



Module 1 ~ Silent Invaders (UE/MS)

Teacher Guide – Hydrilla Vocabulary Activity

INTRODUCTION: Students research new vocabulary words and then read a passage about the invasive plant hydrilla, putting the new vocabulary words in context. Students discuss why hydrilla is so invasive utilizing their understanding of the vocabulary and information in the passage.

ESSENTIAL QUESTION: Why is hydrilla so invasive?

SUBJECTS: Plant biology, ecology

GRADE LEVEL: Upper elementary (UE) to middle school (MS)

TIME ESTIMATES: 1 class period, 45-60 minutes

VOCABULARY: (see definitions below) herbaceous, hydrilla, tuber, turions, ornamental, recreational

LESSON SUMMARY: Students are divided into five groups and asked to research the meaning of key vocabulary words related to hydrilla. The class then regroups and reads an article about hydrilla and discusses the essential question.

LEARNING OBJECTIVES:

- Describe 1 economic impact of hydrilla.
- Describe 1 ecological impact of hydrilla.
- List 2 ways hydrilla propagates (reproduces).
- Explain the terms herbaceous, tuber, turions, ornamental, and recreational in the context of hydrilla/invasive plants.

MATERIALS:

1. Reading passage on hydrilla (1 copy per student)
2. Five large pieces of paper and 5 different colored markers
3. Research tools such as access to the internet, books on plant biology, and/or a dictionary.

ADVANCE PREPARATION:

1. Prior the activity, students should watch the “*Silent Invaders*” video from Module 1:

<http://plants.ifas.ufl.edu/education/curriculum/module-1-silent-invaders/>

2. Write the words *hydrilla*, *turions/tuber*, *herbaceous*, *recreational*, and *ornamental* on the top of the large pieces of paper. (Note: words can be changed to suit the students’ level of understanding)

PROCEDURE:

1. Divide the group of students into 5 cooperative groups and place one sheet of the headed paper at each group’s station. Each group should nominate one student as note taker. The other students will be the researchers.
2. To begin, each group is given a different color marker or pen.
3. Each groups has 5 minutes to research the word on their paper using knowledge they already have, encyclopedias, dictionaries and computers. One student, or one student in each group, can be assigned as a time-keeper to help keep each group on track.



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4. They then have 1-2 minutes to write a definition of the word or a list of facts associated with it based on their research.
5. After they have written their definition, have the students carousel around the room to the next station (make sure they bring their group's colored marker). Repeat this until each group has visited all 5 stations and written a definition for all 5 words
6. After all groups are finished, hang the papers around the room and allow the students to do a gallery walk to read what they have written.
 - As an alternative to the gallery-walk, students could participate in a numbered-heads assigned discussion. The instructor can assign all students a number from 1-5, with each number corresponding one of 5 vocab words (e.g., 1=hydrilla, 2=recreation, etc.). Students could then break up into groups of their assigned number to meet and discuss their vocab word together, and if time allows, teach their vocab word to the class. Allow 10 minutes for this activity.
7. Re-group and read the provided reading passage. Have students mark the vocabulary words as they see them, and also any new words they are not sure about.
8. Optional: Give students 10 minutes to research new words and have them draw something that will help them to remember the definition. (For example, eradication- draw a picture of a person pulling weeds, or even something like zombies being wiped out. It needs to be meaningful to the student.)
9. Reread the article to the students and have them follow along. Discuss and ask:
Why do you believe hydrilla is so invasive?
10. (Optional) Students can be asked to provide an “exit slip” for each to hand in at dismissal. Students should be asked to write down on a piece of paper what they liked/disliked about the activity, and/or something they learned. (e.g., “Tell me the most important thing you learned in this lesson and what you would change to make the lesson better.”)

ASSESSMENT: Ask students to provide a written summary of the text and include answers to the essential question: Why do you believe hydrilla is invasive?

EXTENSION: Have students draw hydrilla and label the roots, tuber and stem.

VOCABULARY DEFINITIONS:

Herbaceous – relating to plants, or to types of plants that have a soft (non-woody) stem.

Native species – are organisms that have typically existed in Florida for thousands of years, and in particular, those that were already living in Florida prior to the arrival of the first European explorers around the year 1492.

Non-native species – are organisms that did not historically exist in Florida outside of captivity prior to the arrival of the first European explorers around the year 1492. Non-native species can be introduced by humans either by accident or on purpose.



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Invasive species – are organisms that are non-native to a particular ecosystem, and which cause or are likely to cause economic or environmental harm or harm to human health. Invasive species are usually very adaptable to new habitats, grow aggressively, and reproduce easily and quickly. They are often introduced to a new location without the environmental checks and balances such as seasonal weather, diseases, or predators that kept them under control in their native range.

