ELA-Literacy.SL.8.1	LAFS.8.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly.
CCSS.ELA-Literacy.L.8.4	LAFS.8.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-Literacy.L.8.6	LAFS.8.L.3.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CCSS.ELA-Literacy.RST.6-8.4	LAFS.68.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
CCSS.ELA-Literacy.WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.

9th – 10th Grade

CCSS.ELA-Literacy.RI.9-10.1	LAFS.910.RI.1.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-Literacy.RI.9-10.4	LAFS.910.RI.2.4	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).
CCSS.ELA-Literacy.SL.9-10.1	LAFS.910.SL.1.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 9-10 topics, texts and issues, building on others’ ideas and expressing their own clearly and persuasively.
CCSS.ELA-Literacy.L.9-10.4	LAFS.910.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grades 9-10 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-Literacy.RST.9-10.4	LAFS.910.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
CCSS.ELA-Literacy.WHST.9-10.9	LAFS.910.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.



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11th – 12th Grade

CCSS.ELA-Literacy.RI.11-12.1	LAFS.1112.RI.1.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
CCSS.ELA-Literacy.RI.11-12.4	LAFS.1112.RI.2.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g. how Madison defines faction in Federalist No. 10)
CCSS.ELA-Literacy.SL.11-12.1	LAFS.1112.SL.1.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.
CCSS.ELA-Literacy.L.11-12.4	LAFS.1112.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11-12 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-Literacy.L.11-12.6	LAFS.1112.L.3.6.	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension of expression.
CCSS.ELA-Literacy.RST.11-12.4	LAFS.1112.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
CCSS.ELA-Literacy.WHST.11-12.9	LAFS.1112.WHST.3.9	Draw evidence from informational text to support analysis, reflection, and research.