

WaterWeb

current water info for schools

A publication of the Southwest Florida Water Management District



The WaterWeb Query

QUESTION:

The water in an estuary is often described as *brackish*. What does this mean?

ANSWER:

A river contains fresh water and the water in a sea or ocean is salty. As a river flows toward the sea, it meets the salty tides of the sea and mixes to create brackish water. Therefore, brackish water is a mixture of salty water and fresh water. The degree of salinity contained in the brackish water fluctuates as the tides move in and out.

Estuaries

Have you ever visited a coastal area where freshwater rivers and streams flow into and mix with salt water? If your answer is *yes*, then you have probably been to an estuary. Estuaries exist in all shapes and sizes and are special places. An estuary can most easily be defined as a semi-enclosed body of water where fresh water mixes with salt water and where river flow meets the tide. As the fresh water from rivers and streams moves toward the sea or ocean, it mixes with the salty seawater. Although the tides can affect the conditions of an estuary, it is a place often protected by barrier islands,

reefs and land from the full force of coastal winds, ocean waves and storms.

Estuaries are considered the most productive of the earth's *ecosystems*, which are communities of plants and animals that grow and live together naturally. Many different habitats may be found in and around estuaries, including freshwater and saltwater marshes, mangrove forests, seagrass and kelp beds, rocky shores and sandy areas.

A variety of birds, mammals, fish and other wildlife live, feed and reproduce in estuaries. Shore birds, fish, marine mammals, shellfish and reptiles are just a few of the species that can be found here.

In addition to providing valuable habitat, estuaries help filter pollutants and sediments out of the water as it moves through the marshes. This process helps improve the quality of the water.

Florida's rapidly growing human population has created challenges for the health and quality of our estuaries. We all need to work hard to protect these estuarine environments.

This issue of *WaterWeb* focuses on estuaries. All articles and activities are designed to help you learn more about these estuarine environments and the importance of protecting our natural resources.

Protect Our Estuaries



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Estuaries

Adapted and excerpted from
The Guide to the Southwest Florida Water Management District
August 1999

Fast Facts About Estuaries

Estuaries are semi-enclosed water bodies with an open connection to the sea. Here, fresh water (springs, rivers, streams) mixes with salt water.

Estuaries are among the most productive ecosystems in nature.

Three-quarters of the sport and commercial fish species in the Gulf of Mexico depend on estuaries at some point in their lives.

We are fortunate to have special coastal areas called estuaries where the fresh water from the land meets and mixes with the salt water of the sea. Tampa Bay, Sarasota Bay and Charlotte Harbor are the largest estuaries that lie within the geographical boundaries of the Southwest Florida Water Management District. Like other estuaries, they are transitional zones between fresh and salt water and are especially valuable because of their roles in marine fisheries production. Estuaries often serve as hatcheries for juvenile fish, which move into deeper water as they mature. If the quality or quantity of estuaries is degraded, the ability of certain species to reproduce can be seriously damaged.

The cycle of fresh water flowing into estuaries is a primary concern in managing their health. The timing and volume of fresh water coming into estuaries are probably the most important factors controlling the physical, chemical and biological characteristics of these water bodies. Among other things, the fresh water establishes circulation patterns, regulates salinity levels, and delivers nutrients and sediments to the estuaries and their dependent species. Many species that depend on estuaries use them primarily during immature larval or juvenile stages. These early life stages require the lower salinity created by fresh water mixing with salty seawater. The immature creatures are then able to take advantage of the rich food sources found in water with low to moderate salt content. There is a direct ecological link between fresh water flowing into an estuary and fishery production.

Fresh water that flows into an estuary often originates many miles away. For that reason, managing the water quality in an estuary involves management of the entire watershed that drains into it.

POINTS TO PONDER

1. Using a map of Florida, locate the estuaries mentioned in the article. Try to find other estuarine areas.
2. How can marine fisheries production be affected by the water quality of an estuary?
3. Why is it important to manage the entire watershed that contains an estuary?

Environmental Science Instructor

Jean Knight, Energy and Marine Center, Port Richey, Florida



WW: Thank you for agreeing to give us this interview for the *WaterWeb*. Please tell us about the Energy and Marine Center and its location.

Ms. Knight: The Energy and Marine Center (EMC) is a unique feature of the District School Board of Pasco County. The facility is located on the Gulf of Mexico in Port Richey on the shores of Salt Springs Run Estuary, just north of the Pithlachascotee River. All third-, fourth- and fifth-grade students in Pasco County visit the center for a one-day field program. The EMC also offers a marine science field experience for high school students.

