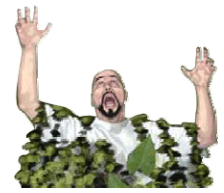


Module 1 ~ Silent Invaders

Freshwater Plant BINGO! (Teacher Notes)



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

Florida is home to more than 7,800 lakes 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, like those used here, 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. These newfound recognition skills will further reduce the "scare" factor often associated with botany. For more information on Florida's aquatic plants (macrophytes):

<http://plants.ifas.ufl.edu/guide/natplant.html>
<http://plants.ifas.ufl.edu/guide/invplant.html>
<http://plants.ifas.ufl.edu/guide/aqumac.html>
http://plants.ifas.ufl.edu/guide/contents_by_keyword.html

Key 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

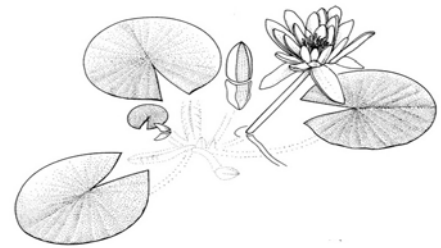
Grade Level: 4, 5 6, 7, 8 (with extensions) 9, 10, 11, 12 (with extensions)

Science Concepts: **Grades 4 and 5:** Comparing and contrast through observation. **Grades 6-7-8:** Analyzing and describing why and how organisms are classified. **Grades 9-10-11-12:** Organisms are classified based on their evolutionary history. Human activities and natural events have a profound effect on populations, biodiversity and ecosystem processes.

Language Arts: Use of new vocabulary and using context clues to determine the meaning of unfamiliar words; organizing information to show understanding.

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), **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.



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)

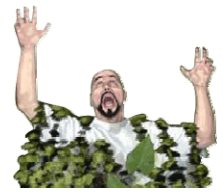
Floating and floating-leaved plants are those that may or may not be anchored to the sediment (they may be rooted to the bottom or may be free-floating), but they all have leaves that float on the water's surface. (e.g., water lily)

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).



Module 1 ~ Silent Invaders

Freshwater Plant BINGO! (Teacher Notes)



Student Learning Objectives:

- 1) Develop a greater appreciation for the design and structure found in Florida's diverse plant life.
- 2) Learn more about aquatic plants through observation and compare/contrast activities.
- 3) Use visual clues/observation skills to match plant illustrations on the BINGO card with plant illustrations projected on the screen (or with the printed 8.5" x 11" illustrations that the teacher holds up).
- 4) Botanical terminology such as: leaf shape, flower shape, leaf and stem arrangement, leaf margins, leaf tips, habit, etc. will become part of a student's "toolbox" for recognizing plants in their own environment.
- 5) Learn to utilize more than one visual clue to identify plants.
- 6) Learn to recognize plants by genus, using common characteristics observed while playing BINGO!
- 7) Learn the difference between native, non-native and invasive plant species and the importance of learning more about plants in Florida. The more we know, the better stewards we will be of our own homes and neighborhoods.

Vocabulary

aquatic plants – grow in water or wet areas; plants that 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 having most of the vegetative growth above the water.

floating-leaved plants – may or may not be anchored to the sediment, but 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 of a lake or pond.

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 that is 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.

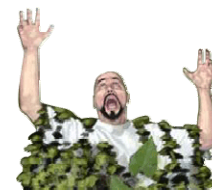
submersed plants - plants growing with their root, stems, and leaves completely under the surface of the water. Sometimes the leaves and/or flowers may grow above the surface.

See illustrated glossary of leaf shapes and flower parts for comprehensive list of botanical terminology:

http://plants.ifas.ufl.edu/education/misc_pdfs/glossary_of_leaf_shapes_low_res.pdf

http://plants.ifas.ufl.edu/education/misc_pdfs/a_glossary_flower_parts.pdf





Module 1 ~ Silent Invaders Freshwater Plant BINGO! (Teacher Notes)

Materials Needed

Teacher / Class:

- **Freshwater Plant BINGO! packet contains the following** (i.e., in addition to these teacher notes):
 - **CD** 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.**
 - **84 botanical line illustrations** (8.5" X 11") <http://plants.ifas.ufl.edu/education/module1/web/bingo.html>
 - **Freshwater Plant BINGO! Cards** 8.5" x 11" (#1 -- 50) <http://plants.ifas.ufl.edu/education/module1/web/bingo.html>
 - **Freshwater Plant BINGO! (illustration checklist)** [PRINT \(PDF\)](#) Search: <http://plants.ifas.ufl.edu/education/>
 - **300 green BINGO chips / 300 red chips** (provided in teacher kit). *Another option: laminate BINGO cards and have students use dry erase pens to mark their squares.*
 - **Freshwater Plant habitat checklist 2009** A companion resource for Freshwater Plants Jigsaw Puzzle and related activities including Freshwater Plant BINGO!; Hands-on Classification Activity, and more...Note: *to be used for extensions involving classification of plant habitats (emersed, submersed, floating).*
Available in teacher BINGO packet or online. Search: <http://plants.ifas.ufl.edu/education/> (3 pages)
 - **Freshwater Plants of the Southeast United States / Recognition Guide** (8.5" x 14")
[emersed PDF](#) (___MB) [floating PDF](#) (___MB) [grass-like PDF](#) (___MB) [submersed](#) (___MB)
(Note: Classroom sets of 15 printed copies available: caip-education@ufl.edu)
 - **Freshwater Plant Habitats 2009** (classroom set of 15; one for every 2 students) -- 8.5" X 14" with color illustrations/definitions of emersed, free-floating, floating-leaved, and submersed plants
- **Classroom set of illustrated glossary of leaf shapes and flower parts. Available for download/printing:**
http://plants.ifas.ufl.edu/education/misc_pdfs/glossary_of_leaf_shapes_low_res.pdf
http://plants.ifas.ufl.edu/education/misc_pdfs/a_glossary_flower_parts.pdf

Per Student:

- 1 – 2 **BINGO cards** (to be switched with other students after each game).
- 15-20 **green BINGO chips**; 15-20 **red BINGO chips**
- **Illustrated glossary of leaf shapes and flower parts**
- Pencil and paper

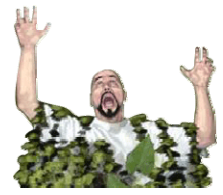
Per Lab Group:

- 1 or 2 each of **Freshwater Plant Habitats** (8.5" x 14") guide
- 1 or 2 each of **Freshwater Plants in the Southeastern U.S.** 8.5"x14" (2 pgs / front & back)
- 1 or 2 each of **Freshwater Plant Habitat Checklist 2009**
- **Freshwater Plant BINGO! (illustration checklist)**



Module 1 ~ Silent Invaders

Freshwater Plant BINGO! (Teacher Notes)



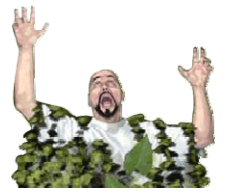
Advance Preparation:

- Prepare AV equipment for viewing the “Freshwater Plant BINGO!” botanical line illustrations (i.e., using the teacher disk or viewable via computer/projector with on-line connection to <http://plants.ifas.ufl.edu/education> **OR pick out illustrations that you will hold up to the class... the old fashioned way.** ☺)
- Distribute BINGO cards (1-2 per student), red and green chips, and additional identification resources to students.
- Ask students to have lined paper and pencil ready.

Procedure:

- 1) View ***Silent Invaders*** presentation on-line: <http://plants.ifas.ufl.edu/education>. Discuss keywords and concepts.
- 2) Use **Freshwater Plant Habitats (8.5” x 14”)** 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.
- 3) Use **Freshwater Plants in the Southeastern United States (8.5” x 14” / 2 sheets)** to further discuss the tools available for identifying plants (field guides, web sites, books, etc.). Notice how the plants are categorized and/or classified in this particular field guide (emersed, submersed, grass-like, etc.). Discuss how using a plant’s habitat is a good way to start classifying plants. Explain: there are more complex methods to key plants with...but this is a good way to start sharpening observation skills.
- 4) **FOR MIDDLE AND HIGH SCHOOL:** Use **Illustrated Glossary of Leaf Shapes** and **Flower Parts** 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. This can be quite gratifying.
- 5) **TIME TO PLAY BINGO!** Randomly select and project individual images from the BINGO disk (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 on the screen, 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? 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 (a student wins by calling out BINGO!). 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 **BINGO plant checklist** and/or the **Freshwater_Plant_habitat_checklist_2009**).

