Teacher Guide – Freshwater Plants Jigsaw Puzzle Activities (Steps 1, 2, 3, 4)

Hundreds of aquatic and wetland plant species can be found throughout Florida -- in our own backyard, neighborhood, or local pond. Learning more about these plants is the first step to becoming better environmental stewards. After all, we need to know more about our native plants and animals before we can begin to tackle the problems associated with invasive species. Having the ability to recognize and identify flora and fauna gives us a greater sense of ownership; studies show that we tend to care more about a plant or animal if we know its name. The following puzzle activities are designed to help students develop better observation skills and a working vocabulary of aquatic plant species commonly found in Florida. Note: Jigsaw puzzles (14" x 20") available by request from: caip-education@ufl.edu .

For more information about Florida's freshwater plants (macrophytes) and habitats: http://plants.ifas.ufl.edu and http://plants.ifas.ufl.edu/manage

ESSENTIAL QUESTION(S):   What characteristics or "clues" can we use to *define* and *identify* aquatic plants?
What characteristics can we use to *categorize* or *classify* aquatic plants?
What is the difference between personal opinion and verified observation?
Why is observation so important in science?

SCIENCE SUBJECT: Biology, Earth Science, Environmental Science, Life Science, Integrated Science

GRADE LEVEL: Upper Elementary and Middle School

SCIENCE AND LANGUAGE ARTS CONCEPRS: See suggested state standards at the end of this document.

TIME ESTIMATE: 2 class periods

LEARNING STYLES: auditory, kinesthetic, visual

LESSON SUMMARY: Students begin with *Silent Invaders* AV presentation, followed by discussion of the four categories commonly used for classifying aquatic plants: emersed (includes grasses, sedges/rushes); floating; floating-leaved; and submersed. After completing a quick review of the terminology, students will assemble a jigsaw puzzle of a typical Florida freshwater pond/lake habitat. Next, they will use the puzzle and accompanying field guides to complete an observation chart. Last, students and teacher play "What Am I?"... a plant identification guessing game.

STUDENT LEARNING OBJECTIVES:

1) Learn about aquatic plants and associated terminology through presentation, discussion and observation.

2) Define emersed, floating-leaved, free floating, and submersed plants; native, non-native and invasive plant species.

3) Assemble a 14" X 20" jigsaw puzzle illustration of a Florida freshwater environment. Use some of these same clues to help categorize the aquatic plants.

4) Identify various plants, based only on descriptions (clues) given by the teacher.

5) Employ more than one resource or visual clue (field guides, etc.) to recognize and/or identify plants.

Teacher Guide – Freshwater Plants Jigsaw Puzzle Activities (Steps 1, 2, 3, 4)

VOCABULARY:

aquatic plants: plants that grow in water or wet areas; plants that complete part or all of their life cycle in, on or near the water.

emersed plants: plants rooted to the bottom (in shallow water) and having most of the vegetative growth above the water. *Note: Sometimes these plants are found out of the water, near the shoreline or in areas that flood.*

floating-leaved plants: plants that may or may not be anchored to the sediment, but have leaves that float on the surface of the water.

free-floating plant: a plant that floats freely on the surface; it does not have any roots attached to the bottom of a lake or pond.

habitat: the locality or external environment in which a plant lives (aquatic, terrestrial, etc.).

invasive plant: a non-native plant species that is able to spread on its own and cause environmental or economic harm.

native plant: a plant species that occurs naturally in a geographic region or area (also referred to as an indigenous plant); it has not been introduced by humans--intentionally or unintentionally.

non-native plant: a plant species that is outside its original, historic range because of intentional or unintentional introduction; exotic; not necessarily invasive. The plant species is often introduced to a new area by human activity.

submersed plants: plants growing with roots, stems, and leaves completely under the surface of the water. Sometimes the leaves and/or flowers may grow above the surface.

terrestrial plants: plants that live on dry land.

MATERIALS NEEDED: All print materials (except the puzzles) are available online: http://plants.ifas.ufl.edu/education

For the teacher:

- Access to *Silent Invaders* presentation http://plants.ifas.ufl.edu/education (online or see teacher resource disk)

- 6 -- Freshwater Plants Jigsaw Puzzles (UF/IFAS Center for Aquatic and Invasive Plants: CAIP-education@ufl.edu)

- 6 -- Freshwater Plants Jigsaw Puzzle Illustrations (8.5" x 11")

- 6 -- Freshwater Plants Jigsaw Puzzle -- Plant Lists (8.5" x 11")

- 15 -- Freshwater Plant Habitats – 8.5" X 11" or 8.5" x 14": color illustrations/definitions of emersed, free-floating, floating-leaved, and submersed plants; quantity = 15 (one for every 2 students). See teacher kit or online.

