

Module 1 ~ Silent Invaders (LE/UE/MS/HS)

Teacher Guide – *Silent Invaders* Audio-Visual Presentation



Audio-visual presentation and all related activities, including answer keys with NG SSS, can be found on this website:
<http://plants.ifas.ufl.edu/education>

Overview: *Silent Invaders* audio-visual presentation is the core lesson for Module 1, upon which all other activities and lessons are based. The 25-minute presentation provides a basic (and humorous) introduction to aquatic and terrestrial plants found in Florida along with the key concepts of aquatic versus terrestrial and also native, non-native and invasive plant species. Students will learn the difference between the three and how some invasive plants are impacting our waterways, lakes, rivers, wetlands and natural areas. The lesson ends with positive actions we can all take to help prevent the spread of invasive plants in our own neighborhoods. **Note:** *This is the keystone lesson for the FL Invasive Plant Education Initiative; it is recommended students watch and discuss this presentation before any other part of the curricula.*



Essential Questions:

- What is difference between aquatic and terrestrial plants?
- What is difference between native, non-native and invasive plants?
- How do non-native plants get here?
- Why are some plants invasive?
- What can I do to help protect Florida's unique environments?

Subject: Biology, Life Science, Environmental Science, Social Studies, Language Arts

Grade Level: elementary (LE/UE), middle school (MS), and high school (HS)

Time Estimate: 45 minutes – 5 minute review of vocabulary; 25 minute presentation; 15 minute discussion

Learning Objectives:

- Identify differences between aquatic and terrestrial plants.
- Describe the difference between native, non-native and invasive plants.
- Identify economic and ecological impacts of invasive plants.
- Explain positive actions students can do to help prevent invasive plant problems.

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

Vocabulary: (Note: Keyword chart and definitions provided in separate document.)

alert, aquatic plants, ballast water, compost, continent, country, dispose, economic harm, emerged plants, environmental harm, floating-leaved plants, house-hold garbage, hydrilla, inspect, invasive plants, native plants, natural areas, non-invasive plants, non-native plants, plant species, region, submersed plants, terrestrial plants, volunteer, water hyacinth

Lesson Summary: Distribute Guiding Questions and review keywords and definitions before viewing the 25-minute video presentation. Depending on grade level and available class time, the video can be shown in segments. (Refer to outline on next page.) Guiding questions are provided to students, for reference, while watching the video. Answers are checked at the end as part of the discussion. Talking Points are also available, providing additional background knowledge for the teacher/instructor.

Materials Needed:

1. Classroom computer/projector with internet access to the website or computer with DVD of presentation, available from the Florida Invasive Plant Education Initiative (caip-education@ufl.edu)
2. Keyword chart and definitions, available to download at plants.ifas.ufl.edu/education
3. Guiding Questions appropriate for grade level (LE/UE, UE/MS, MS/HS), available to download at plants.ifas.ufl.edu/education

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■ Part 1 – Introduction to native plants in Florida

Keywords: aquatic, emerged, floating-leaved, native, submersed, and terrestrial plants

Key Points:

- Florida has thousands of terrestrial plant species;
- Florida is home to hundreds of aquatic & wetland plant species that live in damp to wet soils or even underwater.
- Aquatic plants are often classified as: emerged; floating and floating-leaved; submersed
- Definition and benefits of native plants (includes aquatic and terrestrial)

Suggested Resources:

- See Section 1 Plant Management in Florida Waters: <http://plants.ifas.ufl.edu/manage> for more about native plants
- Photo Mural Set SP 336, contact caip-education@ufl.edu for a free set
- Plant information and images: <http://plants.ifas.ufl.edu>

■ Part 2 – Introduction to non-native plants; how they are introduced to new areas.

Keywords: ballast water, country, continent, region, non-native plants, plant species, water hyacinth

Key Points:

- Learn the criteria used to determine if a plant is native or non-native.
- How do non-native plants get here?
- How do seeds spread?

Suggested Resources:

- See Section 1 Plant Management in Florida Waters: <http://plants.ifas.ufl.edu/manage> for information on the difference between native, non-native, and invasive plants

■ Part 3 – Introduction to invasive plants; why we should be concerned

Keywords: hydrilla, invasive plants, natural areas, economic harm, environmental harm

Key Points:

- Know the difference between a non-native and invasive plant species.
- Learn the ecological impacts of invasive plants. (Why should we care?)

