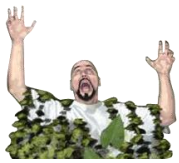


Module 1 ~ Silent Invaders (MS/HS)

Teacher Guide – Florida Plant Research Activity

Essential Questions: Students will become more aware of the plants in their school yard, home and neighborhood and begin to ask the following questions:

- Is this plant native to my area?
- If it is native, what purpose does it serve to the environment and the creatures that share it?
- Are there any plants or animals that depend on this plant for survival?
- If it's native, is it protected?
- If it's non-native, is it a problem?
- How can we know for sure if it's invasive?
- Is this plant important to the Florida economy?

Science Subjects: agriculture, biology, botany, environmental and/or life science, horticulture

Grade level: middle school (MS) and high school (HS)

Science and Language Arts concepts: See suggested state standards at the end of this document.

Overall time estimate: 2 – 3 class periods (~ 90 minutes)

Learning styles: Visual, auditory, and kinesthetic

Vocabulary: aquatic plants, ecosystem, emersed plants, free-floating plants, floating-leaved plants, grass-like plants, invasive plants, native plants, natural areas, non-native plants, region, submersed plants

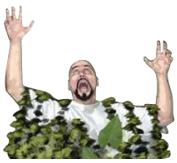
Lesson summary: *It has been suggested by fellow teachers that students have an 'introduction to plants' unit before participating in the following activities.* Students work in teams to research and learn about native, non-native and invasive plants and their place in a Florida ecosystem. Each individual will choose and research a plant from the regional map, located on our website: http://plants.ifas.ufl.edu/plant-directory/recognition-cards/ Using the data chart, students will build a base of information about their chosen plant(s). Once they've utilized the chart, they will search further for specific information on the type of environment it is found in, soils, etc. and its role in the environment (i.e., is it a food source for wildlife?, if it's a non-native, is it beneficial ? or harmful and invasive? etc.) For example:

- Does it provide habitat/shelter for native animals (e.g., insects, birds, fish, amphibians)?
- Does it provide any support for non-native animals?
- Does it provide stability to soils, shorelines, etc.?

Once this information is gathered, they will create a poster or other creative project depicting their findings about the plant in its natural environment, for a presentation to the class.

Student learning objectives: By engaging in this research exercise, students will

1) Define terminology used to describe plants;
2) Explain the value and use of plants to other creatures who share the habitat;
3) Identify the potential for harm from non-native, invasive plants.



Module 1 ~ Silent Invaders (MS/HS)

Teacher Guide – Florida Plant Research Activity

Essential Materials

Teacher *(all materials can be found on this website: plants.ifas.ufl.edu/education)*

- *Silent Invaders* audio-visual presentation -- *available for viewing online or from DVD (contact CAIP-education@ufl.edu*
- Guiding questions (and answer key) for *Silent Invaders*
- Silent Invaders Talking Points (for reference)
- Florida Plant Data Chart
- *Illustrated Plant Structures* – located in the resource section of our website
- Flash cards (to be used as reference/answer key)
    - *Invasive and Non-native Plants You Should Know*
- *Freshwater Plant Habitats (and checklist)* – located in the resource section of our website

Students

- Guiding Questions (for reference during Silent Invaders AV presentation)
- colored pencils, markers or watercolors
- poster board or show board
- writing paper / pencil
- selection of flash cards

Resources (for teacher and students)

- Plant Images and Info – available on our main website (http://plants.ifas.ufl.edu), categorized by:
    - Scientific Name
    - Plant Line Drawings
- USDA Plant Database and website: http://plants.usda.gov
- UF/IFAS CAIP website http://plants.ifas.ufl.edu/manage includes information on:
    - Why Manage Plants? Section 1
    - Overview of Florida Waters – Section 2
    - Control Methods – Section 3
    - Developing Management Plans – Section 4
    - Research and Outreach – Section 5

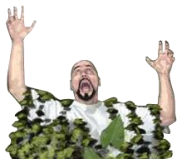
Supplemental Materials (for extensions – see extension activity below)

- access to a camera
- illustration materials
- Magnify It Cards – located in the resource section of our website
- tape recorder or video camera

Advance Preparation (teacher):

1) Preview ***Silent Invaders*** presentation and read thru *Talking Points* and *Guiding Questions*

2) Spend time studying the regional plant list, from the Regional Plant Map, for your area/county and become familiar with the plants in the list.



3) Provide access to the native and also non-native, invasive plant flash cards via computer or print out the cards. (Or print out the pages and let the students make the cards themselves).

4) Gather essential materials (listed on pages 1 and 2) and prepare audio-visual equipment for viewing the presentation.

Day 1 -- Activity:

1) Students view ***Silent Invaders*** presentation. Discuss using the guiding questions provided.

Day 2-- Activity:

1) Students research plants in their area using the web resources referenced in this teacher guide.

2) Upon choosing their plant, they will begin to research and complete the data chart.

