Teacher Guide – Freshwater Plant BINGO!

Note: To request a classroom BINGO set, contact: caip-education@ufl.edu

Florida is home to more than 7,800 lakes (greater than 10 acres) and many more thousands of small ponds, stormwater ditches, swamps, marshes, wetlands and canals. Within these watery environments, there are hundreds of native aquatic and wetland plants, also known as **macrophytes**. Some live entirely *in*, *on*, or *under* the water (see descriptions below). The diversity is truly amazing; some plants have long stems up to 20 feet long with leaves whorled along its entire length (hydrilla); others have tiny air bladders that allow part of the plant to float above the water while the rest stays below (bladderwort); some have leaves several feet long (wild taro) and others are the size of a flea (water meal). The actual shape and arrangement of leaves and stems is just as varied. Of course, this diversity is why plant identification is daunting for many of us; it seems overwhelming. Our approach: Start by spending more time simply observing and marveling at the structure of a plant's leaves, stems, flowers and seeds – along with their general shape or form (its **habit**). Botanical line drawings are helpful as they allow us to focus on the structure and habit without the distraction of color. Once we learn how to look for and observe certain characteristics, it becomes easier to recognize and identify plants in the field. *Freshwater Plant BINGO!* provides a fun way to study, observe and compare/contrast the shape and structure of plants and all of their parts.

For more information on Florida's aquatic and wetland plants go to Section 1 of our website: http://plants.ifas.ufl.edu/manage/

Emersed plants are plants that grow out of the water (or during low-water times, in exposed sediments). They are rooted to the bottom, but their stems, leaves and flowers are above the water. (e.g., alligator weed)

Floating and floating-leaved plants are those that may or may not be anchored to the sediment (they may be rooted to the bottom or may be free-floating), but they all have leaves that float on the water's surface. (e.g., water lily)

Submersed plants grow entirely or almost entirely underwater. Some submersed species produce flowers and are pollinated underwater or at the water surface (e.g., tape grass).

Essential Question(s):

- What characteristics (clues) can we use to *define* / *identify* aquatic plants?
- What characteristics can we use to *categorize* / *classify* aquatic plants?
- What tools do we have to identify plants that we don't know or recognize?

Science Subject: Biology, Environmental Science, Life Science, Integrated Science
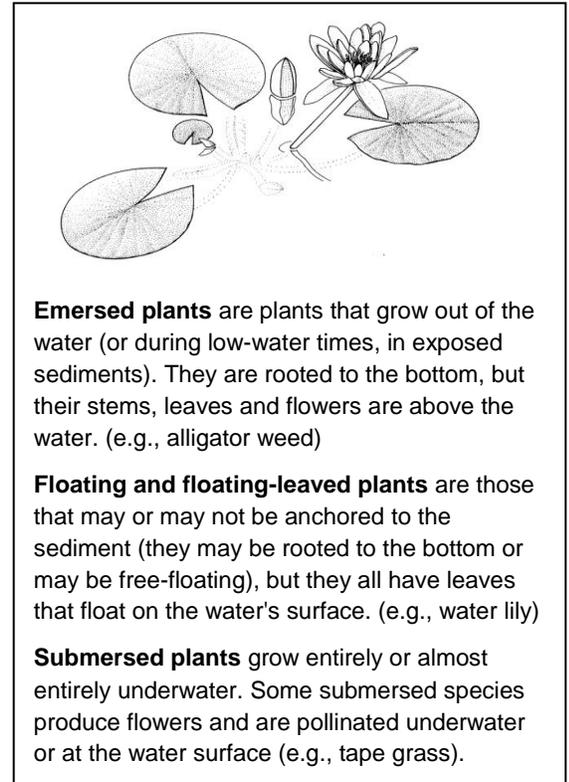
Grade Level: 4th – 12th (UE/MS/HS)

Science and Language Arts Concepts: See suggested state standards at end of this document

Overall Time Estimate: 1-2 class periods

Learning Styles: Visual, auditory, kinesthetic

Lesson Summary: Students begin by viewing *Silent Invaders* presentation and/or discussing the definition of aquatic plants and the four main habitat categories: *emersed* (including grasses, sedges/rushes), *free floating*, *floating-leaved*, and *submersed*. For middle school and high school students, the discussion can be taken further to the topic of *native*, *non-native* and *invasive* plants.

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Student Learning Objectives:

1) Display an appreciation for the design and structure found in Florida's diverse plant life.

2) Use visual clues to match plant illustrations on the BINGO card with plant illustrations projected on the screen (or with the printed 8.5" x 11" illustrations).

3) Distinguish between different types of plants using botanical terminology such as: leaf shape, flower shape, leaf and stem arrangement, leaf margins, leaf tips, habit, etc.

4) Utilize more than one visual clue to identify plants.

5) Identify common characteristics observed within plant genera.

6) Define the difference between native, non-native and invasive plant species.

Vocabulary

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

emersed plants – are rooted to the bottom (in shallow water) and have most of the vegetative growth above the water.