WW: If a student showed an interest in pursuing a career related to estuaries, what advice would you give him or her?

Ms. Knight: I would say first to learn how to be a good observer, be curious and ask questions, and learn how to search for answers. Take trips with your family to coastal areas. Keep a journal or diary of what you find and what you observe. Take advantage of the many excellent resources for students in this area such as The Florida Aquarium in Tampa; Mote Marine Laboratory in Sarasota; the Clearwater Marine Aquarium in Clearwater; the University of South Florida Marine Science program; the Florida Marine Research Institute; and The Pier Aquarium in St. Petersburg. There are many interesting places to visit that have excellent educational programs for students and families. And lastly, go to the library and read and read and read.

WW: What is your occupation at the EMC?

Ms. Knight: I am an environmental science instructor at the EMC. Along with my co-worker, Ken Ford, we develop the curriculum, instruct the students and provide training for teachers.

WW: The theme of this issue of *WaterWeb* is estuaries. How does your role at the EMC help to increase an awareness and appreciation of estuaries?

Ms. Knight: Students who visit the EMC explore the estuary and surrounding marsh and coastal hammock habitats. They learn about the importance of habitats for wildlife, interactions between organisms and the environment, and human impacts and interactions with the environment. Students participate in a variety of activities. They use seine nets to collect fish, crabs, shrimp and other animals that depend on estuarine habitats for part of their lives. They learn to identify mangroves and salt marsh plants that provide food and shelter for animals in the marsh and estuary. They collect fiddler crabs and snails that live in the marsh and learn how the food chains of the marsh and estuary are interconnected. They hike through a coastal hammock trail to search for evidence of wildlife and to discover the importance of these habitats as buffers against flooding, erosion and pollution. These activities provide students with a fun and memorable experience that helps them appreciate the beauty and value of estuaries to wildlife and people.

WW: What is your favorite aspect of your job?

Ms. Knight: Aside from being surrounded by a beautiful environment and being able to work outside, the favorite part of my job is seeing the excitement of the students when they find a baby flounder the size of their fingernail or a seahorse camouflaged in algae, or they catch a "really big" pinfish! It is knowing that students are learning about their natural world. I love it when I overhear a student say to another, "Wow! This is the best day I've ever had at school — I wish every day could be like this!"

WW: Is there anything else you would like to share with us about your role at the EMC?

Ms. Knight: One aspect that I really enjoy about my job is being able to incorporate my love for music and singing with teaching. I like to write songs about the environment and make up music that is fun to listen to, sing along with and even dance to. I think music and movement help us learn and feel good at the same time!

Living in an Estuary

Estuaries are places that are filled with a variety of plants and animals. Here are a few examples of what you might find living in an estuary.



Water Birds

Hérons, egrets, brown pelicans and ibis are just a few of the birds that may be found in an estuary. Estuaries are popular places for breeding and nesting.



Seagrass

Seagrass beds help life in the estuary in many ways. They provide shelter to a variety of wildlife and are considered nurseries for young marine creatures. Seagrasses help other organisms by recycling the nutrients from sediments to the water, which encourages growth of other marine life. They also provide food for grazing marine creatures or become part of the food chain.



Horseshoe Crab

This creature is not a crab at all! It is a distant relative of the spider and scorpion. This harmless creature hasn't changed much in the last 350 to 400 million years. The horseshoe crab spends its time in estuaries mating and laying eggs. It eats clams, worms and other invertebrates.

EXTENDED ACTIVITY

Use an encyclopedia or search the Internet to create a list of plants and animals that live in estuaries. Create a set of estuary cards by writing the name of the animal or plant on one side of the card and the description on the back.

Mangrove Swamps

Not many species of trees can thrive in an environment of salty water and tidal flooding. One of the few exceptions is a tropical tree called a mangrove. In fact, three species of mangroves grow in Florida: the red mangrove, black mangrove and white mangrove. Mangroves are able to filter out the salt from water through the undersides of their leaves or at the surface of their roots. Mangroves have exposed roots that breathe through their pores.

Mangroves require a warm climate and the warm waters of coastal areas. These tropical trees contribute to the quality of the coastal environment in many ways. The dense root systems of the mangrove trees trap organic material brought in by tidal flooding. The root systems also provide a safe environment for many marine creatures and help prevent coastal erosion. Mangroves provide unique roosting and nesting sites for a variety of birds. Herons, egrets, white ibis and brown pelicans may be found among the intricate tangle of branches and roots.