3) After gathering more information, they will design a poster or PowerPoint ™ Presentation. The poster/presentation should contain the following information:

- Scientific name and common name of plant
- Drawings, photographs or graphics of the plant (*Ideally, students will be able to find the plant in their yard or neighborhood and make a drawing from a live sample or a photograph).*
- Plant parts labeled: flower, stems, leaf shapes, leaf margins, leaf arrangements, etc. ***(Note: the native plant flash cards may be used as an answer key).***
- A map showing geographic locations where their plants may be found.
- A description or drawing of the habitat, including other creatures who share/utilize the habitat.

Day 3 -- Activity:

1) Continue working on the projects (if not complete) and/or students make presentations to the class.

Assessment Suggestions: Students present their findings to the class and/or teacher. The presentation should reflect the student's ability to answer the key questions provided at the beginning of this teacher guide.

Extensions:

1) Take a photo, illustration, or sample of the plant(s) to someone who has lived in Florida for many years and record a narrative/anecdotes about that person's experience with (or memories about) the plant via tape recorder, video camera or written description. Students may interview: family members, neighbors, nursery employees, park rangers or someone in the community who is familiar with this plant.

2) Students are asked to find/choose a plant from their yard and research it using the same activity.

3) Students compare the information they collected with fellow students and discuss the differences in information, stories, anecdotes, etc. If students studied the same plant, why is the information different?

References: See Resources on page 2.

Module 1 ~ Silent Invaders (MS/HS)

Teacher Guide – Florida Plant Research Activity

Vocabulary

aquatic plants – plants that live near, on, or under the water.

ecosystem – community of living organisms (plants, animals, microorganisms, etc.) all of which interact among themselves and the environment where they live (on land, in the soil or in the water, etc.).

emersed plants – have roots underwater with part of the plant sticking above the water.

free-floating plants – float in the water column, on the surface of the water, or lie on the bottom. These plants do not root in the sediment, although some species have roots that dangle in the water.

floating-leaved plants – a plant that may or may not be anchored to the sediment, but has leaves that float on the surface of the water.

herbaceous plants - adj. soft, grassy, non- woody plants that, according to season (autumn), lose their above-ground growth but leave intact roots and produce new growth in the new season (spring).

invasive plants – non-native plants that spread on their own and cause environmental or economic harm.

native plants – plants that were here before Columbus arrived to the new world natural areas

non-native plants – (in Florida) a plant species that arrived since the time of Christopher Columbus.

region – an area or division having definable characteristics

submersed plants – grow with their roots, stem and leaves completely underwater.

woody plants - plants that have woody stems and grow continuously throughout the year, many years in a row, without losing their above-ground growth with the change of seasons

Background Information:

There are many thousands of species of plants in the United States, with more than 4,000 species identified and known to be in Florida. Most plants in Florida are "good" plants–they are native and non-invasive; they have evolved into their own ecological niches. Native plants provide food and shelter to animals of all sorts, stability to shorelines and fields, and visual pleasure to those of us lucky enough to live here.

Because a native plant species usually does not take over an area, there is biodiversity – a great number of species growing in balance and living together in harmony. Florida is famous for its biodiversity. There is great diversity because each native species is constrained in its growth by natural factors. Such natural factors include 1) competition with other native species, 2) native diseases, 3) predation by feeding native insects and other animals, 4) climate, 5) water level fluctuation, and so on.

Most plants in Florida's wild areas are native plants, including terrestrial species and aquatic/wetland species. Our state is home to hundreds of native aquatic and wetland plants that live in damp to wet soils, and some even more specialized plants that live entirely in, on, or under water: they include submersed plants, emersed plants (including grasses, sedges and rushes), and floating and floating-leaved plants. (Scientists and government people refer to most of them as aquatic macrophytes. Visit our parent web site for information and photos on more than 500 hundred aquatic and wetland plants.)

Teacher Guide – Florida Plant Research Activity

NON-NATIVE Plants

Of the more than 4,000 plant species in Florida, nearly 1300 species (about 25%) are non-native; they're also referred to as "exotic." We define non-native plants as "those that have become part of the Florida flora following the occupation by European man." In other words: plants that have made their way here since 1513 are considered non-native. *(Source: Richard P. Wunderlin, © 2006 Institute for Systematic Botany).*A non-native plant is a plant species present in a region outside its original, historic range due to intentional or unintentional introduction; not necessarily invasive. The introduction of the plant to a new area is often the result of human activity. The term **non-native** usually refers to plants from other countries, regions or continents; kariba weed (*Salvinia molesta*) probably comes from Brazil, and Brazilian pepper (*Schinus terebinthifolius*) comes from South America, etc. However, the term can also apply to plants from another region, within the same country: smooth cordgrass (*Spartina alterniflora*), a native desirable plant on the U.S. Atlantic coast is invasive on the Pacific coast, covering oyster beds and other vital habitat.