Suggested Resources:

- See Section 1 “Why Manage” of Plant Management in Florida Waters: <http://plants.ifas.ufl.edu/manage>
- Activity Book – Understanding Aquatic Invasive Plants (Florida Edition), copies available by contacting caip-education@ufl.edu

■ Part 4 You Can Help: Positive actions we can take and conclusion

Keywords: alert, compost, dispose, house-hold garbage, inspect, non-invasive plants, volunteer

Key Points: Actions we can take to help solve the problem include:

- learning to recognize invasive plants;
- cleaning off boat trailers after boating;
- never transporting plants to other regions;
- volunteering to help remove invasive plants;
- when gardening, only planting native or non-invasive plants;
- put invasive plants in household trash – NO COMPOST!

Suggested Resources

- See Section 5 of Plant Management in Florida Waters: <http://plants.ifas.ufl.edu/manage> for information on how citizens can become stewards



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Background Information

There are thousands of species of plants in the United States, with more than 4,000 known to be in Florida. Most plants in Florida's natural areas are native terrestrial plants (plants that live on dry land). But Florida is also home to hundreds of native plants that live in damp to wet soils, and even underwater.

FREE TO TEACHERS: The Native Freshwater Plants photo-murals depict Florida's common native freshwater wetland and aquatic plants

NATIVE Plants

Native plants have evolved within their own ecological niches, and are not invasive within their own native ranges. Native plants provide food and shelter to our animals of all sorts, stability to our shorelines and fields, and visual pleasure. Because a native plant species usually does not take over its home range, there is biodiversity – a number of species growing in balance and living together in harmony. Florida is famous for its biodiversity. Biodiversity exists when species are constrained in their growth by natural factors, so they can't overrun their neighboring species. Such natural growth restraints include: competition with other native species, diseases, feeding by insects and other animals, climate, and so on.

By definition, native plants are not invasive. However, sometimes, when a habitat or site becomes "disturbed," (i.e., from construction, digging, or when water level fluctuations have been altered by man-made drainage or pumping systems, or when excessive amounts of fertilizer enter the water body), then certain native plants have been known to cause problems. Our native cat-tails (*Typha* species) are famous for quickly filling in wet areas that have been disturbed or altered. They are often the dominant plant in man-made ponds and ditches. In the Everglades, for example, cattails are crowding out the desirable saw-grass (*Cladium jamaicense*), which produces food and shelter for native Everglades' animals. It is believed that man-made alterations in water level fluctuations as well as nutrient input have given an advantage to cat-tail over saw-grass in certain areas. For the most part though, native plants are in balance with their environment.

NON-NATIVE Plants

Of the more than 4,000 plant species in Florida, perhaps 1,300 species or more (25%) are non-native; they're also referred to as "exotic." A non-native plant is defined as a species present in a region outside its original, historic range due to intentional or unintentional introduction. **IMPORTANT:** It's not necessarily invasive. Non-native plants are also referred to as *non-indigenous* or *exotic*. Another common definition: plants introduced following European contact (after the year 1513) are considered non-native. (Source: Richard P. Wunderlin, © 2006 Institute for Systematic Botany).

The term non-native usually refers to plants from other countries, regions or continents. However, the term can also apply to plants from another region, within the same country. For example: 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 economically important 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, tulips, poinsettias, caladiums, 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."

Unfortunately, almost every place on earth is being invaded by plants from other places. Our "coontail" plants are invading South Africa. Southeast Asia's hydrilla is invading the U.S.

Our native and desirable eel grass is an unwanted invader of Australia's rivers. Old world torpedo grass is growing wildly across Florida, and we're finding it very difficult to manage.



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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 fish are driven from the area.
- Swimming, boating, hiking and other uses can be affected or even dangerous in areas with invasive plants.

How Do Non-Native Plants Get Here?

Non-native plants find their way here through a variety of ways. Any of us could have accidentally introduced them:

- as seed and plant contaminants in imported nursery plants and soils;
- as misidentified/unknown plants sold to/by aquarium keepers, water gardeners, landscapers and friends;
- as whole plants and growing fragments in ballast water in foreign ships coming to our ports;
- on those fruits and flowers you brought home in your vacation luggage;
- and as hitchhikers on boat trailers, props, dive gear, or in bait wells.

