Teacher Guide – Classify Aquatic Plants

Key Questions/Objective: What is an aquatic plant? How do they differ from terrestrial plants? What are the various "habitats' that aquatic plants can be found in? What is the difference between native, non-native and invasive plants? Can you identify whether a plant is native or non-native just by looking at it?

Science Subjects: Biology, botany, environmental science, horticulture

Grade level: UE / MS/ HS

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

Overall time estimate: 1 – 2 class periods, depending on grade level (~ 90 minutes)

Learning styles: Visual, auditory, and kinesthetic

Vocabulary: aquatic plants, emersed plants, free-floating plants, floating-leaved plants, grass-like plants, invasive plants, native plants, natural areas, non-native plants, submersed plants

Lesson summary: Students will become familiar with characteristics commonly used to classify aquatic and wetland plants (i.e., emersed, floating and floating-leaved, submersed and grass-like). They will also learn another way to classify plants by discussing the definition/concept of native, non-native and invasive plants. This will be achieved by viewing a 25 minute presentation; observing and discussing photos, images, and illustrations of plants; and participating in a simple classification activity using flash cards and/or illustrations.

Student learning objectives:

1) Students will be able to describe the difference between aquatic and terrestrial plants and will be able to and discuss the categories often used to classify aquatic plants (emersed, floating and floating-leaved, submersed and grass-like).

2) Students will be able to articulate what a native plant is; a non-native plant; and what makes some plants invasive.

3) Students will begin to take an exploratory look at the various plant parts (using *Illustrated Plant Structures*). This is only an introduction. (No assessment.)

Essential Materials: *All of the following items can be found on our website: http://plants.ifas.ufl.edu/education*

☐ Blank K-W-L Chart

☐ Freshwater Plants of the SE United States / Recognition Guide (8.5" x 14")
 (For a classroom set of these documents, contact caip-education@ufl.edu)

☐ Freshwater Plant Habitats

☐ Freshwater Plant Habitat Checklist

☐ Flashcards:
 o Native Plants You Should Know
 o Invasive and Non-native Plants You Should Know

Extra Materials (for extensions):

☐ Aquatic, Wetland and Invasive Plant Line Drawings: http://plants.ifas.ufl.edu/node/482

☐ Illustrated Plant Structures

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Advance Preparation:

- Prepare classroom computer connection for projection (i.e., online viewing) of **Silent Invaders** presentation: http://plants.ifas.ufl.edu/education . **OR** obtain DVD disk with **Silent Invaders** presentation as PowerPoint™ or QuickTime video file. Contact UF/IFAS Center for Aquatic and Invasive Plants: caip-education@ufl.edu

- Gather essential materials and review resource links provided.

Activity / Procedure:

Day 1:   **25-30 minutes to view; 10-15 minutes for discussion**

Watch **Silent Invaders** presentation: http://plants.ifas.ufl.edu/education/ and discuss Guiding Questions.

Day 2:

1) Students should be paired with at least one other student and given **Freshwater Plant Habitats** and **Freshwater Plants of the Southeast United States / Recognition Guide**. Spend 10 minutes discussing the categories commonly used to classify aquatic plants (i.e., emersed, submersed, or free-floating, floating-leaved and grass-like).

2) **Using the Blank K-W-L Chart**, hold classroom discussion with students using the questions below (or your own):

   Using the "K" column (what we already know), ask students:

   o What are some common characteristics of ALL aquatic plants?

   o What is the difference between emersed, submersed, free-floating, floating-leaved and grass-like plants?

   o Why are floating and floating-leaved plants considered separate categories?

   Using the "W" column (what we need to know), ask students:

   o What else do we need to know about aquatic plants in Florida?

   o Can you tell, just by looking at the plant, whether or not it could be invasive? For example, does it matter if the plant has a pretty flower? Does that make it "good" ? What if the plant is spiky or sharp? Does that mean it's bad? What if it's poisonous? Does that make it invasive?

3) After filling out the K & W columns of table, separate students into groups. Give each group a set of native and invasive plant flash cards (up to10 cards to each group).

4) Students will use the flashcards to practice separating the aquatic plants by characteristic growth (emersed, submersed, free-floating, floating-leaved, grass-like).
   NOTE: DON'T LET THEM "CHEAT" BY READING THE INFORMATION ON THE BACK OF THE CARDS. ☺

   o Additional extension for MS/HS: Taking each sub-category from above, students will categorize plants further by leaf shape, leaf arrangement, etc. OR Students choose their own criteria for classifying.

