READ
THINK
EXPLAIN

1. Estuaries play an important role in our environment. Describe an estuarine environment and explain how it relates to the quality of our water resources.

READ
THINK
EXPLAIN

2. Describe the events that cause water in an estuary to be constantly changing. Explain how the changes in water can affect the ecosystem of the estuary.

Southwest Florida
Water Management District
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WaterWeb

current water info for schools

A publication of the Southwest Florida Water Management District

Estuaries Teacher's Guide

Welcome to the estuaries issue of WaterWeb*! As part of the Splash! Water Resources Education program, the Southwest Florida Water Management District (SWFWMD) offers the* WaterWeb *newsletter for middle and high school students. The newsletter is correlated to grades 6–8 and 9–12 of the Sunshine State Standards and provides an interesting way for students to increase their awareness and respect for Florida's precious water resources.*

This issue of WaterWeb *focuses on estuaries. It includes a media reprint about estuaries, a career focus on an environmental science instructor, a description of several plants and animals that live in estuaries, information about mangrove swamps, instructions for conducting a brackish experiment, a crossword puzzle and word scramble, and suggestions for surfing the Internet. All information and activities are designed to teach students about the importance of estuaries. In addition, we have included* WaterWeb *Challenge, which contains items similar to those students could expect to find on the Florida Comprehensive Assessment Test (FCAT). Let* WaterWeb *make a splash in your classroom today!*

Many other free materials are available from the SWFWMD and can be ordered online at WaterMatters.org/publications/. *We also offer water resources workshops for teachers. Please contact us if you have any questions or suggestions about our water resources education programs.*

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Introduction — Page 1

Estuaries play an important role in the environment. Discuss the concept of an estuary. To provide additional background, use a map of Florida and identify areas where estuaries may exist. Then have students locate rivers that lead to estuarine areas.

Sunshine State Standards
Science (6–8): Processes that Shape the Earth, SC.D.1.3, SC.D.2.3; Processes of Life, SC.F.1.3; How Living Things Interact with Their Environment, SC.G.1.3.
Science (9–12): Processes that Shape the Earth, SC.D.2.4; Processes of Life, SC.F.1.4; How Living Things Interact with Their Environment, SC.G.1.4.

WaterWeb Query — Page 1

Ask students to read the Question and Answer. Have students make a list of several bodies of water that contain salt water (Atlantic Ocean, Gulf of Mexico, Pacific Ocean, etc.) or fresh water (lakes, rivers, ponds, etc.). Then ask students to explain where they would expect to find brackish water.

Sunshine State Standards
Science (6–8): Processes that Shape the Earth, SC.D.2.3; Processes of Life, SC.F.1.3; How Living Things Interact with Their Environment, SC.G.1.3.
Science (9–12): Processes that Shape the Earth, SC.D.2.4; Processes of Life, SC.F.1.4; How Living Things Interact with Their Environment, SC.G.1.4.

Media Reprint — Page 2

Read the article together and complete the exercises. Answers: 1. Accept reasonable responses that show where estuaries may be found in coastal areas. 2. Responses should emphasize the direct link between the quality of water and marine fisheries production. 3. The fresh water that flows into an estuary can originate many miles away. Therefore, pollution in the watershed can potentially contaminate the estuary.

Sunshine State Standards
Science (6–8): Processes that Shape the Earth, SC.D.1.3, SC.D.2.3; Processes of Life, SC.F.1.3; How Living Things Interact with Their Environment, SC.G.2.3.
Science (9–12): Processes that Shape the Earth, SC.D.1.4, SC.D.2.4; Processes of Life, SC.F.1.4; How Living Things Interact with Their Environment, SC.G.2.4.

Career Focus — Page 3

Read the interview with your students. Ask them if they have ever met an environmental science instructor. Ask your students if they would be interested in this type of career and have them give reasons for their responses.

Living In An Estuary — Page 4

A variety of plants and animals live in an estuary. Use the examples on page 4 to get students started on the extended activity in which they use an encyclopedia or the Internet.

Sunshine State Standards
Science (6–8): Processes of Life, SC.F.1.3; How Living Things Interact with Their Environment, SC.G.1.3.
Science (9–12): Processes of Life, SC.F.1.4; How Living Things Interact with Their Environment, SC.G.1.4.