In the past, some species were purposefully introduced to "improve" our natural areas. For example, melaleuca trees (*Melaleuca quinquenervia*) were introduced to Florida from Australia by spreading their seeds from airplanes over the Everglades. At the time, land managers wanted the trees to suck up the "excess" water and make the Everglades more "suitable" for human use while providing a source of wood. The plan resulted in millions of invasive melaleuca trees covering half a million acres which are now known to be destructive to Florida's endangered Everglades environment and animals. Melaleuca trees now are being removed at a huge expense.

How Do Plants Spread?

Plants reproduce and spread by several means. All flowering plants produce seeds – some even grow flowers and are pollinated under water, like the naiads. Depending on the plant, its location and other circumstances, plants may spread when:

- their seeds are dispersed by wind, water, or birds and other animals;
- vegetative "propagules" fall off and form new plants;
- the plant is somehow fragmented (such as by a boat propeller) and the plant parts re-grow into new plants;
- yard waste is taken elsewhere;
- the root system expands and gives rise to new plants.

STEWARDSHIP: What Can We Do?

When buying plants, choose a legitimate nursery, and confirm that the vendor is aware of what species are restricted, both regionally and federally. Be sure to verify the correct plant identification and common names. For aquatic plants, rinse them in a bucket of tap water to remove unwanted sediments and/or bugs.

When disposing of plants that have the potential of spreading into nearby woods or waterbodies, completely dry or freeze the plants to kill them, and then add them to household garbage that will not be composted. Incineration is another possible alternative. (Burning in a backyard trashcan is not hot enough to kill some seeds).

Learn how to identify invasive non-native plants, as well as our native plants. It's not so difficult to learn a few plants that are interesting or important to you.

For more about non-native invasive plants see Section 1 of our manage website: plants.ifas.ufl.edu/manage

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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

4th Grade

SC.4.L.17.4: Recognize ways plants and animals, including humans, can impact the environment.
 SS.4.C.2.1: Discuss public issues in Florida that impact the daily lives of its citizens.

5th Grade

SC.5.L.17.1: Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

7th Grade

SC.7.E.6.6: Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.
 SC.7.L.17.2: Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.
 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.
 SS.7.C.2.13: Examine multiple perspectives on public and current issues.

8th Grade

SC.8.N.4.2: Explain how political, social and economic concerns can affect science and vice versa.
 SS.8.G.5.1: Describe human dependence on the physical environment and natural resources to satisfy basic needs in local environments in the United States.
 SS.8.G.5.2: Describe the impact of human modifications on the physical environment and ecosystems of the United States throughout history.

9th-12th Grade

SC.912.L.17.6: Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.
 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.
 SC.912.L.17.20: Predict impact of individuals on environmental systems; examine how human lifestyles affect sustainability.

Common Core State Standards

2nd Grade

Common Core Code	FL Common Core Code	Common Core Standard
L.2.4	LAFS.2.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 2 reading and content, choosing flexibly from an array of strategies.
SL.2.1	LAFS.2.SL.1.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
SL.2.3	LAFS.2.SL.1.3	Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

3rd Grade

L.3.4	LAFS.3.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.
SL.3.1	LAFS.3.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
SL.3.3	LAFS.3.SL.1.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.



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4th Grade

RI.4.4	LAFS.4.RI.2.4	Determine meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.
RI.4.7	LAFS.4.RI.3.7	Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
RF.4.3	LAFS.4.RF.3.3	Know and apply grade-level phonics and word analysis skills in decoding words.
SL.4.1	LAFS.4.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 4 topics/texts, building on others' ideas and expressing their own clearly.
SL.4.2	LAFS.4.SL.1.2	Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
L.4.3	LAFS.4.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
L.4.4	LAFS.4.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.
L.4.6	LAFS.4.L.3.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

5th Grade

RI.5.4	LAFS.5.RI.2.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.
RF.5.3	LAFS.5.RF.3.3	Know and apply grade-level phonics and word analysis skills in decoding words.
SL.5.1	LAFS.5.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
SL.5.2	LAFS.5.SL.1.2	Summarize written a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
L.5.3	LAFS.5.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
L.5.4	LAFS.5.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

6th Grade

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.
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 grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
L.6.3	LAFS.6.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
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 flexibly from a range of strategies.
L.6.6	LAFS.6.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.
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.

7th Grade

SL.7.1	LAFS.7.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 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.



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L.7.3	LAFS.7.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
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.
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

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.
L.8.3	LAFS.8.L.2.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
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.
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.
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.

9 – 10th Grade

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.
L.9-10.4	LAFS.910.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.
L.9-10.6	LAFS.910.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 or expression.
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.

11 – 12th Grade

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.
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.
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.
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 or expression.