5) Once this activity is complete, lead another class discussion using the following questions:

   o Can an emersed plant also be a submersed plant? Do they see examples in the cards?

   o What types of wildlife might live in or use these habitats?

   o *(For MS/HS extension)* If they used their own criteria for classifying, what was it and why?

   o *(For MS/HS extension)* How do you think leaf shapes or other characteristics might affect a plant's ability to survive in the various habitats (submersed habitats, emersed, etc.)?

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Assessment Suggestions:

1) Using their new knowledge, students create a model or picture of a lake habitat, illustrating various plant categories (emersed, submersed, etc.) or groups work together to make a large mural (on a large sheet of paper). Line drawings of select plants can be printed, cut out, colored and pasted in the correct location on the mural. Once the mural is complete, students can label the various plants, etc.

2) Students choose a native, non-native or invasive plant and write a news article as if they just discovered the plant in Florida, using the new terminology learned with this activity. **OR** Students create and advertisement or Powerpoint ™ presentation, with illustrations, about the merits of a specific native plant or problems associated with a specific non-native invasive plant for a science magazine.

3) Students create their own assessment piece (true/false, short answer or multiple choice).

4) Students make their own botanical line drawings of examples of emersed, submersed, floating, grasp-like and also native, non-native and invasive plants and label plant parts (using the leaf shapes handout).

Extensions:

- This same approach can be done with terrestrial (upland) plants which can be classified into two main categories: herbaceous plants or woody plants. Or students can practice the very basic task of classifying by terrestrial or aquatic. Also, see this webpage for other ways to classify/categorize plants: http://plants.ifas.ufl.edu/

- *(For MS/HS extension)* Ask students to choose another team and compare classifications. What is similar and what is different? Why? Would they change classification system after comparing yours with the other teams in your class?

> **herbaceous plants** - adj. soft, grassy, non-woody plants that according to season (autumn) lose their above-ground growth but leave intact roots and produce new growth in the new season (spring).
>
> **woody plants** - plants that have woody stems and grow continuously throughout the year, many years in a row, without losing their above-ground growth with the change of seasons. Example: *Hypericum fasciculatum.*

Resources/References:

- Plant Type Categories: http://plants.ifas.ufl.edu/node/34

- Glossary: available on our education website

- Information on the following can be found in Section 1 of our website: http://plants.ifas.ufl.edu/manage
  - Aquatic and Wetland Plants in Florida (emersed, submersed plants)
  - Free-floating and floating-leaved plants
  - Native aquatic and wetland plants in Florida
  - Non-native and invasive aquatic plants

- Information on Florida Fish and Wildlife can be found in Section 2 on the above website

Vocabulary:

1. **aquatic plants** – plants that live near, on, or under the water.

2. **emersed plants** – have roots underwater with part of the plant sticking above the water.

3. **floating-leaved plants** – leaves floating on the surface; roots are not always anchored to bottom.

4. **free-floating plants -** plants that are not anchored in the sediment.

5. **invasive plants** – non-native plants that spread on their own and cause environmental or economic harm.

6. **native plants** – plants that were here before Columbus arrived to the New World.

7. **natural areas** – lands that have not been developed for agriculture, business or housing.

8. **non-native plants** – (In Florida) a plant species that arrived since the time of Columbus.

9. **submersed plants** – grow with their roots, stem and leaves completely underwater.

10. **terrestrial plant** – a plant that is living or grown on land; not aquatic.

Background Information:

Native plants are a plant species that occur naturally within a geographic region or area. In Florida, the phrase "native plant" refers to those species that were here prior to European contact (also referred to as an indigenous plant). It has not been introduced by humans, intentionally or unintentionally. Native plants provide food and shelter to animals of all sorts, stability to shorelines and fields, and visual pleasure to those of us lucky enough to live here. Because a native plant species usually does not take over an area, there is biodiversity – a great number of species growing in balance and living together in harmony. Florida is famous for its biodiversity.

Diversity is possible because each native species is constrained in its growth by a number of natural factors:

> 1) competition with other native species
>
> 2) native diseases
>
> 3) predation by feeding native insects and other animals
>
> 4) climate
>
> 5) water level fluctuation, and so on

Non – native plants are from someplace else: non-natives are also known as "exotic." Botanists define non-native plants as a plant species that is present in a region outside its original, historic range due to intentional or unintentional introduction; not necessarily invasive or those that have become part of our flora following the occupation of Europeans in North America -- plants that have made their way here (i.e., to Florida) since 1513. Of the more than 4,000 plants found in Florida, more than 1,300 are non-native and out of those, about 130 have been deemed "invasive."