Black mangroves can be found in abundance along the entrance of the Manatee River into Tampa Bay. The black mangrove can be easily identified by its numerous breathing tubes, which stick up from the surrounding soil. These tubes allow the tree to take in oxygen from the salty water. The white flowers that appear year-round are rich in nectar, which often attract bees. The black mangrove forms seeds, called "propagules," that are shaped like lima beans and begin to grow while they are still attached to the parent tree. Eventually, they drop into the water and, after floating to shore, take root to make more black mangroves.

The red mangrove is often called the walking tree. Its strange, dangling prop roots resemble stilts. Because of the prop roots, red mangroves look like they are walking on water. The intricate patterns of the roots provide habitat for many young marine animals. Like the black mangrove, the red mangrove also forms seeds on the parent tree. These torpedo-shaped seeds also drop into the water and float with the current to a suitable location to take root.

The white mangrove usually appears farther inland and on higher ground than the other two species of mangrove. Because of where the white mangroves live, they are not as affected by the coastal waves and tides. However, they also need a way to excrete salt. They depend on bumps at the base of the leaves to help remove salt from their system.

We have learned to recognize the importance of mangrove swamps. In the past, they were routinely removed for new neighborhoods and businesses. Now we protect these areas from development so we can enjoy their natural beauty into the future.

WHAT DO YOU THINK?

Use the information about mangroves to answer the questions below.

1. How are all three mangroves similar?
2. Describe a few unique characteristics about each species.
3. Draw a diagram that illustrates the differences and similarities among the three species of mangroves.



Black Mangrove Seedling



Roots of Black Mangrove



White Mangrove Fruits



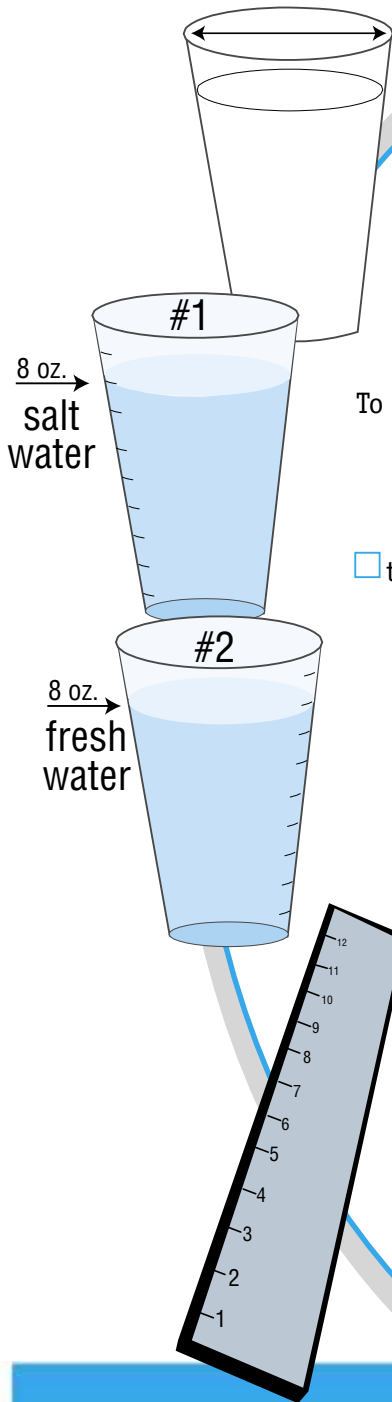
Red Mangrove Seedling



Red Mangrove Flowers

A Brackish Experiment With Salt Water and Fresh Water

Measure diameter of cup



Background

The marine life in an estuary must adapt to the constant changes of water in order to survive. Try this experiment to learn more about a few of the differences between salt water and fresh water. Then find out what happens when salt water meets and gradually mixes with fresh water.

Learning Goals

To learn about the density of water.
To stimulate thought about the mixing of fresh and salty water.

Subjects

Science and Mathematics

Materials

- two clear plastic cups (10 oz.)
- salt
- water
- 1 tablespoon
- food coloring
- measuring cup
- knife
- ruler
- two slices of raw potato

Activity

1. Measure the diameter of the top of each cup.
2. Cut two 1-inch slices of potato that will fit in the cup.
3. Fill each cup with 8 ounces of water.
4. Add 3 tablespoons of salt to the first cup.
5. Add food coloring to the water in the second cup.
6. Place one slice of potato in each cup.
7. Record your observations.
8. Add 2 more tablespoons of salt to the first cup and stir.
9. Record your observations.
10. Remove the potato from the second cup.
11. Very slowly, pour some of the colored water from the second cup on top of the potato in the first cup.
12. Record your observations.
13. Gently stir the water.
14. Record your observations.
15. Write a summary describing what you learned by conducting the experiment.