Trees Living In Water — Page 5

Prior to reading the article, ask students if they have ever seen mangrove trees and how they would describe them. Read the information about mangrove swamps and discuss the questions at the end of the article.

Sunshine State Standards
Science (6–8): Processes that Shape the Earth, SC.D.1.3, SC.D.2.3; How Living Things Interact with Their Environment, SC.G.1.3.
Science (9–12): Processes that Shape the Earth, SC.D.1.4, SC.D.2.4; How Living Things Interact with Their Environment, SC.G.1.4.

Classroom Activity — Page 6

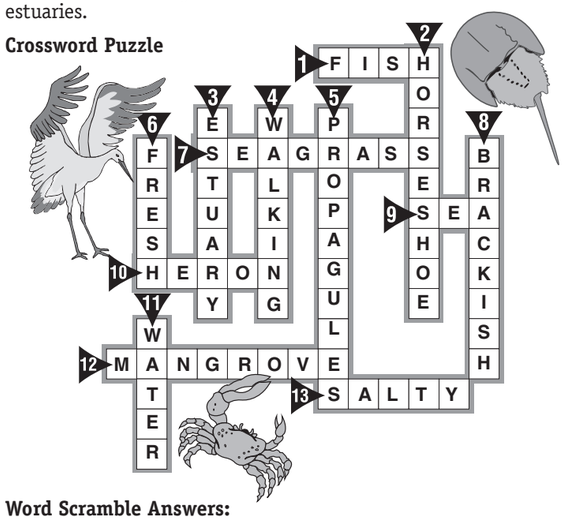
A Brackish Experiment With Salt Water and Fresh Water
Before beginning this activity, make sure your students understand the concept of brackish water. Proceed with the activity and discuss your students' recorded observations.

Sunshine State Standards
Science (6–8): The Nature of Matter, SC.A.1.3; Processes that Shape the Earth, SC.D.1.3; The Nature of Science, SC.H.1.3.
Mathematics (6–8): Measurement, MA.B.1.3.
Science (9–12): The Nature of Matter, SC.A.1.4; Processes that Shape the Earth, SC.D.1.4; The Nature of Science, SC.H.1.4.
Mathematics (9–12): Measurement, MA.B.1.4.

Activities — Page 7

Although these activities are meant to be fun, they reinforce important vocabulary and concepts associated with understanding estuaries.

Crossword Puzzle



Word Scramble Answers:
ecosystems, estuaries, hatchery, coastal

Paragraph:
Estuaries are special *coastal* areas where fresh water meets and mixes with the salty water of the sea. Estuaries are very productive *ecosystems*. They serve as a *hatchery* for young fish and other marine life. Estuaries also help filter pollutants and sediments, which improves the quality of the water. Let's all work to protect our *estuaries*.

Sunshine State Standards
Language Arts (6–8): Reading, LA.A.1.3, LA.A.2.3.
Language Arts (9–12): Reading, LA.A.1.4, LA.A.2.4.

WaterWeb — Page 8

A lot of information is available about estuaries. Visit the sites listed in this section. Ask students to identify several new facts they learned about estuaries while surfing the sites. Be sure to have students visit the SWFWMD's web site at *WaterMatters.org*.

Sunshine State Standards
Science (6–8): The Nature of Science, SC.H.2.3, SC.H.3.3.
Language Arts (6–8): Reading, LA.A.2.3.
Science (9–12): The Nature of Science, SC.H.2.4, SC.H.3.4.
Language Arts (9–12): Reading, LA.A.2.4.

WaterWeb Challenge

WaterWeb Challenge
Items included in the Challenge are similar to those presented on the Florida Comprehensive Assessment Test (FCAT). Make copies of the Challenge (on following pages) and explain to students that this provides good practice for preparing for the FCAT. Students should be allowed to use the *WaterWe*b issue as they complete the Challenge.