The term invasive is used to describe a non-native plant that escaped cultivation and is spreading into natural wild lands and waters and is causing **economic** and/or **environmental** harm. Invasive plants are also described as "nuisances, pests, or noxious" meaning they negatively affect our native plants and animals, or hinder humans' uses of our waters and lands.

- **Emersed plants** are aquatic plants rooted in sediments with leaves and/or stems protruding above the water's surface. Cattail, maidencane, and bulrush are examples of emersed plants. Emersed plants grow in water-saturated soils and submersed soils near the edge of a waterbody. They generally grow out to a maximum depth of from 1 to 3 meters (about 3 to 10 feet). Emersed (emergent) plants perform many functions in waterbodies. They provide food and habitat for animals and reduce shoreline erosion. They can also increase transpirational water losses from a waterbody, sometimes to the point where water levels are lowered.

- **Submersed plants** are large plants that grow primarily below the water's surface. Eelgrass, hydrilla (an invasive plant), and coontail are examples of submersed plants. Some of these plants are rooted to the waterbody's sediments (e.g., eelgrass and hydrilla) while some, like coontail, are not. Submersed plants provide food and habitat for wildlife populations (fish, waterfowl, invertebrates) and affect nutrient cycles and other chemical cycles in complex ways. They also help stabilize shorelines and sediments. Submersed plants can increase water clarity and increase or decrease dissolved oxygen concentrations, depending on plant abundance and other factors.

- **Floating-leaved plants** are plants that are primarily rooted to sediments and also have leaves that float on the water's surface. Waterlilies, spatterdock, and lotus are examples of floating-leaved plants. Floating-leaved plants are generally found growing along the shoreline, lake-ward of the emergent plants.

- **Free-floating plants** are plants that are not anchored in the sediment; they get their nutrients directly from the water. Free-floating plants include the duckweeds, bladderwort, coontail, and the invasive water Free-floating plants are plants that are not anchored in the sediment; lettuce and water hyacinth. Floating plants provides food and habitat for wildlife populations (fish, waterfowl, invertebrates) and affect nutrient cycles and other chemical cycles in complex ways. They also help stabilize shorelines and sediments. Floating plants can increase water clarity and increase or decrease dissolved oxygen concentrations, depending on their abundance.

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Next Generation Sunshine State Standards

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

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

6th Grade continued
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.

9th - 12th Grades
SC.912.L.14.53: Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.
SC.912.L.17.2: Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.

Common Core Standards

4th Grade

Common Core Code	FL Common Core Code	Common Core Standard
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.
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.
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.
W.4.2	LAFS.4.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
W.4.2b	LAFS.4.W.1.2b	Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
W.4.2d	LAFS.4.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.4.4	LAFS.4.W.2.4	Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.4.5	LAFS.4.W.2.5	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.(Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 4 on page 29.)
W.4.9	LAFS.4.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.
SL.4.1c	LAFS.4.SL.1.1c	Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
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.4.4	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.4.4a	LAFS.4.L.3.4a	Use context (e.g., definitions, examples, or restatements in text) as a clue to the meaning of a word or phrase.
L.4.4b	LAFS.4.L.3.4b	Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., telegraph, photograph, autograph).

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5th Grade

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.
RI.5.3	LAFS.5.RI.1.3	Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
RI.5.5	LAFS.5.RI.2.5	Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.
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.
W.5.2	LAFS.5.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
W.5.2b	LAFS.5.W.1.2b	Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
W.5.2d	LAFS.5.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.5.5	LAFS.5.W.2.5	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
W.5.9	LAFS.5.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.5.1c	LAFS.5.SL.1.1c	Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
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.5.5	LAFS.5.L.3.5	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
L.5.5a	LAFS.5.L.3.5a	Interpret figurative language, including similes and metaphors, in context.
L.5.5b	LAFS.5.L.3.5b	Recognize and explain the meaning of common idioms, adages, and proverbs.

6th Grade

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.
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.
W.6.2	LAFS.6.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.6.2a	LAFS.6.W.1.2a	Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
W.6.2b	LAFS.6.W.1.2b	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
W.6.2d	LAFS.6.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.6.4	LAFS.6.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.6.5	LAFS.6.W.2.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
W.6.9	LAFS.6.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.
SL.6.1c	LAFS.6.SL.1.1c	Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.
SL.6.2	LAFS.6.SL.1.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

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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.6.4a	LAFS.6.L.3.4a	Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
L.6.4b	LAFS.6.L.3.4b	Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., audience, auditory, audible).
RST.6-8.1	LAFS.68.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts.
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).
RST.6-8.10	LAFS.68.RST.4.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
WHST.6-8.2d	LAFS.68.WHST.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
WHST.6-8.4	LAFS.68.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.5	LAFS.68.WHST.2.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis reflection, and research.