BRACKISH OBSERVATIONS

Record Steps	Observations
Step No. 7	
Step No. 9	
Step No.12	
Step No.14	
Summary:	

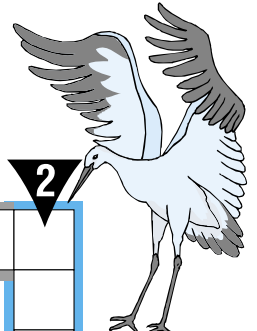
SAMPLE

Activities

WaterWeb Crossword Puzzle

Sharpen your pencils.

Complete each sentence with the correct word that fits in the puzzle.

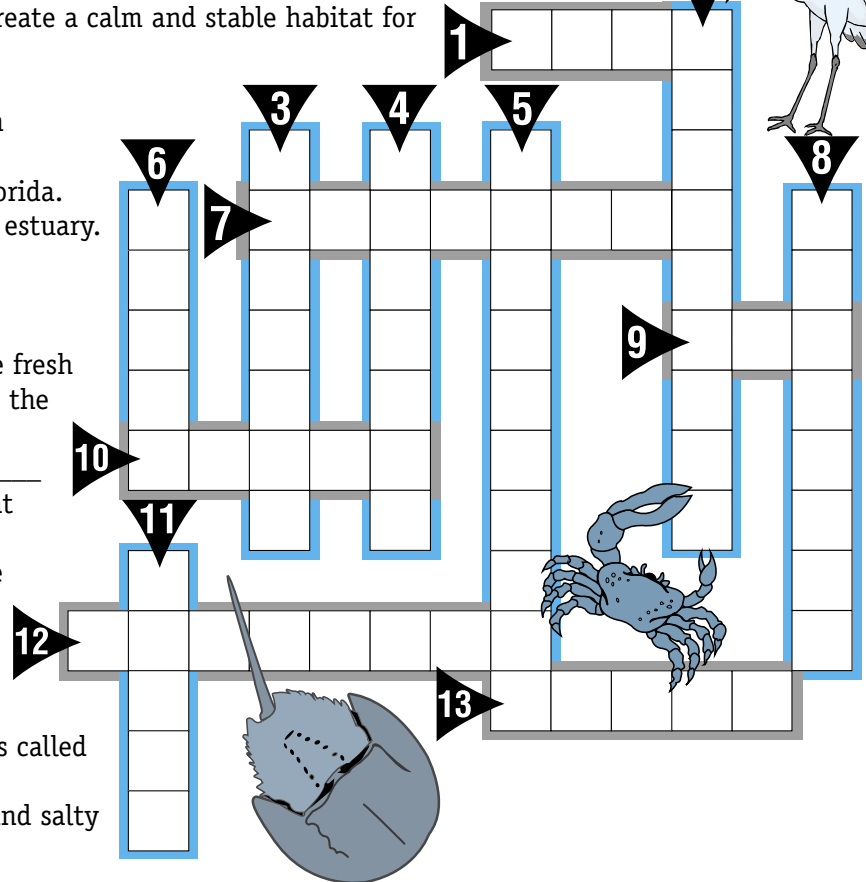


Across:

- Estuaries often serve as hatcheries for young _____.
- The _____ beds in an estuary help to create a calm and stable habitat for a variety of wildlife.
- The _____ contains salty water.
- One type of water bird you may find in an estuary is a _____.
- Three species of _____ trees grow in Florida.
- Fresh water and _____ water mix in an estuary.