Not all non-native plants are problematic . A wide variety of agricultural plants, such as tomatoes, citrus trees and other "economic crops" in Florida are obviously "good" and essential to human health and our economy. These plants are well managed by the farmers who plant them and sell their valuable products. Rarely do our non-native food crops spread as weeds. (As far as we know, there aren't any forests being threatened by tomato plants.) Some ornamental non-native plants (roses,etc.) also are benign. Genetics, climate, soil, disease, insects prevent some cultivated plants from being able to spread on their own; they simply will not survive unless humans take care of them. As a result, they generally don't cause any significant problems in the wild. Therefore, we have little to worry about when it comes to certain non-native plants that will not spread on their own.

INVASIVE Plants: What's the problem?

Under the right conditions, some non-native plants can become **invasive**. An **invasive plant is a non-native plant species that has escaped cultivation, is spreading on its own and causing environmental or economic harm.**
Invasive non-native plants can outgrow, replace, and otherwise destroy our native plants. That's because non-native plants usually do not have their natural enemies -- the diseases, insects and other environmental stresses -- that keep them in check in their native ranges. The destruction and replacement of our native plants has several significant consequences:

- Our natural biodiversity is destroyed;
- Our native plants can be eliminated;
- Our wildlife have evolved to use native plants are not able to make use of non-native plants. As a result, they leave the area or die off;
- invasive plants can completely fill the water column or cover the surface so that fish are driven from the area;
- swimming, boating, hiking and other uses can be affected or even dangerous in areas with invasive plants.

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.

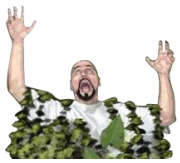
Next Generation Sunshine State Standards

9th – 12th Grade
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

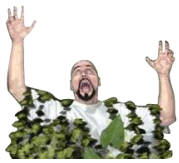
Common Core Code	FL Common Core Code	Common Core Standard
RI.6.1	LAFS.6.RI.1.1	Cite textual evidence to support analysis of what text says explicitly as well as inferences drawn from text.



RI.6.7	LAFS.6.RI.3.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
W.6.2	LAFS.6.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.6.4	LAFS.6.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.6.8	LAFS.6.W.3.8	Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
W.6.9	LAFS.6.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
SL.6.1	LAFS.6.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL.6.2	LAFS.6.SL.1.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
SL.6.4	LAFS.6.SL.2.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
SL.6.5	LAFS.6.SL.2.5	Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
L.6.3	LAFS.6.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
RST.6-8.1	LAFS.68.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts.
WHST.6-8.4	LAFS.68.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.6	LAFS.68.WHST.2.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
WHST.6-8.8	LAFS.68.WHST.3.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis reflection, and research.

7th Grade

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.
W.7.2	LAFS.7.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.7.4	LAFS.7.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.7.8	LAFS.7.W.3.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
W.7.9	LAFS.7.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
SL.7.1	LAFS.7.SL.1.1	Engage effectively in range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL.7.2	LAFS.7.SL.1.2	Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
SL.7.4	LAFS.7.SL.2.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
SL.7.5	LAFS.7.SL.2.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
L.7.3	LAFS.7.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
RST.6-8.1	LAFS.68.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts.
WHST.6-8.4	LAFS.68.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.6	LAFS.68.WHST.2.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.



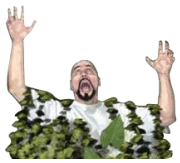
WHST.6-8.8	LAFS.68.WHST.3.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis reflection, and research.

8th Grade

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.
W.8.2	LAFS.8.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.4	LAFS.8.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.8	LAFS.8.W.3.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
W.8.9	LAFS.8.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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 topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL.8.4	LAFS.8.SL.2.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
SL.8.5	LAFS.8.SL.2.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
L.8.3	LAFS.8.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
RST.6-8.1	LAFS.68.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts.
WHST.6-8.4	LAFS.68.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.6	LAFS.68.WHST.2.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
WHST.6-8.8	LAFS.68.WHST.3.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis reflection, and research.

9th – 10th Grade

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.
W.9-10.2	LAFS.910.W.1.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through effective selection, organization, analysis of content.
W.9-10.4	LAFS.910.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.9-10.8	LAFS.910.W.3.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
W.9-10.9	LAFS.910.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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 grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
SL.9-10.4	LAFS.910.SL.2.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
RST.9-10.1	LAFS.910.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
WHST.9-10.4	LAFS.910.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.



WHST.9-10.6	LAFS.910.WHST.2.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
WHST.9-10.8	LAFS.910.WHST.3.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation
WHST.9-10.9	LAFS.910.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.

11th – 12th Grade

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.
W.11-12.2	LAFS.1112.W.1.2	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.
W.11-12.4	LAFS.1112.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.11-12.9	LAFS.1112.W.3.9	Draw evidence form literary or informational texts to support analysis, reflection, and research.
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.
SL.11-12.2	LAFS.1112.SL.1.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
SL.11-12.4	LAFS.1112.SL.2.4	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.
RST.11-12.1	LAFS.1112.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.7	LAFS.1112.RST.3.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
WHST.11-12.4	LAFS.1112.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.6	LAFS.1112.WHST.2.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7	LAFS.1112.WHST.3.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8	LAFS.1112.WHST.3.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	LAFS.1112.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.