Ornamental – A plant grown for its attractive appearance, or for use in a decorative or commercial manner.

Recreational – Activities done for the purpose of enjoyment, for example, boating, fishing, swimming, water skiing, and nature viewing.

Submersed – A plant species growing and spending most of its life cycle entirely underwater.

Tubers – A thickened part of a stem or root rhizome, which can serve as a reproductive bud from which new plants arise. Hydrilla can produce millions of tubers per acre annually from September to March, and its tubers can remain dormant for years and are largely immune to human management and control activities. This makes hydrilla eradication nearly impossible.

Turions – Compact dormant buds used for plant reproduction. Hydrilla's **turions** are 5-8mm (0.2-0.3 in.) long, are dark green, and appear spiny. Hydrilla plant fragments and stems laden with turions can drift throughout a water body and produce new plants.

BACKGROUND INFORMATION:

Many aquatic weed scientists consider *Hydrilla verticillata* the most problematic aquatic plant in the United States. This plant, native to Africa, Australia, and parts of Asia, was introduced to Florida in 1960 via the aquarium trade. Hydrilla is now well established throughout water bodies in the southern states where control and management costs millions of dollars each year. From 1980 to 2005, Florida alone spent \$174 million on hydrilla control.

Hydrilla is a submersed plant. It can grow to the surface and form dense mats. It may be found in all types of water bodies. These dense mats interfere with recreation and destroy fish and wildlife habitat

Hydrilla stems are slender, branched and up to 25 feet long. Hydrilla's small leaves are strap-like and pointed. They grow in whorls of four to eight around the stem. The leaf margins are distinctly saw-toothed. Hydrilla often has one or more sharp teeth along the length of the leaf mid-rib. Hydrilla produces tiny white flowers on long stalks. It also produces 1/4 inch turions at the leaf axils and potato-like tubers attached to the roots in the mud. Hydrilla has several advantages over other plants. It will grow with less light and is more efficient at taking up nutrients than native species. It also has extremely effective methods of propagation. Besides making seeds (seedlings are actually rarely seen in nature), it can sprout new plants from root fragments or stem fragments containing as few as two whorls of leaves. Recreational users can easily spread these small fragments from water body to water body.

However, hydrilla's real secret to success is its ability to produce structures called turions and tubers. (Presence of these structures is also a characteristic that distinguishes this species from similar looking plants.) Turions are compact and produced along the leafy stems. They break free from the parent plant and drift or settle to the lake bottom to start new plants. They are generally about a quarter inch long, dark



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green, and appear spiny. Tubers are underground and form at the end of roots. They are small, potato-like or pea-like, and are usually white or yellowish. Hydrilla produces an abundance of tubers and turions in the fall and the tubers may remain dormant for several years in the sediment. Tubers and turions can withstand ice cover, drying, herbicides, and ingestion and regurgitation by waterfowl. One square meter of hydrilla can produce 5,000 tubers!

Source: <http://myfwc.com/media/1386747/hydrilla-mgmt-position-background-information.pdf>

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

2nd Grade

SC.2.L.17: Interdependence. (A. Plants and animals, including humans, interact with and depend on each other and their environment to satisfy their basic needs. B. Both human activities and natural events can have major impacts on the environment. C. Energy flows from the sun through producers to consumers.)

3rd Grade

SC.3.L.17: Interdependence. (A. Plants and animals, including humans, interact with and depend on each other and their environment to satisfy their basic needs. B. Both human activities and natural events can have major impacts on the environment. C. Energy flows from the sun through producers to consumers.)

4th Grade

SC.L.17.4: Recognize ways plants and animals, including humans, can impact the environment.

5th Grade

SC.5.L.14.2 Compare and contrast the function of organs and other physical structures of plants.

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.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.

Common Core State Standards

3rd Grade

Common Core	FL Standards	Common Core Standard
CCSS.ELA-LITERACY.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.



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CCSS.ELA-LITERACY.RI.3.1	LAFS.3.RI.1.1	Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
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4th Grade

CCSS.ELA-LITERACY.RI.4.1	LAFS.4.RI.1.1	Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-LITERACY.RI.4.4	LAFS.4.RI.2.4	Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a <i>grade 4 topic or subject area</i> .
CCSS.ELA-LITERACY.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.

5th Grade

CCSS.ELA-LITERACY.RI.5.1	LAFS.5.RI.1.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-LITERACY.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 <i>grade 5 topic or subject area</i> .
CCSS.ELA-LITERACY.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 <i>grade 5 topics and texts</i> , building on others' ideas and expressing their own clearly.

6th Grade

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 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 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.



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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.
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.



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