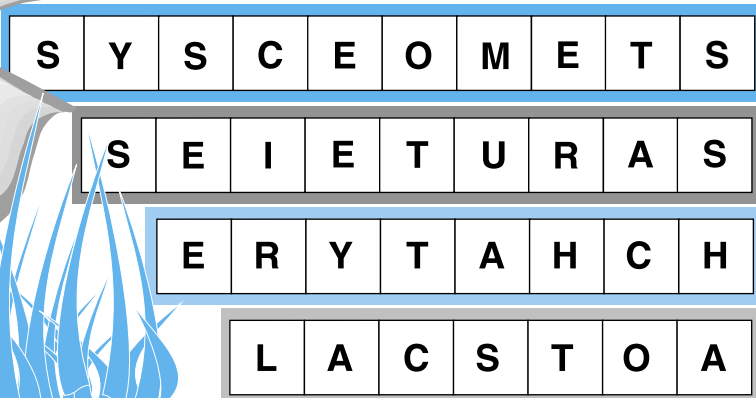
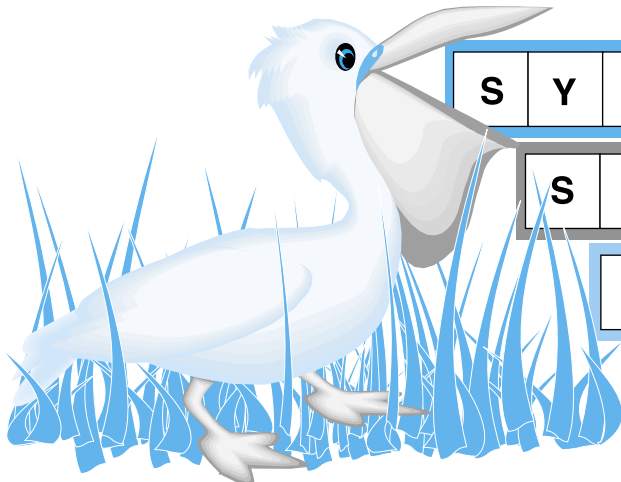
Down:

- The _____ crab really isn't a crab.
- An _____ is a special coastal area where fresh water from the land meets and mixes with the salt water of the sea.
- The red mangrove is often called the _____ tree because of its dangling prop roots that resemble stilts.
- The young plants that grow while they are attached to the black mangrove are called _____.
- The water that flows from our rivers is _____ water.
- A mixture of salty water and fresh water is called _____ water.
- It is important that we protect our fresh and salty _____ resources.



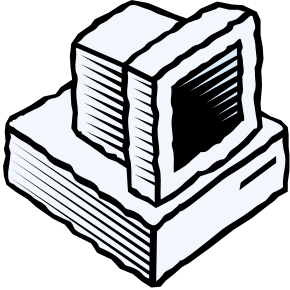
WaterWeb Scramble

Unscramble the letters to form words. Then use these words to complete the paragraph.



Estuaries are special _____ areas where fresh water meets and mixes with the salty water of the sea. Estuaries are very productive _____. They serve as a _____ 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 _____.

Sites for *WaterWeb* Readers to Explore



There is a lot of information about estuaries available on the Internet. Here are just a few web sites for you to explore. All of them have numerous related links for you to gather additional material and participate in activities about topics related to estuaries.

Tampa Bay Estuary Program

Florida Marine Research Institute

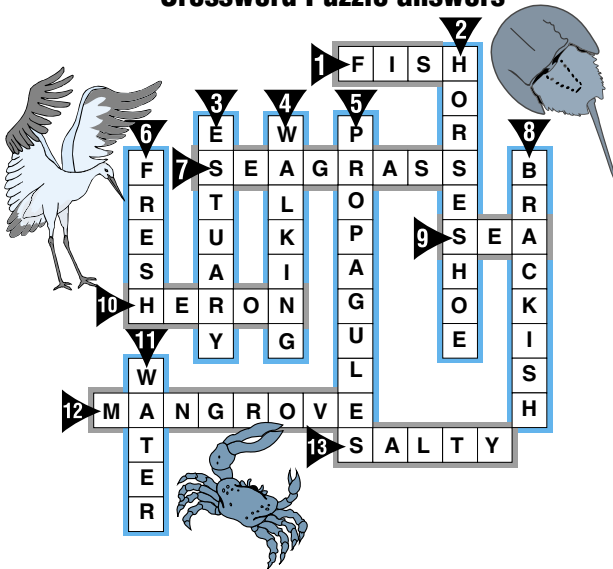
EPA National Estuary Program

Also, don't forget to explore the Southwest Florida Water Management District's web site at WaterMatters.org

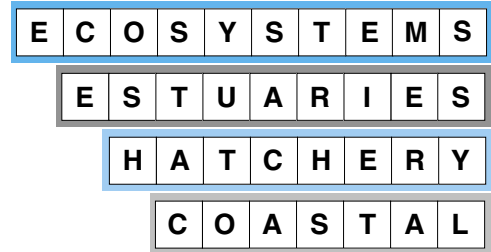
Answers

WaterWeb Crossword Puzzle answers

Activities on page 7



WaterWeb Scramble answers



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*.

Contact Information

Southwest Florida
Water Management District

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