7th Grade

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.
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.
RI.7.7	LAFS.7.RI.3.7	Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).
RI.7.10	LAFS.7.RI.4.10	By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.
W.7.2	LAFS.7.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.7.2a	LAFS.7.W.1.2a	Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
W.7.2b	LAFS.7.W.1.2b	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
W.7.2d	LAFS.7.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain topic.
W.7.4	LAFS.7.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.7.5	LAFS.7.W.2.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
W.7.9	LAFS.7.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.7.1c	LAFS.7.SL.1.1c	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
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.
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.7.4a	LAFS.7.L.3.4a	Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

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).
RST.6-8.1	LAFS.68.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts.
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).
RST.6-8.10	LAFS.68.RST.4.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
WHST.6-8.2d	LAFS.68.WHST.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
WHST.6-8.4	LAFS.68.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.5	LAFS.68.WHST.2.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis reflection, and research.

8th Grade

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.
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.
W.8.2	LAFS.8.W.1.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.2a	LAFS.8.W.1.2a	Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
W.8.2b	LAFS.8.W.1.2b	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.2d	LAFS.8.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.8.4	LAFS.8.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.5	LAFS.8.W.2.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
W.8.9	LAFS.8.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.
SL.8.1c	LAFS.8.SL.1.1c	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
SL.8.2	LAFS.8.SL.1.2	Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
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.8.4a	LAFS.8.L.3.4a	Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
L.8.4b	LAFS.8.L.3.4b	Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., precede, recede, secede).
RST.6-8.1	LAFS.68.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts.
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).

RST.6-8.10	LAFS.68.RST.4.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
WHST.6-8.2d	LAFS.68.WHST.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
WHST.6-8.4	LAFS.68.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.5	LAFS.68.WHST.2.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
WHST.6-8.9	LAFS.68.WHST.3.9	Draw evidence from informational texts to support analysis reflection, and research.

9 – 10th Grade

RI.9-10.1	LAFS.910.RI.1.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
W.9-10.2	LAFS.910.W.1.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
W.9-10.2a	LAFS.910.W.1.2a	Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
W.9-10.2b	LAFS.910.W.1.2b	Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
W.9-10.2d	LAFS.910.W.1.2d	Use precise language and domain-specific vocabulary to manage the complexity of the topic.
W.9-10.4	LAFS.910.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.9-10.5	LAFS.910.W.2.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
W.9-10.9	LAFS.910.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.
SL.9-10.1c	LAFS.910.SL.1.1c	Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
SL.9-10.2	LAFS.910.SL.1.2	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
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.9-10.4a	LAFS.910.L.3.4a	Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
RST.9-10.1	LAFS.910.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
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.
RST.9-10.7	LAFS.910.RST.3.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.10	LAFS.910.RST.4.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
WHST.9-10.2d	LAFS.910.WHST.1.2d	Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
WHST.9-10.4	LAFS.910.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.9-10.5	LAFS.910.WHST.2.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-10.9	LAFS.910.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.

11 – 12th Grade

RI.11-12.1	LAFS.1112.RI.1.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
W.11-12.2	LAFS.1112.W.1.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
W.11-12.2a	LAFS.1112.W.1.2a	Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
W.11-12.2b	LAFS.1112.W.1.2b	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
W.11-12.2d	LAFS.1112.W.1.2d	Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
W.11-12.4	LAFS.1112.W.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.11-12.5	LAFS.1112.W.2.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
W.11-12.9	LAFS.1112.W.3.9	Draw evidence form literary or informational texts to support analysis, reflection, and research.
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.
SL.11-12.1c	LAFS.1112.SL.1.1c	Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
SL.11-12.2	LAFS.1112.SL.1.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
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.11-12.4a	LAFS.1112.L.3.4a	Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
RST.11-12.1	LAFS.1112.RST.1.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
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.
RST.11-12.7	LAFS.1112.RST.3.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.10	LAFS.1112.RST.4.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
WHST.11-12.2d	LAFS.1112.WHST.1.2d	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.11-12.4	LAFS.1112.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5	LAFS.1112.WHST.2.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.9	LAFS.1112.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.