Answers to multiple-choice items: 1-b, 2-a, 3-d, 4-a, 5-c, 6-b, 7-b, 8-d, 9-d, 10-b

Answers to extended-response items:
Question 1. Responses will vary. Student should be able to demonstrate an understanding of estuaries and their link to the quality of water resources.
Score 2 points if . . . The response indicates that the student has a basic understanding of estuaries and their link to the quality of water resources. The student has provided a response that is accurate and complete.
Score 1 point if . . . The response indicates that the student has a partial understanding of estuaries and their link to the quality of water resources. The student has provided a response that includes information that is essentially correct, but the information is too general or too simplistic.
Score 0 points if . . . The response is inaccurate, confused, and/or irrelevant.

Question 2. Responses will vary. Student should be able to demonstrate an understanding of brackish water and the changing degree of salinity caused by tidal flow, and how plants and animals must be able to adapt to their changing environment.
Score 2 points if . . . The response indicates that the student has demonstrated an understanding of the events that cause water in an estuary to be constantly changing and how this affects the ecosystem of the estuary. The student has provided a response that is accurate and complete.
Score 1 point if . . . The response indicates that the student has partially demonstrated an understanding of the events that cause water in an estuary to be constantly changing and how this affects the ecosystem of the estuary. The student has provided a response that includes information that is essentially correct, but the information is too general or too simplistic.
Score 0 points if . . . The response is inaccurate, confused, and/or irrelevant.

Sunshine State Standards
Science (6–8): The Nature of Matter, SC.A.1.3; Processes that Shape the Earth, SC.D.1.3; How Living Things Interact with Their Environment, SC.G.1.3.
Language Arts (6–8): Reading, LA.A.2.3; Writing, LA.B.2.3.
Science (9–12): The Nature of Matter, SC.A.1.4; Processes that Shape the Earth, SC.D.1.4; How Living Things Interact with Their Environment, SC.G.1.4.
Language Arts (9–12): Reading, LA.A.2.4; Writing, LA.B.2.4.

WaterWeb Challenge

Directions: *This is your opportunity to demonstrate what you have learned about estuaries. It is also an opportunity for you to practice answering questions similar to those found on the FCAT. Do your best and meet the challenge!*

For each multiple-choice item, select the best answer.

1. In this issue of *WaterWeb*, you have learned a lot about estuaries. Where could you possibly find an estuary?
   a. at a lake
   b. at a water area where a river meets the sea
   c. at the source of a river
   d. on an island in the ocean

2. What term is used to describe a community of plants and animals that grow and live together naturally?
   a. an ecosystem
   b. a seagrass bed
   c. a propagule
   d. a mangrove

3. Which one below does NOT belong in a list of features about estuaries?
   a. They are semi-enclosed water bodies.
   b. They are transitional zones between fresh and salt water.
   c. They often serve as hatcheries for young marine life.
   d. They increase the amount of pollution in an area.

4. Which species of tropical trees is able to thrive in an estuarine environment?
   a. mangrove
   b. wax myrtle
   c. maple
   d. pine

5. Which three species of mangrove trees live in Florida?
   a. spiny mangrove, propagule mangrove and walking mangrove
   b. brown mangrove, red mangrove, tan mangrove
   c. black mangrove, red mangrove and white mangrove
   d. hardwood mangrove, flatwood mangrove and scrub mangrove

6. How do plants in an estuary help improve the estuary's quality of water?
   a. by flowing salty water through it
   b. by filtering pollutants and sediments from the water
   c. by flowing fresh water through it
   d. by serving as a hatchery for young fish

7. Water in an estuary is described as *brackish*. What does this mean?
   a. The water is brown and salty.
   b. The water contains a mixture of fresh and salty water.
   c. The water is warm and muddy.
   d. The water is filled with tiny organisms.

8. How do mangroves provide good habitats for young animals?
   a. Their intricate pattern of roots and branches serve as a shelter.
   b. They can trap organic material brought in by tidal flooding.
   c. Their unique branches can be used for roosting and nesting.
   d. All of the above.

9. Which of the following would you NOT expect to find living in an estuary?
   a. herons
   b. horseshoe crabs
   c. seagrass
   d. skunks

10. What is an important message for readers after completing this *WaterWeb* issue?
    a. Teach others that estuaries are not very productive natural areas.
    b. Use your knowledge about estuaries to encourage others to help protect them.
    c. Realize that there is a very limited variety of wildlife found in an estuary.
    d. Avoid visiting natural areas such as estuaries.