Module 1 ~ Silent Invaders Freshwater Plant BINGO! (Teacher Notes)



Extensions:

- Play in small lab group, with students taking turns being the game “facilitator” and picking out the plants to display to their classmates.
- Laminate BINGO! cards and use dry erase pens to mark off matches (instead of chips). Students can then use the pens to write plant names down on their actual BINGO card square. Let them use **Freshwater Plants in the Southeastern U.S. (11" X 17" posters)** as a field guide for identifying their plants and use the BINGO check list to check their answers.
- Students cut up the current BINGO sheets/cards and make their own BINGO cards, using their favorite plants. Or they could make sets of plants according to their habitats: emersed plants, floating or floating leaved plants and/or submersed plants.
- Expand on the game: call out plant morphology characteristic (leaf shape, leaf arrangement, leaf tip, etc.) to challenge students further.
- Make a BINGO! game using the Leaf Shape / Flower Part illustrations.
- 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 BINGO checklist for answers).

Additional Notes:



Module 1 ~ Silent Invaders

Freshwater Plant BINGO! (Teacher Notes)

Upper Elementary Sunshine State Standards

Science Grade 4

Big Idea #1 SC.4.N.1.2: Compare the observations made by different groups using multiple tools and seek reasons to explain the difference across groups.

Science Grade 5

Big Idea #1 SC.5.N.1.1: Define a problem, use appropriate reference material to support scientific understanding, plan, and carry out scientific investigations on various types such as: systematic observation, identification of variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.5.N.1.6: Recognize and explain the difference between personal opinion/interpretation and verified observation.

Big Idea #2 SC.5.N.2.1: Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.

Big Idea #14 SC.5.L.14.2: Compare & contrast the function of organs and other physical structures of plants and animals.

Science Grade 6

Big Idea #15 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.

Language Arts

Grade 4

LA.4.1.6.1: TSW use new vocabulary that is introduced and taught directly.

LA.4.1.6.2: TSW listen to, read, and discuss familiar and conceptually challenging text.

LA.4.1.6.3: TSW use context clues to determine the meaning of unfamiliar words.

LA.4.1.4.3: TSW use language structure to read multi-syllabic words in text.

Grade 5

LA.5.1.6.1: TSW use new vocabulary that is introduced and taught directly.

LA.5.1.6.2: TSW listen to, read, and discuss familiar and conceptually challenging text.

LA.5.1.6.3: TSW use context clues to determine the meaning of unfamiliar words.

Grade 6

LA.6.1.6.1: TSW use new vocabulary that is introduced and taught directly.

LA.6.1.6.2: TSW listen to, read, and discuss familiar and conceptually challenging text.

LA.6.1.6.3: TSW use context clues to determine the meaning of unfamiliar words.

LA.6.2.2.3: Organize information to show understanding (e.g., representing main ideas within a text through charting, mapping paraphrasing, or summarizing).

LA. 6.4.2.2: Record information (e.g., observations, notes, lists, charts, map labels, legends) related to a topic, including visual aids as appropriate.

Middle School Sunshine State Standards,

Science Grade 6

Big Idea #15

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.

Science Grade 7

Big idea #15 SC.7.L.15.2 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.

Big Idea #17 SC.7.L.17.3 Describe and investigate various limiting factors in a local ecosystem and their impact on native populations including food, shelter, water, space, disease, parasitism, and nesting sites.

Science Grade 8

Big Idea #4 SC.8.N.4.1 Explain that science is one of the processes that can be used to inform decision making at the community, state, national and international levels.

SC.8.N.4.2 Explain how political, social and economic concerns can affect science and vice versa.

Science Grade 9,10, 11, 12

Standard 14 & 15

C) Organisms are classified based on their evolutionary history.
D) Natural selection is a primary mechanism leading to evolutionary change.

Standard 16

D) Reproduction is characteristic of living things and essential for the survival of the species.

Standard 17

A) The distribution and abundance of organisms is determined by the interactions between organisms
C) Human activities and natural events have a profound effect on populations, biodiversity and ecosystem processes