- Hand lens magnifiers – classroom set of 30

- Answer Key for activities (Steps 1&2, 3 and 4) listed below

For students (Grades 4-5):

- Steps 1 & 2: Plant Terminology Match-up (UE)
- Step 3: Observation Chart (UE)
- Step 4: WHAT AM I? activity (UE)

For students (Grades 6-7-8):

- Steps 1 & 2: Plant Terminology Match-up (MS)
- Step 3: Observation Chart (MS)
- Step 4: WHAT AM I? activity (MS)

Teacher Guide – Freshwater Plants Jigsaw Puzzle Activities (Steps 1, 2, 3, 4)

Each student should receive:

- **1 -- Plant Terminology Match-Up** activity (UE version or MS version)
- **1 -- Observation Chart** (UE version and/or MS version)
- **1** -- **hand lens magnifier**

Each lab group should receive:

- **1 -- Freshwater Plants Jigsaw Puzzle** per group (minimum of 2 students / maximum of 4)
- **1 -- Freshwater Plants Puzzle Illustration**
- **1 -- Freshwater Plants Jigsaw Puzzle—Plant List**
- **1 -- Freshwater Plant Habitats**

- **OPTIONAL: 1 set -- Freshwater Plants in the Southeastern U.S. Identification Guide** 8.5" x 14" (please contact caip-education@ufl.edu for copies)

PROCEDURE

Step 1: View *Silent Invaders* presentation and discuss

- Watch *Silent Invaders* new media lesson/presentation as a group; discuss keywords and concepts.

- Use **Freshwater Plant Habitats** to discuss and clarify types of aquatic plants/habitats (vocabulary).

- **OPTIONAL**: Observe and discuss the **Freshwater Plants in the Southeastern United States** (8.5" x 14"; two pages, 2-sided). Talk about the tools available for identifying plants (field guides, internet, books, etc.). Notice how plants are categorized and/or classified in this particular field guide (emersed, submersed, grass-like, etc.). Discuss how this can be used as a way to classify plants; it also makes them easier to remember. NOTE: For this activity, grass-like plants would also be classified as "emersed."

- Distribute **Terminology Match-Up** activity for students to complete.

Step 2: Assemble and discuss puzzles

- When match-up activity is complete, divide students into groups to assemble the puzzles (group size 3-4).

- Once the puzzles are assembled, give students magnifying hand lenses and begin discussion:
  - What types of plants do they see?
  - How many are in the water?
  - Have they seen plants like this before?
  - Do they see anything besides plants (any animals)? What other animals might be found there?
  - Do any of the plants have flowers?
  - Are any plants UNDER the water? FLOATING?
  - Do they understand the difference between "floating-leaved" and "free-floating"?
  - Do they see plants emerging out of the water, along the shoreline?

Continue to discuss the various types of plants (emersed, floating-leaved, free-floating, submersed) Which category do the grasses and sedges fit into? (answer=emersed). Discuss the possibility that some emersed plants may be found out of the water (in the flood zone) and yet they will still be considered emersed.

Teacher Guide – Freshwater Plants Jigsaw Puzzle Activities (Steps 1, 2, 3, 4)

Step 3: Use Observation Chart to record data

Give students the Freshwater Plant Jigsaw Puzzle **Observation Chart** (UE or MS version). Let students choose their own plants or assign plants from the puzzle illustration to each lab group to research using the materials available (field guides, etc.). Ask students to use their new terminology knowledge to determine if the plants are emersed, submersed, floating-leaved or free-floating and record data about them.

Consult the **Freshwater Plants Jigsaw Puzzle--Plant List** or **Freshwater Plants in the Southeastern United States** to check their work.

Step 4: Play *WHAT AM I?* Game

Now… it's time to play the freshwater plant guessing game: *WHAT AM I?* Call out the characteristics for the listed plants (provided on the **What Am I**? activity sheet). Note: DO NOT read out the name of the plant. Give students a number of chances to name the plant based on clues you give them. You decide how many chances they get, based on time available. **Extensions:** Students take turns researching and writing descriptions of other plants shown in the puzzle and play the game among their own teams**.**

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

Note: This Teacher Guide includes all of the suggested standards for the various Jigsaw Puzzle activities.

4th Grade
SC.4.N.1.4: Recognize ways plants and animals, including humans, can impact the environment.

6th Grade
SC.6.L.15.1: Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

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.17.3: 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

4th Grade

Common Core Code	FL Common Core Code	Common Core Standard
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 grade 4 topic or subject area.
RF.4.3	LAFS.4.RF.3.3	Know and apply grade-level phonics and word analysis skills in decoding words.
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.

Teacher Guide – Freshwater Plants Jigsaw Puzzle Activities (Steps 1, 2, 3, 4)

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).
SL.4.1	LAFS.4.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led)with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

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.
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.
L.5.6	LAFS.5.L.3.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships (e.g., however, although, nevertheless, similarly, moreover, in addition).
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.

6th Grade

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.
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.
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.
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.
RST.6-8.7	LAFS.68.RST.3.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

7th Grade

RI.7.4	LAFS.7.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 a specific word choice on meaning and tone.
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.
L.7.6	LAFS.7.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.
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.
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.

Teacher Guide – Freshwater Plants Jigsaw Puzzle Activities (Steps 1, 2, 3, 4)

RST.6-8.7	LAFS.68.RST.3.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

8th Grade

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.
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.
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.
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.
RST.6-8.7	LAFS.68.RST.3.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).