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

free-floating plant – floats freely on the surface; it does not have any roots attached to the bottom.

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

habit – the tendency of a plant to grow a certain way; the general characteristic appearance of a plant. For example, a weeping habit describes plants with drooping branches.

invasive plant - a non-native plant species able to spread on its own, causing 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 present in a region outside its original, historic range due to intentional or unintentional introduction; exotic; not always invasive. The introduction is often the result of human activity.

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

Materials Needed

Note: All materials are available to download and print from our website or by contacting caip-education@ufl.edu

<u>Teacher:</u>

- o **Disc** with Freshwater Plant BINGO! illustrations for projecting (LCD projector or overhead). *NOTE: The enclosed CD contains 2 folders -- BINGO cards & BINGO Illustrations. BINGO cards are for printing (for student use); BINGO illustrations are for you to print out and hold up or to project on the screen*

- o **84 botanical line illustrations** 8.5" X 11"

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Per Student:

- 1 – 2 **BINGO cards** (to be switched with other students after each game).

- 25 – 30 **BINGO Chips**

- **Illustrated Plant Structures**

- Pencil and paper

Per Lab Group:

- 1 **Freshwater Plant Habitats**

- 1 **Freshwater Plant Habitat Checklist**

Procedure:

1. Prepare AV equipment for viewing the "Freshwater Plant BINGO!" botanical line illustrations using the BINGO! Resource disc OR simply pick out illustrations that you will hold up to the class.

2. Distribute BINGO cards (1-2 per student), chips, and additional identification resources to students.

3. Use **Freshwater Plant Habitats** guide and vocabulary to discuss types of aquatic plants and the habitats they live in. Be sure to point out there are always exceptions: some plants can grow in one area as submersed plants and as emersed plants in other environments, or even in the same area.

4. **MIDDLE AND HIGH SCHOOL:** Use **Illustrated Plant Structures** to further discuss the structure of plants and how the information can be used to recognize the genus/species of plants (in general terms). While playing BINGO, ask students if they see any similar structure, leaf shape, arrangement etc. among the plants. Notice that plants within the same genus are extremely similar. With practice, it becomes easier to identify a plant genus, even if we don't have enough information to take it down to the species.

5. **TIME TO PLAY BINGO!** Randomly select and project individual images from the BINGO disc (or from the 8.5" x 11" printouts in the bingo packet). Ask students to match images from their card to the image they see on the screen (or the hard copy drawing). While the image is projected, observe and discuss the structure and characteristics of the plant. Ask students to discuss their observations and point out similarities with other plants. Do they think it's an emersed, submersed or floating plant? Or is it grass-like?

6. Once students have a match, ask them to write down the name of the plant on their paper and place a chip on their BINGO card square. (You will be providing the plant name; it will be on the 8.5" x 11" illustration). This is a good time to discuss scientific name vs. common name — which can be used later for extension activities.

7. Once a game is complete, ask ALL students to use the **Freshwater Plant Habitat Checklist** to find out how the plants from their card (with chips) fit into the emersed, submersed, floating or floating-leaved categories.

8. Next, ask them to research and find out whether the plant is native, non-native or invasive (using the **Freshwater Plant Habitat Checklist**.) Are there any characteristics of the plant that might make it invasive?

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Extensions:

- Play in small lab group, with students taking turns being the game facilitator and picking out the plants to display to their classmates.

- Expand on the game: call out plant morphology characteristic (leaf shape, leaf arrangement, leaf tip, etc.) to challenge students further.

- Provide a list of guiding questions. For example: What is this bulbous shape for (water hyacinth)? Do you think this plant is emersed or submersed category? Etc.

- Create a **SUPER BINGO**: students have to match a row of 4 plants and then be the first to tell whether their plant matches are native, non-native or invasive. (See **Freshwater Plant Habitat checklist** for answers).

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

Grade 6
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.

Grade 9,10, 11, 12
SC.912.L.17.a The distribution and abundance of organisms is determined by the interactions between organisms
SC.912.L.17.c Human activities and natural events have a profound effect on populations, biodiversity and ecosystem processes

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.4.4	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.
RI.5.7	LAFS.5.RI.3.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
RF.5.3	LAFS.5.RF.3.3	Know and apply grade-level phonics and word analysis skills in decoding words.
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.5.4c	LAFS.5.L.3.4c	Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.

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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).

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.
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.
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

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.7.4	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.7.4b	LAFS.7.L.3.4b	Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., belligerent, bellicose, rebel).
L.7.4c	LAFS.7.L.3.4c	Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.
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.
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

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.8.4	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.8.4c	LAFS.8.L.3.4c	Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.
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.

9th – 10th Grade

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).
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.9-10.4c	LAFS.910.L.3.4c	Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.
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

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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.

11th – 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 (e.g., how Madison defines faction in Federalist No. 10).
RI.11-12.7	LAFS.1112.RI.3.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
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.11-12.4c	LAFS.1112.L.3.4c	Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.
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.